Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

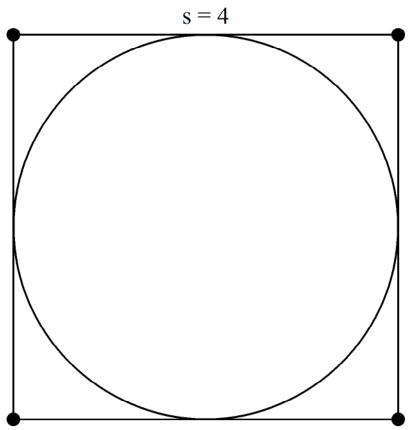
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$$_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is $_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $(_{17}C_2)(_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

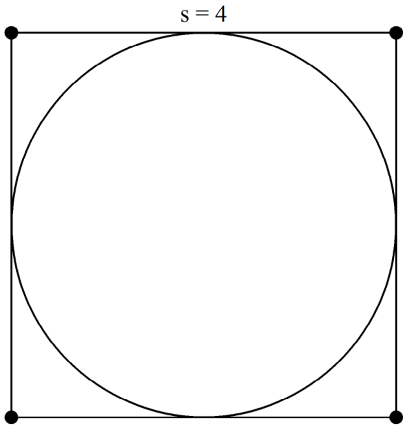
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_{n}C_{r} = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_{5} = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

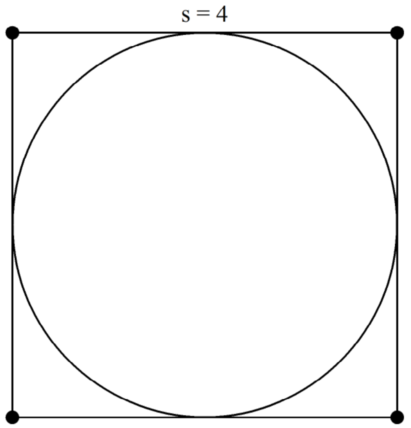
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B
The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

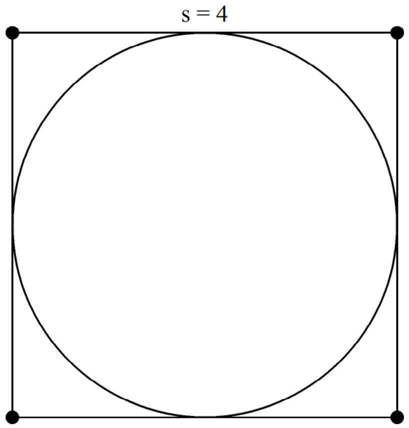
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a.	independent; 0.24	c.	dependent; 0.16
b.	independent; 0.27	d.	dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} $$

$n = 12$ and $r = 5$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} $$

Expand.

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} $$

Divide out common factors.

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 $$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16 - 4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

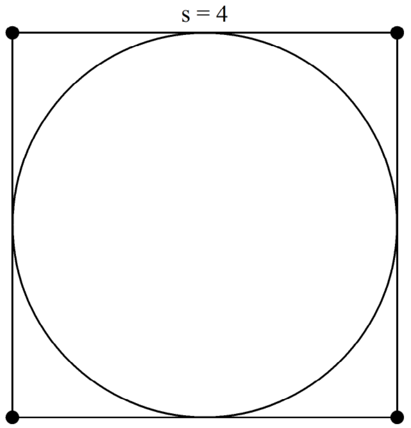
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a.	independent; 0.24	c.	dependent; 0.16
b.	independent; 0.27	d.	dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A

Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!} \frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$ Use the complement.

$= 1 - (\frac{1}{7})$ There are 7 days in the week.

$= 85.7\%$

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

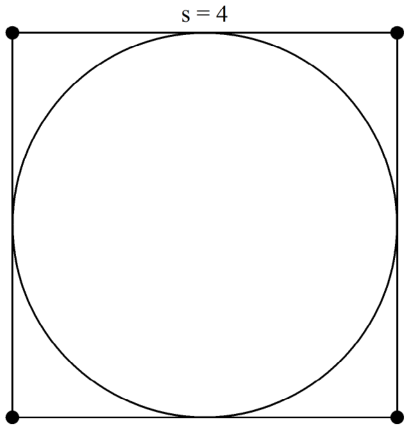
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$$ {}_{7!}P_{7!} \frac{7!}{(7-7)!} = \frac{7!}{0!} $$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

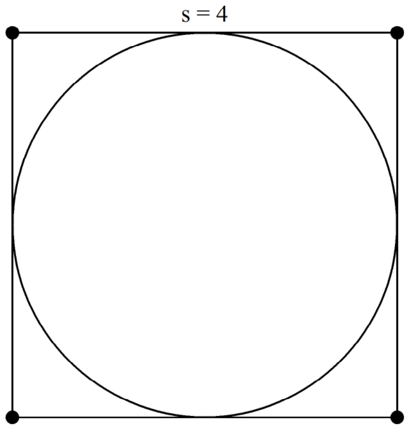
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
c. dependent; 0.16
b. independent; 0.27
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A

Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

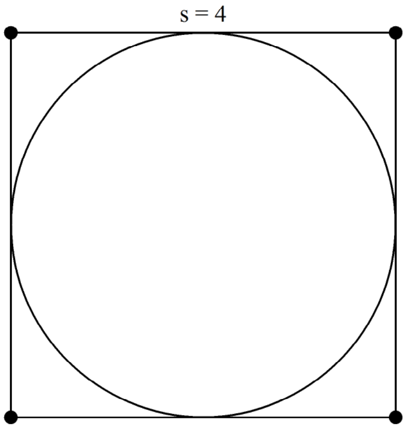
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot \underline{\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}}}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (\underline{\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}})} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot \underline{\underline{\underline{8}}}}{5 \cdot \underline{\underline{\underline{4}}} \cdot 3 \cdot \underline{\underline{\underline{2}}} \cdot 1} = \frac{12 \cdot 11 \cdot \underline{10} \cdot \underline{\underline{\underline{9}}}}{\underline{5} \cdot \underline{\underline{\underline{3}}}} = 12 \cdot 11 \cdot 2 \cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A
Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A
When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

