Bluebonnet Learning
Secondary Mathematics
EDITION 1

Grade 7

Skills Practice

STUDENT EDITION

Acknowledgment

Thank you to all the Texas educators and stakeholders who supported the review process and provided feedback. These materials are the result of the work of numerous individuals, and we are deeply grateful for their contributions.

Notice

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GRADE 7

MODULE 1

Thinking Proportionally

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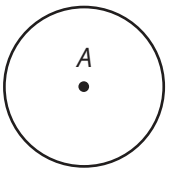
Name _____ Date _____

I. Exploring the Ratio of Circle Circumference to Diameter

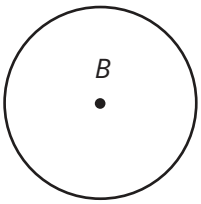
Topic Practice

A. Use a string and a centimeter ruler to measure the radius and circumference of each circle. Calculate the ratio of the circumference of the circle to its diameter.

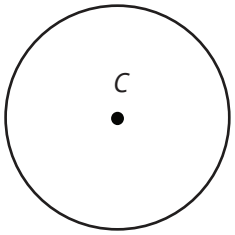
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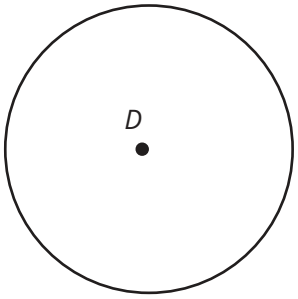
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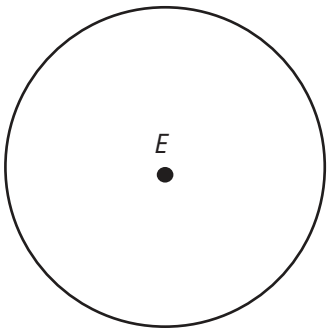
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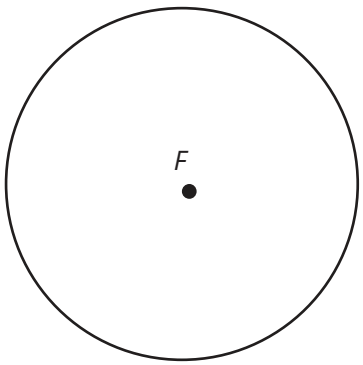
4.



5.



6.



B. For each question, write a ratio that represents the value of π. For Questions 1 – 4, determine the circumference of the circle. Use 3.14 for π.

1. The circumference of a circle is C, and the diameter of the circle is 24.

2. The circumference of a circle is C, and the diameter of the circle is 9.2.

3. The circumference of a circle is C, and the radius of the circle is 7.

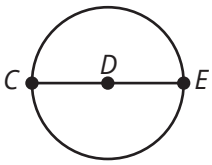
4. The circumference of a circle is C, and the radius of the circle is 1.2.

5. The circumference of a circular wall around a fountain is 5.65 meters, and the diameter of the wall is 1.8 meters.

6. The circumference of a circle on a gym floor is 37.10 feet. The radius of the circle on the floor is 5.91 feet.

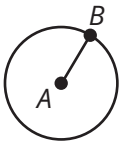
C. Use the given information to complete the table. Use 3.14 for π. Then verify that π is the ratio of the circumference to the diameter for each circle.

1. **Circle 1**



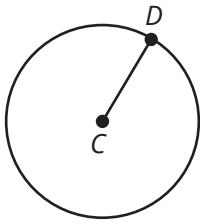
$d = 4$ cm

2. **Circle 2**



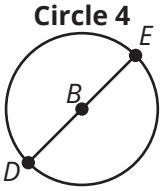
$r = 7$ mm

3. **Circle 3**



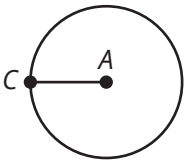
$r = 12$ in.

4. **Circle 4**



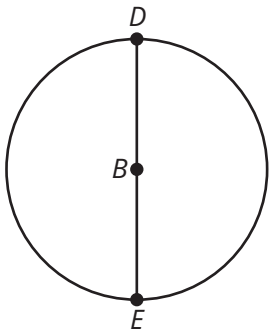
$d = 10$ mm

5. **Circle 5**



$r = 2.5$ m

6. **Circle 6**



$d = 7$ in.

	Circle	Circumference	Radius	Diameter	π = Circumference/ Diameter
1.	Circle 1				
2.	Circle 2				
3.	Circle 3				
4.	Circle 4				
5.	Circle 5				
6.	Circle 6				

D. Determine the circumference for each problem situation. Use 3.14 for π and round to the nearest hundredth, when necessary.

1. Emily bought a new circular dining room table with a radius of 2 feet. She wants to decorate the outer edge of the table with wooden beads. What is the distance around the outer edge of the table?

2. Sarah buys a circular mirror. She wants to decorate the mirror by gluing ribbon along the outer edge of the mirror. How long is the ribbon when the mirror has a 15 inch radius?

3. Logan runs laps at the local high school. It is a circular track with a diameter of 44 feet. How far does he run after completing one lap?

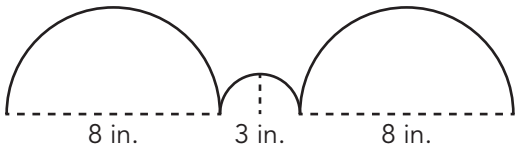
4. Avery is designing a platform for a local theater company. He plans to paint a red circle in the center of the platform, and he plans to outline the circle with black paint. When the circle has a diameter of 8 meters, how long is the black outline?

5. A circus sets up a miniature train for children to ride. The circular track has a radius of 6 feet. How far will the train travel after one rotation on the track?

6. Camilla takes her dog to the park on a 3-foot leash. Camilla stands in one spot and lets her dog run around her to play. What is the length of the boundary for the area where Camilla's dog can run around in?