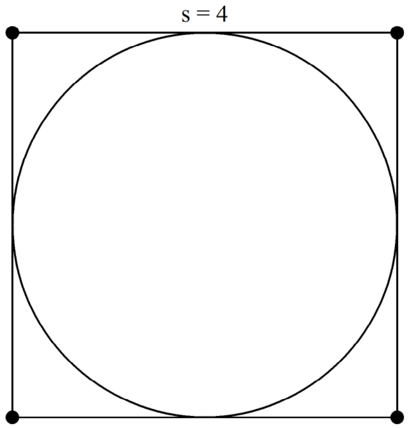
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$ $n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$ Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$ Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$ Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21.$

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

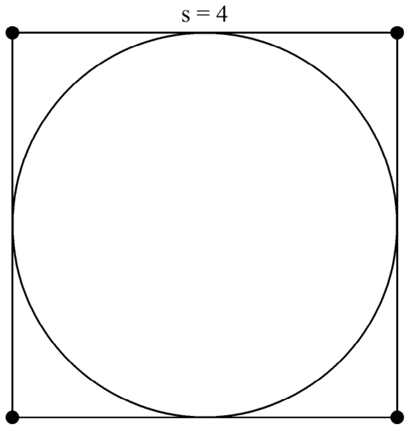
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_{n}C_{r} = \dfrac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5 $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.} $$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

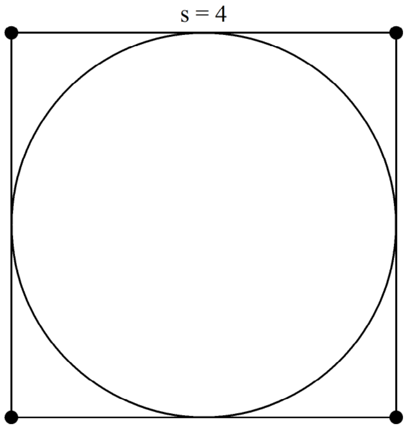
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A

Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_{n}C_{r} = \frac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_{5} = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5 $$

$$ {}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.} $$

$$ {}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.} $$

$$ {}_{12}C_{5} = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.} $$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

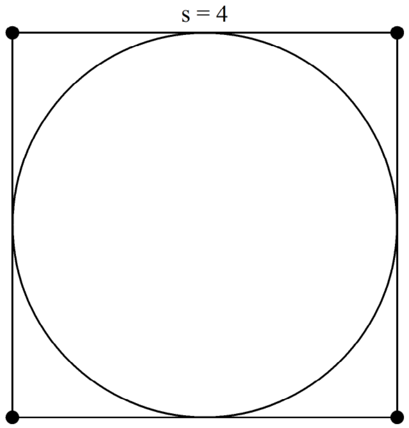
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
c. dependent; 0.16
b. independent; 0.27
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_{n}C_{r} = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16 - 4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B
The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

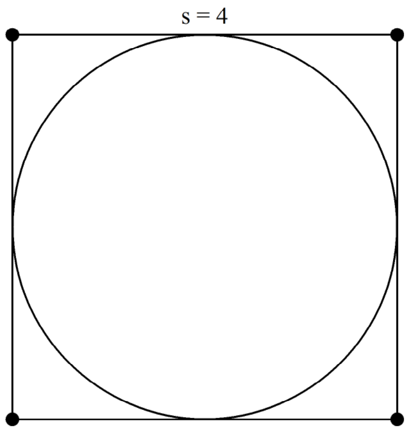
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A

Since the order matters, use the formula for permutations.

$$_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5 $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.} $$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16 - 4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

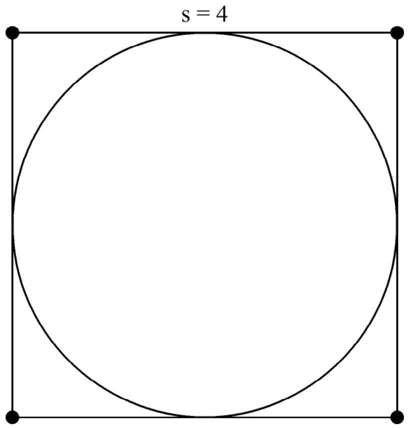
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!} \frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

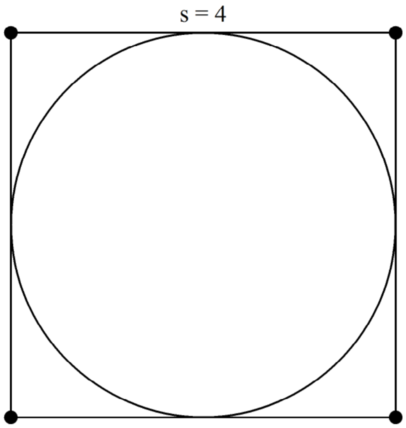
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!}=\frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16 - 4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

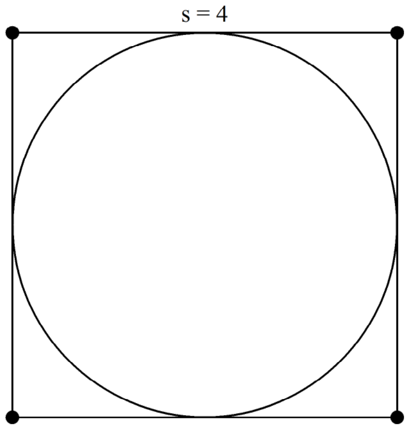
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!} \frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$ Use the complement.

$= 1 - (\frac{1}{7})$ There are 7 days in the week.

$= 85.7\%$

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21.$

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

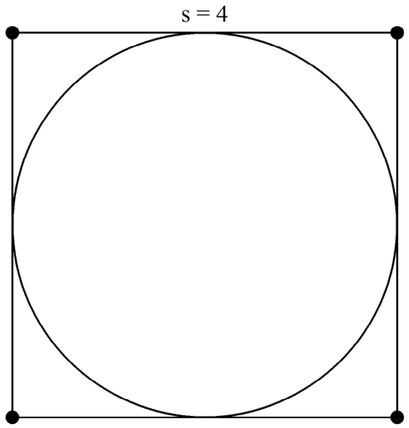
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

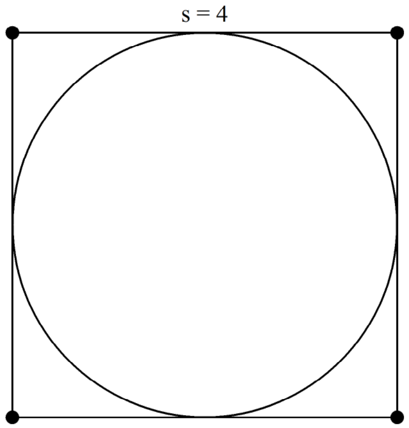
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_{n}C_{r} = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

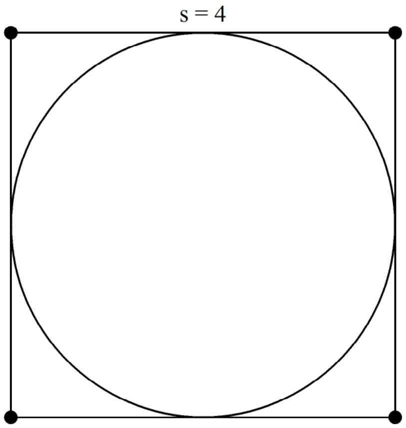
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%	c. 3.4%
b. 78.5%	d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$	c. $\frac{23}{33}$
b. $\frac{10}{33}$	d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49	c. 0.09
b. 0.23	d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$	c. $\frac{2}{11}$
b. $\frac{9}{44}$	d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.
$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!}=\frac{7!}{0!}$$
Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

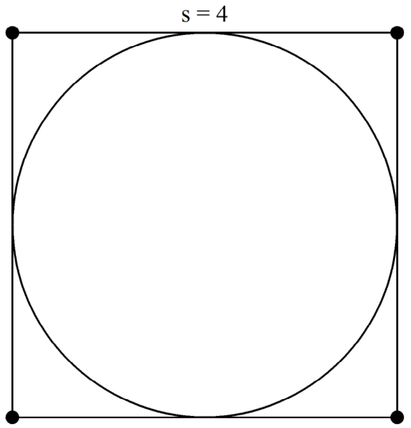
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$ Use the complement.

$= 1 - (\frac{1}{7})$ There are 7 days in the week.

$= 85.7\%$

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

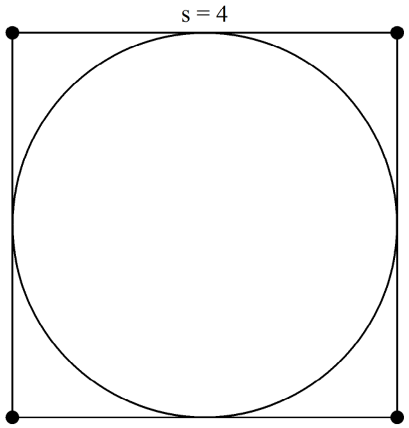
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot \underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}})} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot \underline{\underline{8}}}{5 \cdot \underline{\underline{4}} \cdot 3 \cdot \underline{\underline{2}} \cdot 1} = \frac{12 \cdot 11 \cdot \underline{10} \cdot \underline{\underline{9}}}{\underline{5} \cdot \underline{\underline{3}}} = 12 \cdot 11 \cdot 2 \cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

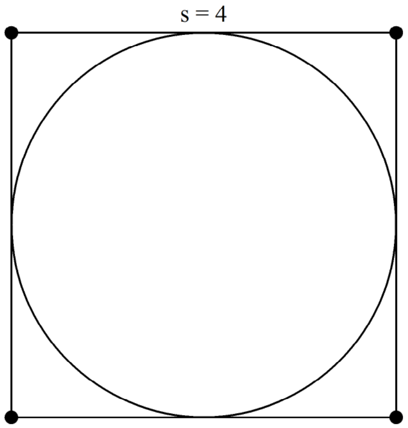
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$$ {}_{7!}P_{7!}\ \frac{7!}{(7-7)!} = \frac{7!}{0!} $$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad \text{n = 12 and r = 5} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.} $$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A
Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A
When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

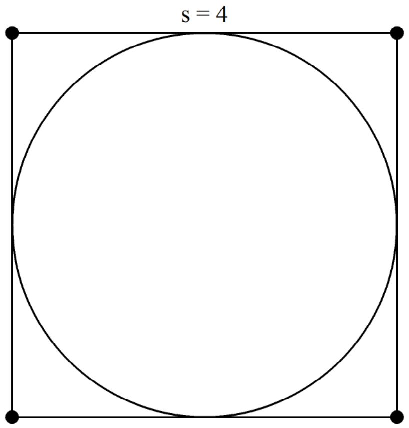
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