Extension

A rope is arranged using three semi-circles to form the pattern shown. Determine the length of the rope.



Spaced Practice

1. Carlos and Jasmine are training for a marathon.

   a. Jasmine runs 13.5 miles in 2 hours. What is her rate?

   b. Carlos wants to run the 26.2 miles of the marathon in 4.5 hours. At about what rate will he have to run to reach this goal? Round to the nearest tenth.

2. Fifteen seventh graders were randomly selected to see how many pushups in a row they could do. Their data are shown.

   45, 40, 36, 38, 42, 48, 40, 40, 70, 45, 42, 43, 48, 36

   a. Determine the mean of this data set.

   b. Determine the median of this data set.

3. Convert each measurement.

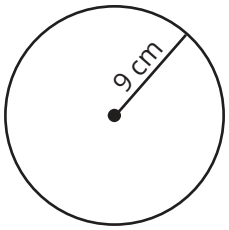
   a. $4\frac{1}{2}$ pounds = _____ OZ

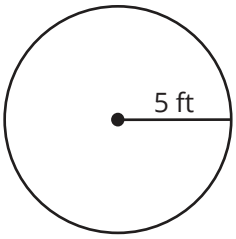
   b. 22.86 cm = _____ mm

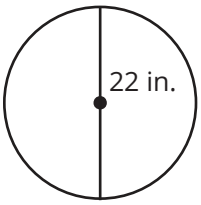
II. Area of Circles

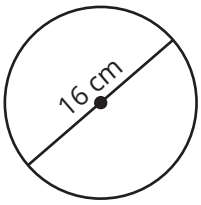
Topic Practice

A. Calculate the area of each circle. Use 3.14 for π and round to the nearest hundredth, when necessary.

1. 

2. 

3. 

4. 

5. A circle has a radius of 150 millimeters.

6. A circle has a diameter of 60 feet.

B. Determine the circumference or area for each problem situation. Use 3.14 for π and round your answer to the nearest hundredth, when necessary.

1. Luna is buying a round backyard pool. The distance around the edge of the pool is 38 feet. Determine the area that the pool will cover.

2. Nahimana is digging a round flower garden in her backyard. She has 19 feet of rubber edging to place around the garden. What is the area of the new garden?

3. Isaiah is spreading mulch in a circle on top of an area where he has planted some seeds. He has enough mulch to cover an area that is 28.26 square feet. How much rubber edging does Isaiah need to encircle the mulch that will cover the seeds?

4. Lucas is adding mulch to an existing round flower bed. The length of the rubber edging around the flower bed is 25.12 feet. What is the area that Lucas needs to cover with mulch?

5. Mason is decorating for a birthday party. He would like to add a paper streamer around the edge of a round table. The table covers an area of 12.56 square feet. What is the minimum length of the paper streamer Mason needs?

6. Sebastian is adding a mosaic pattern to the top of a small round table. The distance around the edge of the table top is 4.71 feet. What is the area that Sebastian needs to cover with the mosaic pattern?

C. Fiesta's Restaurant offers the following sizes of quesadillas.

	Kids	Small	Medium	Large
Diameter	6 in.	8 in.	10 in.	12 in.
Pieces	4	6	8	10
Cost	$3	$5	$6.25	$7.50

Kayla is trying to determine which size offers the best buy. Determine the unit rate for each size of quesadillas. Use 3.14 for π and round to the nearest hundredth, when necessary.

1. Kids

2. Small

3. Medium

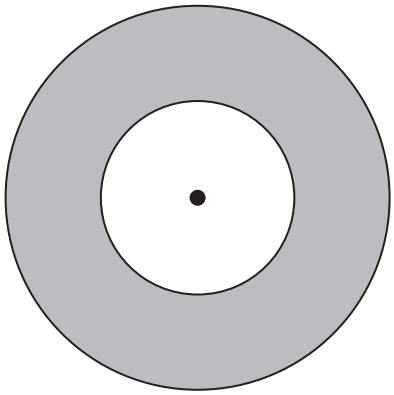
4. Large

5. Which size quesadillas is the best buy? Explain your reasoning.

6. What is the difference in cost between the unit rate of the most expensive size and the least expensive size?

Extension

The radius of the small circle is 0.5 millimeter. The area of the large circle is 28.26 square millimeters. Calculate the area of the shaded region.



Spaced Practice

Determine the circumference of each circle, given its radius or diameter. Use 3.14 for π and round to the nearest tenth.

1. Radius: 4.5 cm

2. Diameter: 12 ft

Determine each unit rate. Round your answer to the nearest thousandth if necessary.

3. 75 square feet of tile for $126

4. 420 miles in 6.5 hours

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III. Solving Area and Circumference Problems

Topic Practice

A. Solve each problem. Let $\pi = 3.14$. Round your answer to the nearest hundredth, when necessary.

1. You need to replace the cover for a light in your bathroom. The light cover is a circle. The circumference of the light cover is 43.96 inches. What are the radius and diameter of the light cover? What is the area of the light cover?

2. You order a pizza for dinner. The circumference of the pizza is 31.4 inches. What are the radius and diameter of the pizza? What is the area of the pizza?

3. You are responsible for setting the table for dinner. Each place setting has a circular dinner plate. The circumference of the dinner plate is 37.68 inches. What are the radius and diameter of the dinner plate? What is the area of the dinner plate?

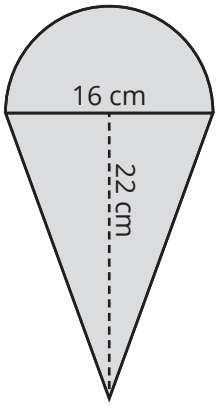
4. You collect coins. One of your favorite coins is a silver-colored coin showing a man's portrait. The radius of the coin is 12 millimeters. What is the diameter of the coin? What is the circumference of the coin? What is the area of the coin?