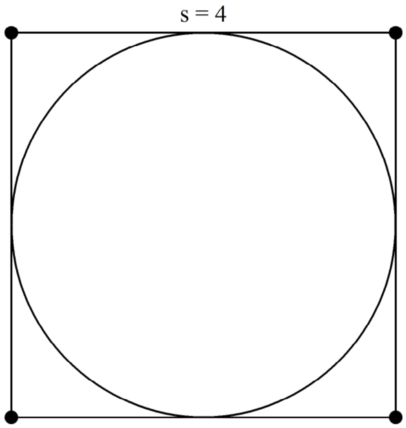
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16 - 4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10 + 12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

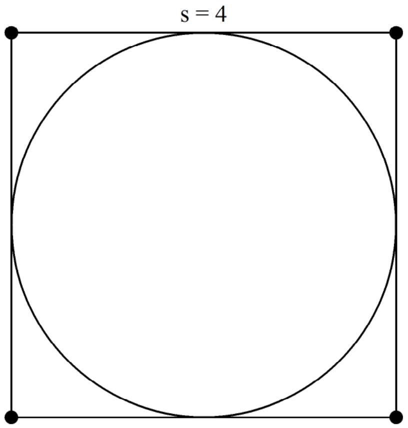
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$ $n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$ Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$ Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$ Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

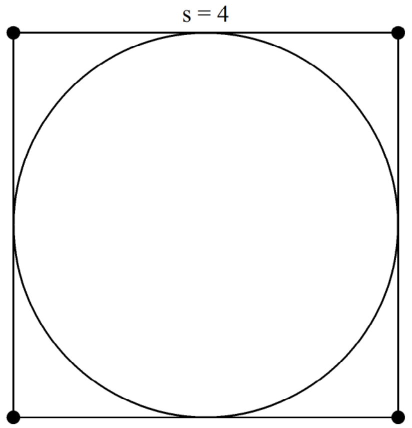
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$ $n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$ Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$ Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$ Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

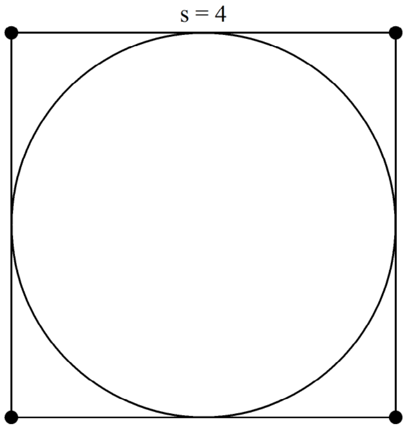
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24

b. independent; 0.27

c. dependent; 0.16

d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$ $n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot(7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$ Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot(\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$ Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$ Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits c. 24 outfits
b. 6 outfits d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways c. 42 ways
b. 49 ways d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways c. 60 ways
b. 95,040 ways d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$ c. $\frac{1}{6}$
b. $\frac{1}{3}$ d. $\frac{2}{3}$

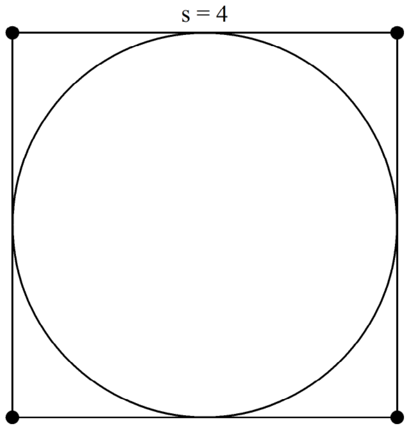
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0% c. 14.3%
b. 80.0% d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10 c. 0.15
b. 0.05 d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
c. dependent; 0.16
b. independent; 0.27
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\ \frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot \underline{\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}}}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}})} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot \underline{\underline{8}}}{5 \cdot \underline{\underline{4}} \cdot 3 \cdot \underline{\underline{2}} \cdot 1} = \frac{12 \cdot 11 \cdot \underline{10} \cdot \underline{\underline{9}}}{\underline{5} \cdot \underline{\underline{3}}} = 12 \cdot 11 \cdot 2 \cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

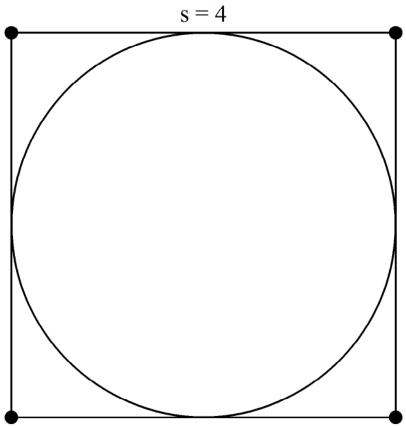
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!} \frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$ Use the complement.

$= 1 - (\frac{1}{7})$ There are 7 days in the week.

$= 85.7\%$

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B
The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

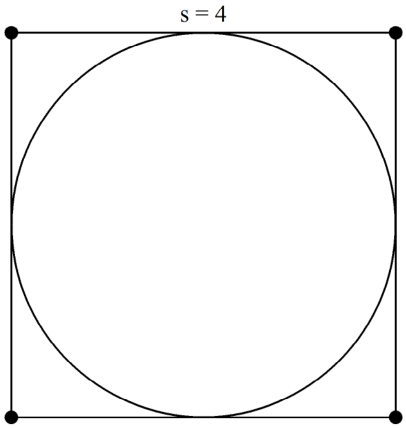
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.
a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.
a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A

Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5 $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.} $$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.} $$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

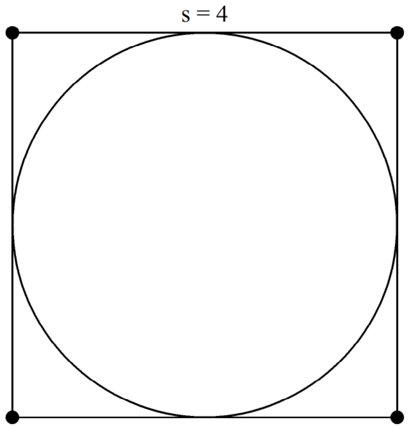
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

   One outcome does not affect the other, so the events are independent.
   To find the probability that A and B both happen, multiply the probabilities.
   $P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

    The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
    The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
    For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
    To find the probability that both events happen, multiply the probabilities.
    $P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24.$

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

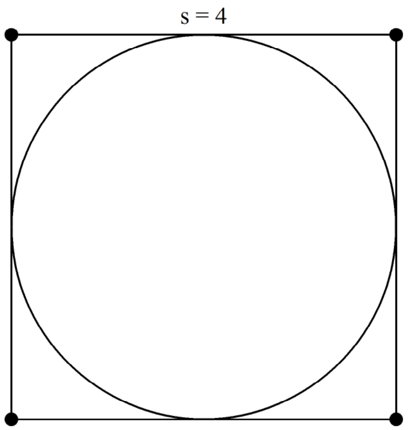
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$ $n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$ Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$ Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$ Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$$A_o = A_s - A_c$$

$$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

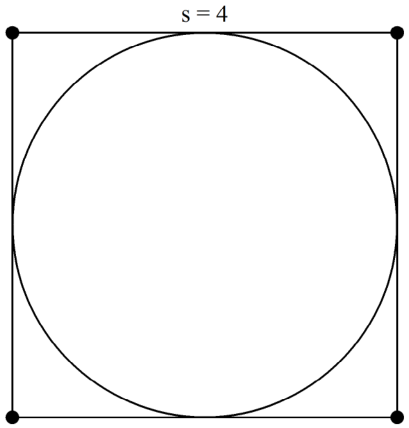
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804

OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b

TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805

OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d

TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ Class: ___________________ Date: __________ ID: A

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

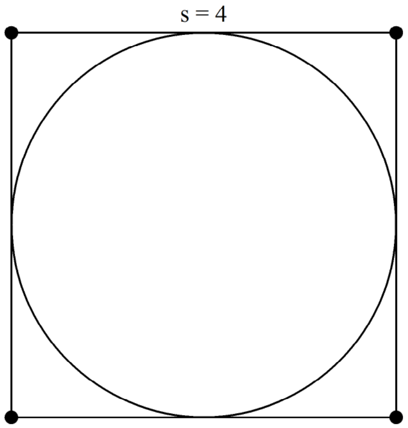
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%	c. 3.4%
b. 78.5%	d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$	c. $\frac{23}{33}$
b. $\frac{10}{33}$	d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49	c. 0.09
b. 0.23	d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$	c. $\frac{2}{11}$
b. $\frac{9}{44}$	d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

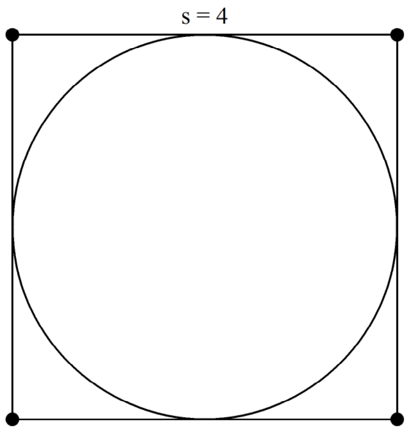
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100.$

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits c. 24 outfits
b. 6 outfits d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways c. 42 ways
b. 49 ways d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways c. 60 ways
b. 95,040 ways d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$ c. $\frac{1}{6}$
b. $\frac{1}{3}$ d. $\frac{2}{3}$

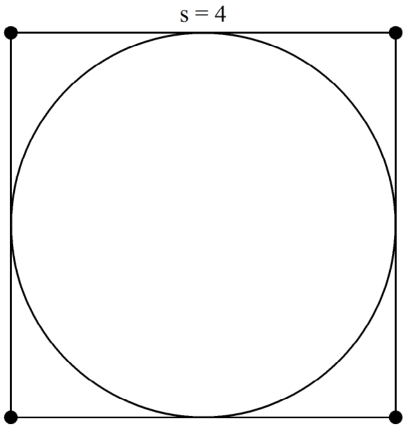
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0% c. 14.3%
b. 80.0% d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10 c. 0.15
b. 0.05 d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24	c. dependent; 0.16
b. independent; 0.27	d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$$ {}_{12}C_5 = \frac{12!}{5!\,(12-5)!} $$

$n = 12$ and $r = 5$

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} $$

Expand.