5. You buy a new wheel for your bicycle. The diameter of the bicycle wheel is 22 inches. What is the radius of the bicycle wheel? What is the circumference of the bicycle wheel? What is the area of the bicycle wheel?

6. Your friend orders a new cover for his round swimming pool. The area of the pool cover is 200.96 square feet. What are the radius and diameter of the pool cover? What is the circumference of the pool cover?

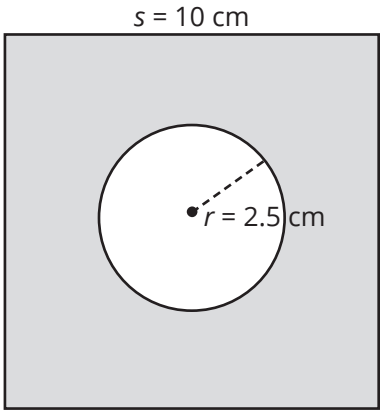
B. Determine the area of each shaded region. Let $\pi = 3.14$. Round your answer to the nearest hundredth, when necessary.

1. A figure is composed of a triangle and a semicircle.

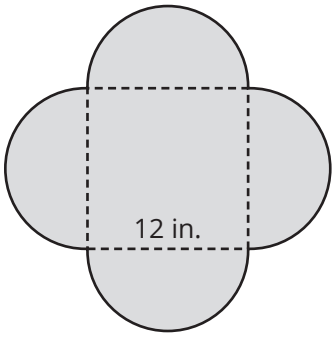


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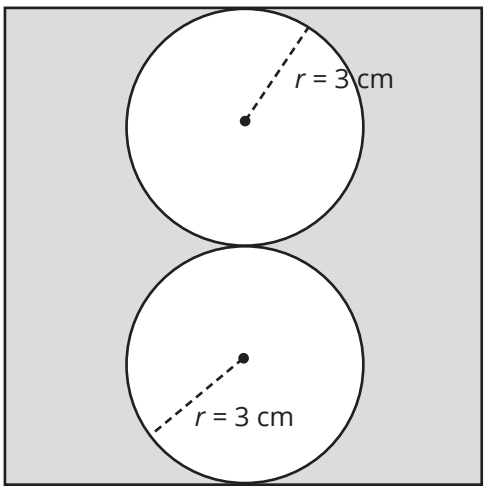


3. A figure is composed of a square and four semicircles.

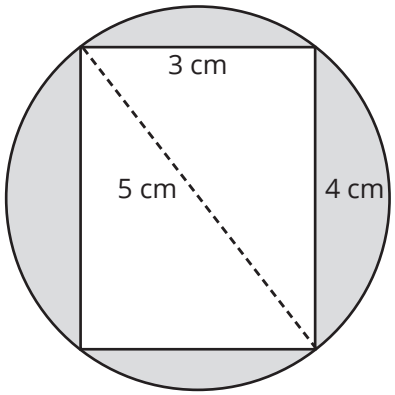


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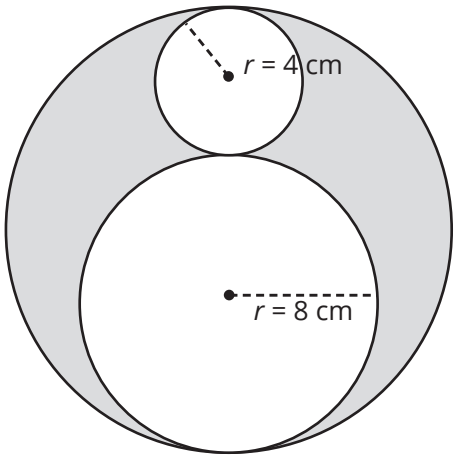


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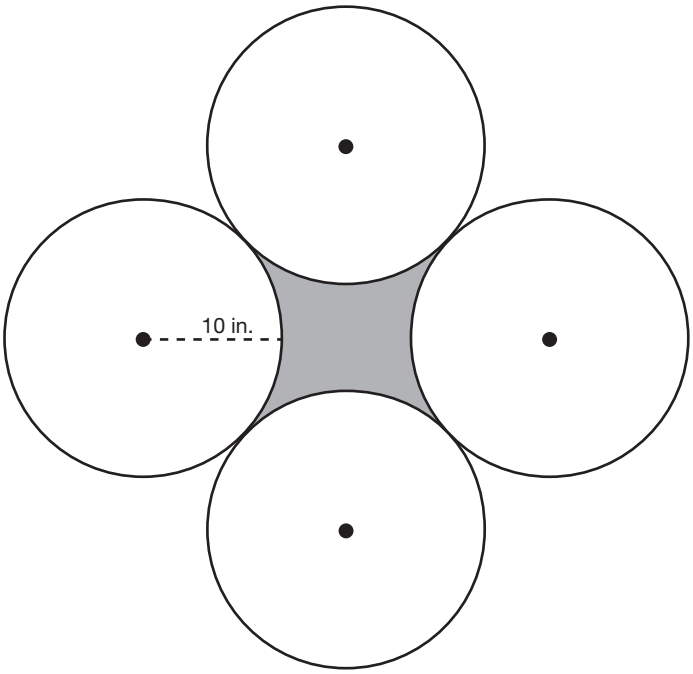
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6.



Extension

1. Determine the area of the shaded region. All circles have the same radius of 10 inches. Use 3.14 for π.



Spaced Practice

Solve each problem. Round your answer to the nearest tenth, when necessary. Use 3.14 for π.

1. Adriana is adding mulch to an existing round flower bed. The length of the rubber edging around the flower bed is 25.12 feet. What is the area that Adriana needs to cover with mulch?

2. Angelina is adding a mosaic pattern to the top of a small round table. The distance around the edge of the table top is 6.28 feet. What is the area that Angelina needs to cover with the mosaic pattern?

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Determine each area.

3. Area of a triangle with a base length of 4 in. and a height of 9 in.

4. Area of a parallelogram with a base length of 2.9 ft and a height of 5.5 ft.

5. Area of a trapezoid with a top base length of 6 cm, a bottom base length of 12 cm, and a height of 5 cm.

Write a unit rate for each ratio.

6. $\frac{28 \text{ cm}}{4 \text{ square feet}}$

7. $\frac{5.15 \text{ yd}}{5 \text{ square feet}}$

Name _____ Date _____

I. Unit Rate Representations

Topic Practice

A. Write a unit rate for each recipe or mix. Compare the unit rates to answer each question.

1. Angelina and Gabriel are each making trail mix. Angelina's recipe calls for 3 parts raisins to 2 parts almonds. Gabriel's recipe calls for 4 parts raisins to 3 parts almonds. Which recipe has a higher concentration of almonds?

2. Nahimana and Jasmine are each making pineapple punch. Nahimana's recipe calls for 5 parts pineapple juice to 3 parts orange sherbet. Jasmine's recipe calls for 8 parts pineapple juice to 6 parts orange sherbet. Which recipe will have a stronger orange flavor?

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3. Isaiah and Avery are each making Hawaiian snack mix. Isaiah's recipe calls for 5 parts dried pineapple to 2 parts macadamia nuts. Avery's recipe calls for 3 parts dried pineapple to 1 part macadamia nuts. Which recipe has a higher concentration of macadamia nuts?

4. Adriana and Mei are each making lemonade. Adriana's recipe calls for 4 parts lemon juice to 2 parts sugar syrup. Mei's recipe calls for 5 parts lemon juice to 3 parts sugar syrup. Which recipe has a stronger lemon flavor?

5. Sarah and Camilla are each making snack mix. Sarah's recipe calls for 8 parts pretzels to 3 parts peanuts. Camilla's recipe calls for 6 parts pretzels to 2 parts peanuts. Which recipe has a higher concentration of peanuts?

6. Mason and Lucas are each making a wildflower seed mix to plant in their gardens. Mason's mix calls for 8 parts poppy seeds to 5 parts daisy seeds. Lucas's mix calls for 10 parts poppy seeds to 8 parts daisy seeds. Which mix will produce a higher concentration of poppy flowers?

B. Complete each table. Use the table to determine the unit rate.

1. Sebastian can read 12 pages of his book in 3 minutes.

Minutes	1	3		
pages		12	24	48

2. Carlos is delivering newspapers. In 2 hours he delivers 60 newspapers.

Newspapers		60	90	105
Hours	1	2		

3. Valentina's new printer can print 10 photos in 5 minutes.

Photos		10	25	50
Minutes	1	5		

4. Kayla is mixing blue paint and white paint to create a shade of light blue paint. She creates the shade she likes by mixing 12 ounces of blue paint with 8 ounces of white paint.

Blue paint (oz)		12	18	
White paint (oz)	1	8		18

5. Luna is making fruit salad. The recipe calls for 3 cups of sliced peaches to 2 cups of halved grapes.

Peaches (c)		3		6
Grapes (c)	1	2	3	

6. Avery is stuffing envelopes. She stuffs 50 envelopes in 30 minutes.

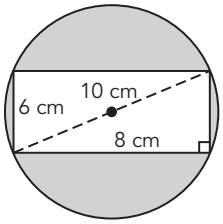
Envelopes		50		
Hours	0.25	0.5	1	2

Extension

A line is graphed through points at (4, 5) and (8, 10). What is the ordered pair of the unit rate?

Spaced Practice

Use the circle shown to answer each question. Use 3.14 for π. Round to the nearest tenth.



1. Calculate the exact area of the circle.

2. Calculate the circumference of the circle.

3. Determine the total area of the shaded regions.

Use 3.14 for π. Round to the nearest hundredth.

4. Gabriel's dog is on a leash that is 6 feet long. What is the approximate circular area of Gabriel's dog's play area?

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II. Solving Problems with Ratios of Fractions

Topic Practice

A. The table shows the weights of four different animals as adults and babies.

Animal	Adult Weight (pounds)	Baby Weight (pounds)
Tiger	650	$2\frac{1}{2}$
Giraffe	3000	110
Polar Bear	750	1.3
Elephant	8000	200
Panda	190	0.2

Determine the ratio of baby weight to adult weight for each animal. Round to the nearest thousandth, when necessary.

1. Tiger

2. Giraffe

3. Polar Bear

4. Elephant

5. Panda

6. Compare the ratios of baby weight to adult weight. List the animals in order from the least to the greatest ratio.

B. Rewrite each given rate as a unit rate.

1. A cell phone company mistakenly advertises that their data plan costs 50 cents for every 10 kilobytes of data.

2. A store advertises that 12-ounce sodas are 99 cents each.

3. A carnival game advertises 50 cents to toss 4 rings.

4. At a yard sale, Mason sees a sign that advertises 85 cents for 5 books.

5. An office supply store is having a back-to-school sale and advertises in the local paper that pencils are 88 cents for 11.

6. A restaurant advertises that wings are 75 cents for 2 on Monday nights.

7. A fast-food restaurant has a sign that says "5 chicken nuggets for 95 cents."

8. A recycling center claims to give 96 cents for every 12 aluminum cans turned in.

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C. Convert each rate.

1. Convert the rate 5 feet per 3 seconds to yards per hour.

2. Convert the rate 1000 fluid ounces per 2 hours to cups per minute.

3. Convert the rate of 10 yards per 5 minutes to feet per hour.

4. Convert the rate of 48 feet per hour to inches per minute.

5. Convert the rate of 12 pints per 15 minutes to quarts per hour.

6. Convert the rate of 48 ounces per 2 hours to pounds per day.

D. Answer each question by comparing unit rates.

1. Nahimana can type 40 words in half a minute. Sebastian can type 100 words in one and a half minutes. Which student can type at a greater rate of words per minute?