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} $$

Divide out common factors.

$$ {}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 $$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

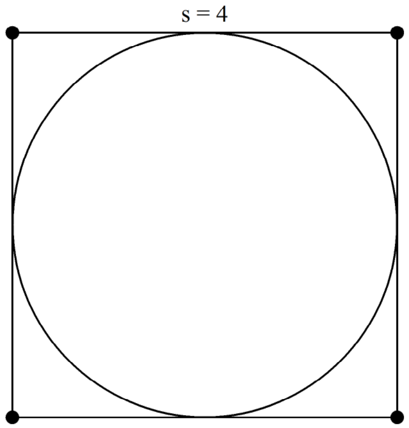
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.
The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.
For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.
To find the probability that both events happen, multiply the probabilities.
$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
    One outcome does not affect the other, so the events are independent.
    To find the probability that A and B both happen, multiply the probabilities.
    $P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

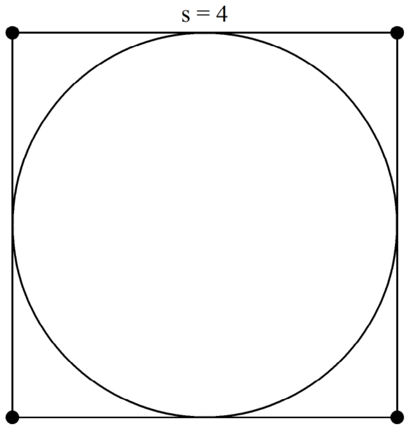
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5% c. 3.4%
b. 78.5% d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$ c. $\frac{23}{33}$
b. $\frac{10}{33}$ d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49 c. 0.09
b. 0.23 d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$ c. $\frac{2}{11}$
b. $\frac{9}{44}$ d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot \underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 \cdot (\underline{\underline{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}})} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot \underline{\underline{8}}}{5 \cdot \underline{\underline{4}} \cdot 3 \cdot \underline{\underline{2}} \cdot 1} = \frac{12 \cdot 11 \cdot \underline{10} \cdot \underline{\underline{9}}}{\underline{5} \cdot \underline{\underline{3}}} = 12 \cdot 11 \cdot 2 \cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A
One outcome does not affect the other, so the events are independent.
To find the probability that A and B both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
b. 6 outfits
c. 24 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
b. 49 ways
c. 42 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
b. 95,040 ways
c. 60 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
b. $\frac{1}{3}$
c. $\frac{1}{6}$
d. $\frac{2}{3}$

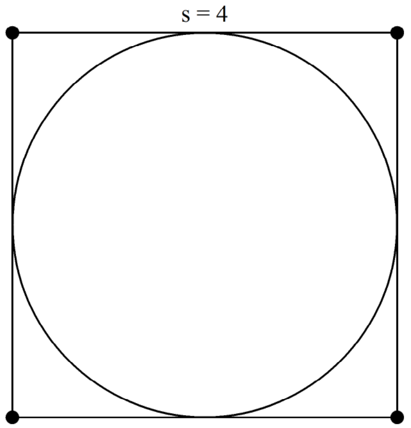
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
b. 80.0%
c. 14.3%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
b. 0.05
c. 0.15
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
b. 78.5%
c. 3.4%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
b. $\frac{10}{33}$
c. $\frac{23}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
b. 0.23
c. 0.09
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
b. $\frac{9}{44}$
c. $\frac{2}{11}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\,\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of n items taken r at a time is ${}_nC_r = \dfrac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!} \qquad n = 12 \text{ and } r = 5$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)} \qquad \text{Expand.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1} \qquad \text{Divide out common factors.}$$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{8}}}{5\cdot \underline{\underline{4}}\cdot 3\cdot \underline{\underline{2}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{9}}}{\underline{5}\cdot \underline{\underline{3}}} = 12\cdot 11\cdot 2\cdot 3 = 729 \qquad \text{Simplify.}$$

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177{,}100.$

The number of favorable outcomes is $({}_{17}C_2)({}_{8}C_4) = 9520.$

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177{,}100} \approx 0.05.$

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability

Name: ________________________ **Class:** ___________________ **Date:** __________ **ID: A**

Algebra II Practice Quiz 11.1 - 11.3

Multiple Choice

Identify the choice that best completes the statement or answers the question.

____ 1. Louise wears an outfit everyday that consists of one top (shirt, T-shirt, or blouse), one bottom (pants or skirt) and one scarf. Her wardrobe consists of a tan skirt, a pair of black pants, 2 T-shirts, one silk blouse, 1 button-down shirt, and a set of 3 scarves. How many different outfits can Louise put together?

a. 9 outfits
c. 24 outfits
b. 6 outfits
d. 3 outfits

____ 2. There are 7 singers competing at a talent show. In how many different ways can the singers appear?

a. 5,040 ways
c. 42 ways
b. 49 ways
d. 720 ways

____ 3. Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

a. 792 ways
c. 60 ways
b. 95,040 ways
d. 17 ways

____ 4. An experiment consists of rolling a number cube. What is the probability of rolling a number greater than 4? Express your answer as a fraction in simplest form.

a. $\frac{1}{2}$
c. $\frac{1}{6}$
b. $\frac{1}{3}$
d. $\frac{2}{3}$

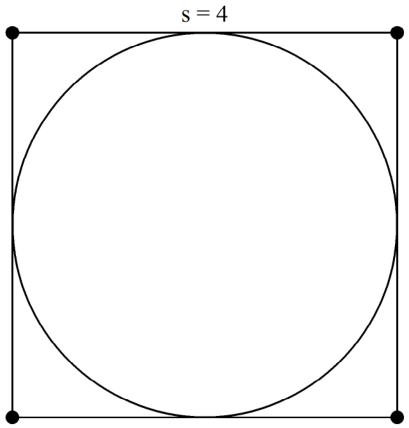
____ 5. A person is selected at random. What is the probability that the person was not born on a Monday? Express your answer as a percent. If necessary, round your answer to the nearest tenth of a percent.

a. 20.0%
c. 14.3%
b. 80.0%
d. 85.7%

____ 6. In a recent survey of 25 voters, 17 favor a new city regulation and 8 oppose it. What is the probability that in a random sample of 6 respondents from this survey, exactly 2 favor the proposed regulation and 4 oppose it? Express your answer as a decimal.

a. 0.10
c. 0.15
b. 0.05
d. 0.20

____ 7. A circle is inscribed in a square with a side length of 4. If a point in the square is chosen at random, what is the probability that the point is in the square but not in the circle? Express your answer as a percent, and round to the nearest tenth.



a. 21.5%
c. 3.4%
b. 78.5%
d. 12.6%

____ 8. An experiment consists of spinning a spinner. The table shows the results. Find the experimental probability that the spinner does not land on red. Express your answer as a fraction in simplest form.