2. Adriana takes $\frac{5}{12}$ hour to complete 50 math problems. Carlos is able to complete 48 math problems in $\frac{2}{5}$ hour. Which student can complete math problems at a greater rate of problems per hour?

3. Sarah's home computer downloads a 7 megabyte program in $\frac{5}{6}$ minute. Parker's home computer takes $1\frac{1}{4}$ minutes to download a 9 megabyte program. Whose computer downloads at a greater rate of megabytes per minute?

4. Isaiah travels for $1\frac{1}{3}$ hours to visit a friend who lives $4\frac{1}{2}$ miles away. Diego travels $4\frac{1}{4}$ miles to visit a friend. It takes him $1\frac{1}{5}$ hours to get there. Who travels at a greater rate of miles per hour?

5. Mei drove 45 miles and used $3\frac{3}{4}$ gallons of gas. Luna drove 85 miles and used $5\frac{2}{3}$ gallons of gas. Which driver used fewer gallons of gas per mile?

6. Lucas baked $5\frac{1}{2}$ batches of cookies in one and one half hours. Jasmine baked $3\frac{1}{3}$ batches of cookies in $\frac{11}{12}$ hour. Which baker made cookies at a greater rate of batches per hour?

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E. Solve each problem by setting up and solving a proportion.

1. The human body is often drawn using specific ratios. The average height of an adult is drawn using 7 head lengths (the height of the head is $\frac{1}{7}$ the total height). When a person in a painting is 63 centimeters tall, how tall is the person's head?

2. The Appalachian Trail is a 2,155-mile hiking trail in the Eastern United States. You plan to hike the section of the trail that is in New Jersey at a rate of 9 miles per day. When the hike will take you 8 days, what is the length of the trail in New Jersey?

3. The average person breathes 35 pounds of air per day. At this rate, how many pounds of air will the average person breathe in seven days?

4. You are on a hockey team. Your time on the ice is 12 minutes per game. A season is twenty games. How many minutes do you play during the season?

5. In an hour, a jogger burns about 4 calories per pound of body weight. How many calories will a jogger who weighs 151 pounds burn in an hour?

6. In the old British money system, 5 shillings was equal in value to 1 crown. Emily had 45 shillings. What was the value in crowns?

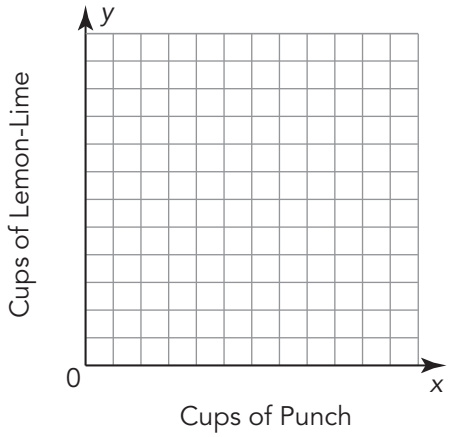
Extension

A scale model of a train is constructed at the ratio 1 : 87.1. If the scale model of a locomotive is 10.4712 inches long, how long is the actual locomotive in feet?

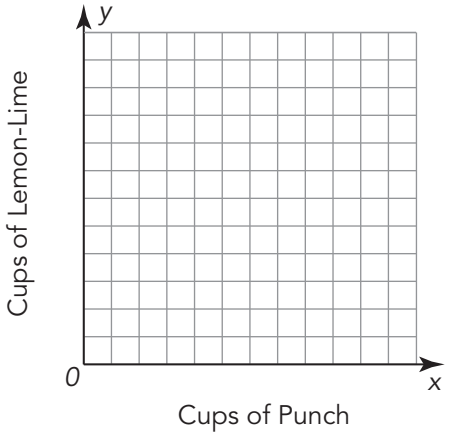
Spaced Practice

Determine each unit rate and graph each rate on the coordinate plane.

1. $\frac{3}{4}$ cup of punch to $\frac{1}{8}$ cup of lemon-lime



2. 1 cup of lemon-lime : $1\frac{1}{2}$ cups of punch



Answer each question. Use 3.14 for π. Round to the nearest hundredth.

3. The diameter of a circle is 4 cm. Determine the area of the circle.

4. The radius of a circle is 3 ft. Determine the circumference of the circle.

III. Solving Proportions Using Means and Extremes

Topic Practice

A. Solve each problem by setting up and solving a proportion.

1. A football team won ten games out of sixteen of their games during the 2009 regular season. At this rate, how many games do they need to play to win 50 games?

2. The 18 wind turbines on a hill are enough to meet the electrical needs of all 6 houses on a city street. How many wind turbines are needed to meet the electrical needs of 26 houses?

3. Between 1990 and 2000, the population of New York City increased at a rate of 32 people every four hours. By how many people would the population have increased in 63 hours?

4. A local survey determined that 4 out of every 10 Internet users have downloaded music at some point. At this rate, out of 60 Internet users, how many have downloaded music?

5. The string that produces the lowest tone on a piano vibrates 87 times in 3 seconds. How many times would this string vibrate in 12 seconds?

6. A 10-ounce package of animal cookies costs $2. What should a 35-ounce package cost, assuming the same cost per ounce?

B. Solve for each variable using the means and extremes method. Round to the nearest hundredth, when necessary.

1. $\frac{4}{28} = \frac{x}{35}$

2. $12 : 6 = 60 : x$

3. $560 : 80 = x : 300$

4. $\frac{41}{282} = \frac{7}{x}$

5. $\frac{39}{9} = \frac{x}{2}$

6. $74 : 31 = 2 : x$

7. $\frac{x}{3} = \frac{1351}{7}$

8. $26 : x = 117 : 9$

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C. Use the given information to answer each question.