Outcome	**Frequency**
red	11
purple	10
green	12

a. $\frac{2}{3}$
c. $\frac{23}{33}$
b. $\frac{10}{33}$
d. $\frac{1}{3}$

____ 9. A grab bag contains 3 football cards and 7 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. 0.49
c. 0.09
b. 0.23
d. 0.21

____ 10. A bag contains hair ribbons for a spirit rally. The bag contains 3 black ribbons and 9 green ribbons. Lila selects a ribbon at random, then Jessica selects a ribbon at random from the remaining ribbons. What is the probability that Lila selects a black ribbon and Jessica selects a green ribbon? Express your answer as a fraction in simplest form.

a. $\frac{3}{22}$
c. $\frac{2}{11}$
b. $\frac{9}{44}$
d. $\frac{3}{16}$

____ 11. A grab bag contains 6 football cards and 4 basketball cards. An experiment consists of taking one card out of the bag, replacing it, and then selecting another card. Determine whether the events are independent or dependent. What is the probability of selecting a football card and then a basketball card? Express your answer as a decimal.

a. independent; 0.24
b. independent; 0.27
c. dependent; 0.16
d. dependent; 0.36

Numeric Response

12. Sheila visits the dentist once per year. After her check-up, she may choose 1 toy out of 6 different toys. Over 4 years, how many ways can Sheila choose her toys if she chooses a different toy each year?

13. On a field trip, 4 students bring bag lunches. On the way there, the bag lunches get mixed up. What is the probability that no students get his or her own bag lunch back?

Algebra II Practice Quiz 11.1 - 11.3
Answer Section

MULTIPLE CHOICE

1. ANS: C

Number of tops	times	Number of bottoms	times	Number of scarves
4	×	2	×	3

The total number of outfits is $4 \times 2 \times 3 = 24$

	Feedback
A	Multiply the number of ways to choose a top by the number of ways to choose a bottom by the number of ways to choose a scarf.
B	Make sure you count the total number of tops and the total number of bottoms.
C	Correct!
D	That's the number of scarves. The number of outfits is a combination of scarves with tops and bottoms.

PTS: 1 DIF: Basic REF: Page 794
OBJ: 11-1.1 Using the Fundamental Counting Principle NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

2. ANS: A
Since the order matters, use the formula for permutations.

$${}_{7!}P_{7!}\frac{7!}{(7-7)!} = \frac{7!}{0!}$$

Since 0! = 1, the number of ways is 7! = 5,040.

	Feedback
A	Correct!
B	Since the order is important, use the formula for permutations.
C	Since the order is important, use the formula for permutations.
D	Since the order is important, use the formula for permutations.

PTS: 1 DIF: Average REF: Page 796 OBJ: 11-1.2 Finding Permutations
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations
KEY: permutation | ordering

3. ANS: A

Step 1 Determine whether the problem represents a combination or a permutation.
The order does not matter because choosing a green shirt, a blue shirt, and a red shirt is the same as choosing a red shirt, a blue shirt, and a green shirt. It is a combination.

Step 2 Use the formula for combinations.

The number of combinations of *n* items taken *r* at a time is ${}_nC_r = \frac{n!}{r!\,(n-r)!}$.

$${}_{12}C_5 = \frac{12!}{5!\,(12-5)!}$$

$n = 12$ and $r = 5$

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot 7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

Expand.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8\cdot \underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}}}{5\cdot 4\cdot 3\cdot 2\cdot 1\cdot (\underline{\underline{\underline{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}}})} = \frac{12\cdot 11\cdot 10\cdot 9\cdot 8}{5\cdot 4\cdot 3\cdot 2\cdot 1}$$

Divide out common factors.

$${}_{12}C_5 = \frac{12\cdot 11\cdot 10\cdot 9\cdot \underline{\underline{\underline{8}}}}{5\cdot \underline{\underline{\underline{4}}}\cdot 3\cdot \underline{\underline{\underline{2}}}\cdot 1} = \frac{12\cdot 11\cdot \underline{10}\cdot \underline{\underline{\underline{9}}}}{\underline{5}\cdot \underline{\underline{\underline{3}}}} = 12\cdot 11\cdot 2\cdot 3 = 729$$

Simplify.

There are 729 ways to select a group of 5 shirts from 12.

	Feedback
A	Correct!
B	You found the permutation *nPr*. Order is not important, so find the combination *nCr*.
C	Check your formula. Find the combination *nCr*.
D	Check your formula. Find the combination *nCr*.

PTS: 1 DIF: Average REF: Page 797 OBJ: 11-1.3 Application
NAT: 12.4.4.e TOP: 11-1 Permutations and Combinations

4. ANS: B

There are six possible outcomes when a fair number cube is rolled. Because the number cube is fair, all outcomes are equally likely. There are two numbers greater than 4 on the number cube: 5 and 6. So the probability of rolling one of these numbers is $\frac{2}{6} = \frac{1}{3}$.

	Feedback
A	This is the probability of rolling a number greater than or equal to 4. Find the probability of rolling a number greater than 4.
B	Correct!
C	This is the probability of rolling a 4. Find the probability of rolling a number greater than 4.
D	This is the probability of rolling a number less than or equal to 4. Find the probability of rolling a number greater than 4.