1. Camilla drove 175 miles to visit her grandparents. How many kilometers did she travel?

2. Parker weighs 165 pounds. What is his mass in kilograms?

3. Valentina is making dinner for her family. The recipe she is using calls for 0.5 kilogram of ground chicken. How many pounds of ground chicken does she need?

4. Diego needs to refill his lawn mower gas tank. The tank holds 4.2 liters of gas. How many gallons of gas does the tank hold?.

5. Isaiah is going to compete in a 5000-meter race. How long is the race in yards?

6. Kayla's favorite basketball player is 2.1 meters tall. How tall is Kayla's favorite basketball player in feet

Extension

The word *four* has 4 letters, so the number-to-letter-count ratio for 4 is 1 : 1, or just 1. Are there any other numbers between 1 and 20 that have equal number-to-letter-count ratios? What are they?

Spaced Practice

1. The table shows the gallons filled in a pool over time.

   a. Complete the table.

Number of Hours	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{8}$
Gallons Filled			500	

   b. Determine a unit rate for this situation.

2. Pi is the ratio of what two measures of a circle?

3. Which is a better deal—a 16-inch diameter pizza for $12.99 or an 8-inch diameter pizza for $6?

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Name _____ Date _____

I. Proportional Relationships

Topic Practice

A. Determine whether the relationship between the two data sets in each is proportional.

1.

Data Set One	Data Set Two
5	3
30	18

2.

Data Set One	Data Set Two
25	35
45	50

3.

Data Set One	Data Set Two
18	45
28	70

4.

Data Set One	Data Set Two
279	45
434	70

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5.

Data Set One	Data Set Two
7	18
11	26

6.

Data Set One	Data Set Two
33	4
110	13

7.

Data Set One	Data Set Two
8	6
44	33

8.

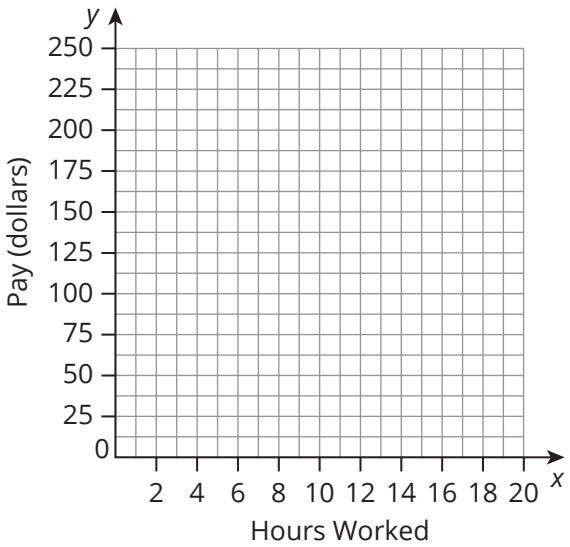
Data Set One	Data Set Two
15	108
20	144

B. For each problem situation:

- Complete the table of values.
- Complete the graph or identify the graph that matches the scenario in the table.
- Determine whether the situation is linear or non-linear.
- Determine whether the situation is proportional or not proportional.

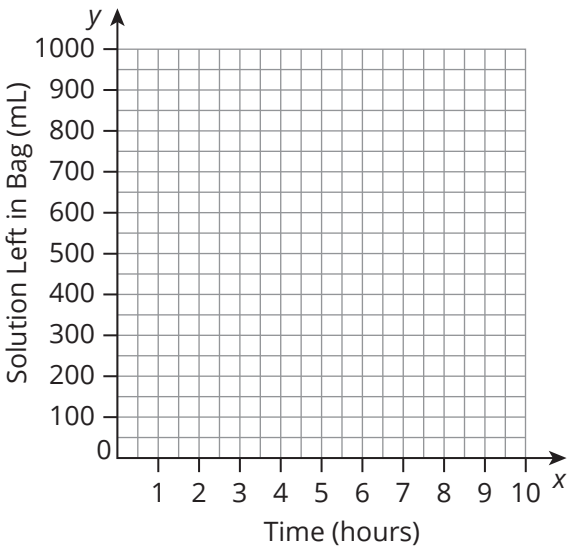
1. Luna makes $12 per hour at her job.

Hours Worked	Pay (dollars)
2	
3	
5	
	120
15	
	240



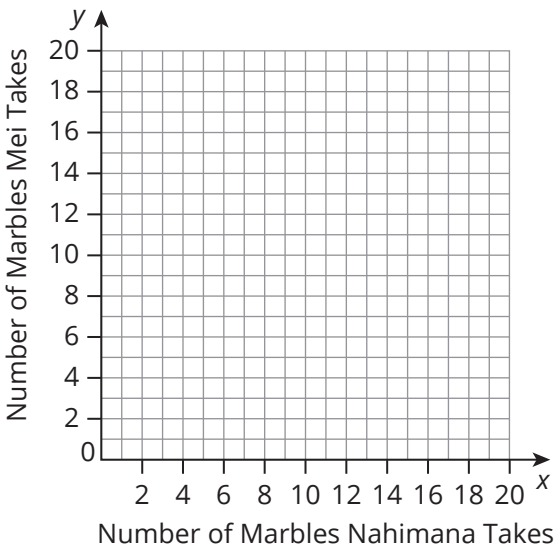
2. A patient receives an intravenous saline solution from a 1000-milliliter IV fluid bag. The solution is dispensed at a rate of 125 mL per hour.