PTS: 1 DIF: Basic REF: Page 802
OBJ: 11-2.1 Finding Theoretical Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability KEY: probability | theoretical probability

5. ANS: D

$P(\text{different days}) = 1 - P(\text{Monday})$	Use the complement.
$= 1 - (\frac{1}{7})$	There are 7 days in the week.
$= 85.7\%$	

	Feedback
A	Use the complement. The probability of someone being born on a Monday is 14.3%.
B	Use the complement. The probability of someone being born on a Monday is 14.3%.
C	Use the complement. The probability of someone being born on a Monday is 14.3%.
D	Correct!

PTS: 1 DIF: Basic REF: Page 803 OBJ: 11-2.2 Application
NAT: 12.4.4.b TOP: 11-2 Theoretical and Experimental Probability

6. ANS: B

Since order does not matter, use combinations.

The number of outcomes in the sample space is ${}_{25}C_6 = \dfrac{25!}{6!\,(25-6)!} = 177,100$.

The number of favorable outcomes is $({}_{17}C_2)({}_8C_4) = 9520$.

The probability that in a random sample of 6 respondents from this survey, with exactly 2 favoring the proposed regulation and 4 opposing it, is $\dfrac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}} = \dfrac{9520}{177,100} \approx 0.05$.

	Feedback
A	Since order does not matter, use combinations.
B	Correct!
C	To find the probability, divide the number of favorable outcomes by the number of outcomes in the sample space.
D	To find the number of outcomes in the sample space, use the combinations formula.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.3 Finding Probability with Permutations or Combinations
NAT: 12.4.4.e TOP: 11-2 Theoretical and Experimental Probability

7. ANS: A

Find the ratio of the area of the region inside the square but outside the circle to the total area of the square.

The area of the region outside the circle is equal to the area of the square minus the area of the circle.

$A_o = A_s - A_c$

$A_o = (4^2) - (\pi(2)^2) = 16 - 4\pi$

$$\frac{\text{Area outside region}}{\text{Area square}} = \frac{A_o}{A_s} = \frac{16-4\pi}{16} = 0.215 = 21.5\%$$

	Feedback
A	Correct!
B	This is the probability that the point is in the circle, find the probability that the point is not in the circle.
C	Find the ratio of the area of the region outside the circle to the total area of the square.
D	Find the ratio of the area of the region outside the circle to the area of the square.

PTS: 1 DIF: Average REF: Page 804
OBJ: 11-2.4 Finding Geometric Probability NAT: 12.4.4.b
TOP: 11-2 Theoretical and Experimental Probability

8. ANS: A

When the spinner does not land on red, it must land on purple or green.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{10+12}{33} = \frac{22}{33} = \frac{2}{3}$$

	Feedback
A	Correct!
B	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
C	To find the probability that the spinner does not land on a color, find the probability that the spinner lands on either of the two other colors.
D	This is the probability that the spinner does land on the color. The problem asked you to find the probability that the spinner does not land on that color.

PTS: 1 DIF: Basic REF: Page 805
OBJ: 11-2.5 Finding Experimental Probability NAT: 12.4.4.d
TOP: 11-2 Theoretical and Experimental Probability

9. ANS: D

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.3 \bullet 0.7 = 0.21$.

	Feedback
A	To find the probability that both events happen, multiply the probabilities of the events.
B	The events are independent. To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	Correct!

PTS: 1 DIF: Average REF: Page 811
OBJ: 11-3.1 Finding the Probability of Independent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

10. ANS: B

The color of the first ribbon affects the mix of ribbons left in the bag, so the events are dependent.

The probability of drawing a black ribbon first is 3 out of 12, or $\frac{1}{4}$.

For the second draw, there are 11 ribbons left, and there are still 9 green ribbons. The probability of drawing a green ribbon second is 9 out of 11, or $\frac{9}{11}$.

To find the probability that both events happen, multiply the probabilities.

$P(\text{black and green}) = \frac{1}{4} \bullet \frac{9}{11} = \frac{9}{44}$.

	Feedback
A	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
B	Correct!
C	Check the numerators of your probabilities. Since the first ribbon drawn was black, the original number of green ribbons is still in the bag.
D	Check the denominators of your probabilities. The first ribbon is not replaced, so there is one fewer ribbon for the second draw.

PTS: 1 DIF: Average REF: Page 812
OBJ: 11-3.2 Finding the Probability of Dependent Events NAT: 12.4.4.h
TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

11. ANS: A

One outcome does not affect the other, so the events are independent.
To find the probability that *A* and *B* both happen, multiply the probabilities.
$P(A \text{ and } B) = P(A) \bullet P(B) = 0.6 \bullet 0.4 = 0.24$.

	Feedback
A	Correct!
B	To find the probability that both events happen, multiply the probabilities of the events.
C	To find the probability that both events happen, multiply the probabilities of the events.
D	To find the probability that both events happen, multiply the probabilities of the events.

PTS: 1 DIF: Average REF: Page 814
OBJ: 11-3.4 Determining Whether Events are Independent or Dependent
NAT: 12.4.4.a TOP: 11-3 Independent and Dependent Events
KEY: events | independent events | outcomes | probability

NUMERIC RESPONSE

12. ANS: 15

PTS: 1 DIF: Average NAT: 12.4.4.e
TOP: 11-1 Permutations and Combinations

13. ANS: $\frac{3}{8}$

PTS: 1 DIF: Advanced NAT: 12.4.4.h
TOP: 11-2 Theoretical and Experimental Probability