Time (hours)	Solution Left in Bag (ml)
0	
1	
	750
3	
5	
	0



3. Nahimana and Mei must decide how to divide 16 marbles between themselves.

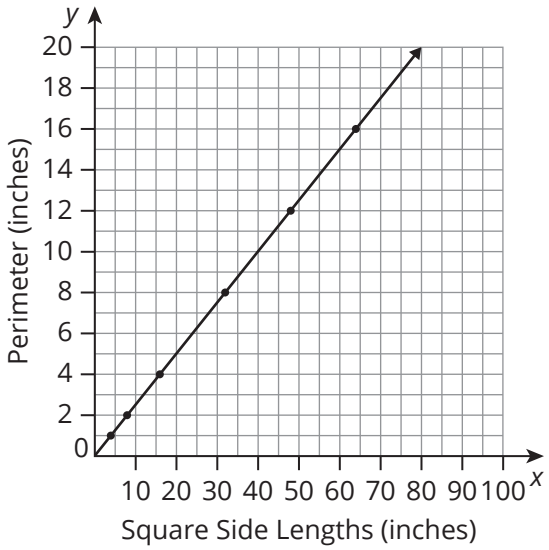
Number of Marbles Nahimana Takes	Number of Marbles Mei Takes
0	16
4	
6	
	7
13	
	0



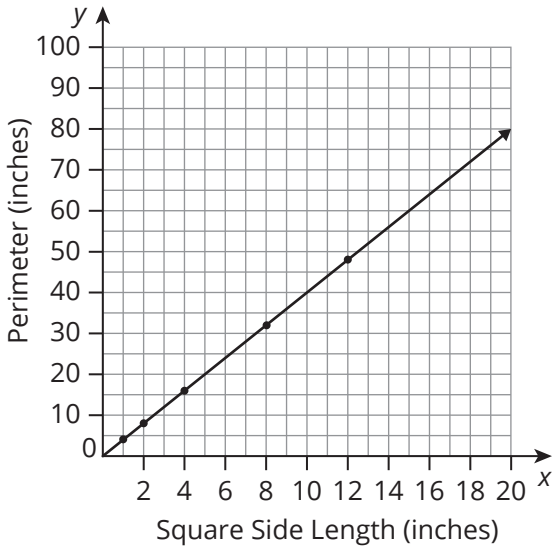
4. The perimeter of a square is 4 times the length of one side.

Square Side Length (inches)	Perimeter (inches)
	4
2	
	16
8	
12	
	64

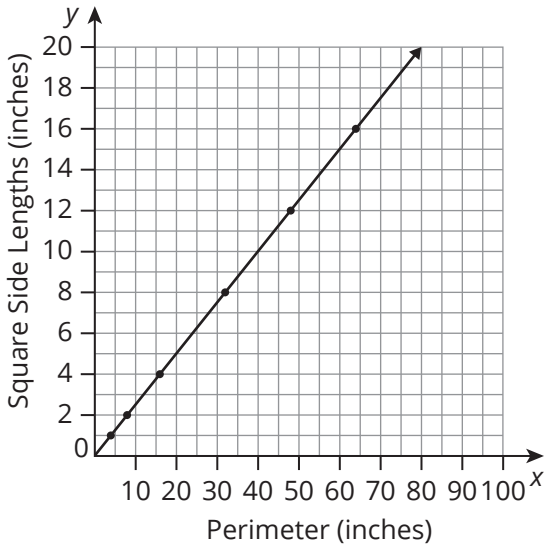
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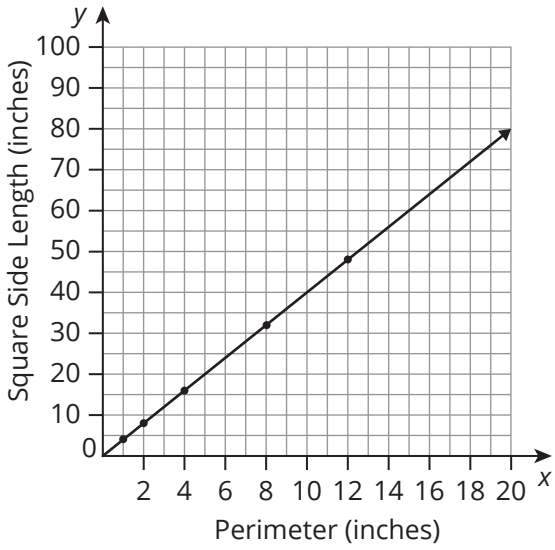
B.



C.



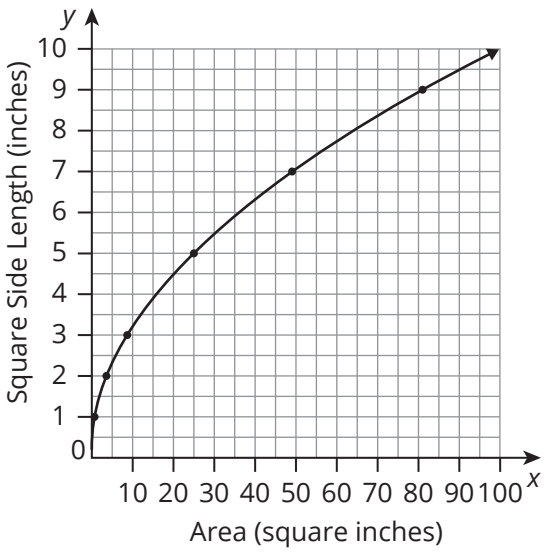
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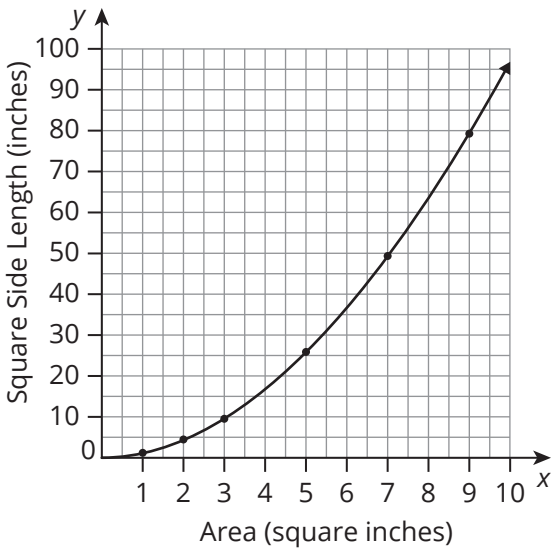
5. The area of a square is calculated by squaring the length of one side.

Square Side Length (inches)	Area (square inches)
1	
	4
3	
	25
7	
9	

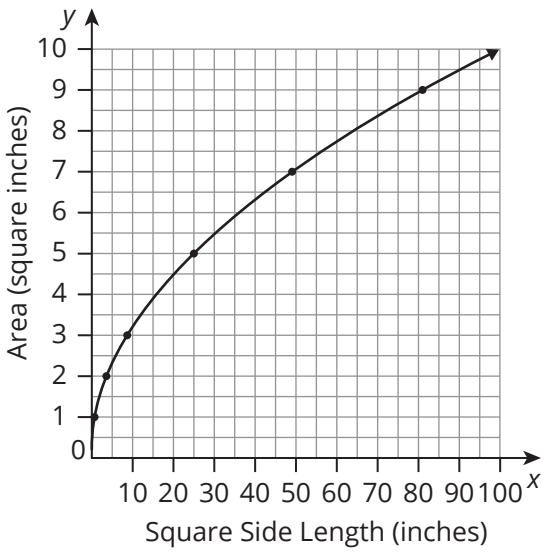
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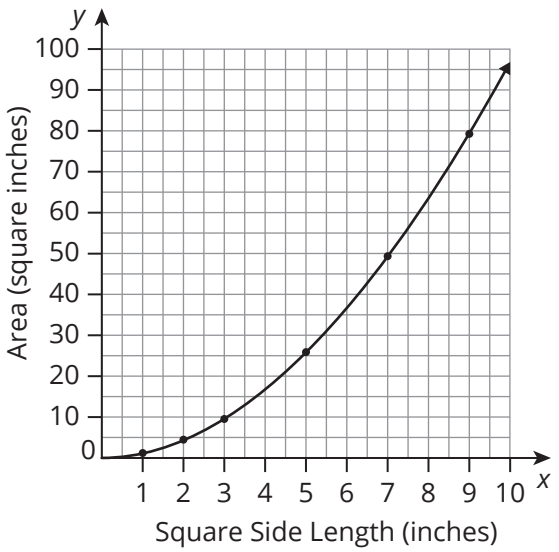
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C.



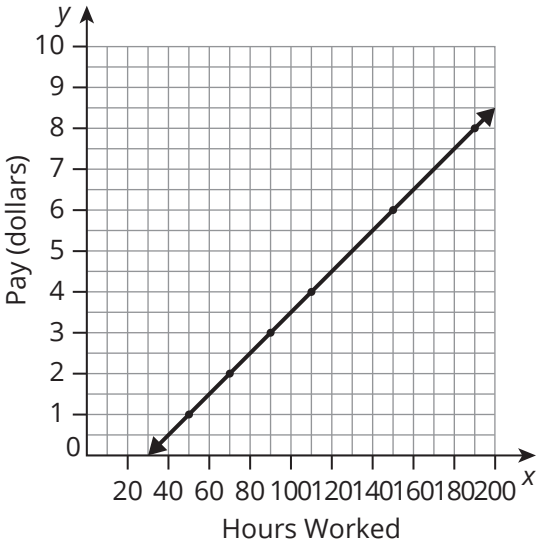
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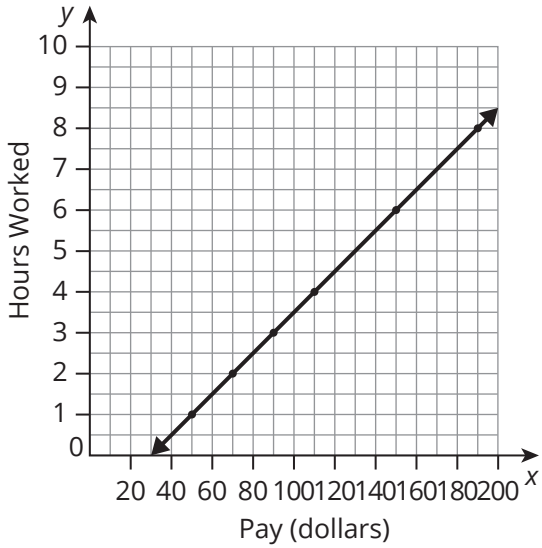
6. When Mason, a nurse at a local hospital, works on Saturdays, he is paid a $30 bonus plus $20 per hour worked.

Hours Worked	Pay (dollars)
1	
2	
3	
	110
6	
	190

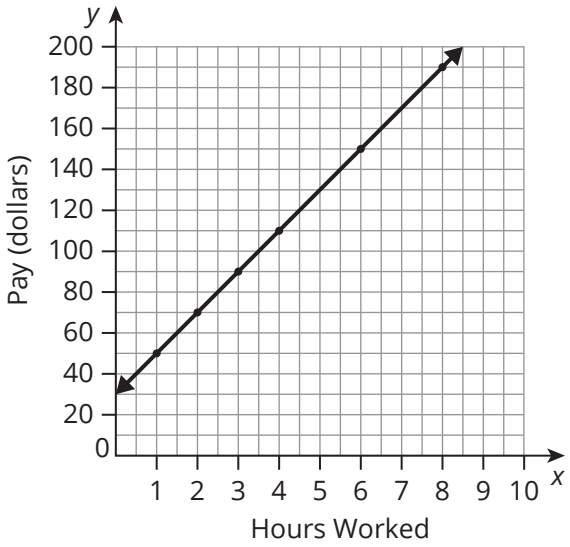
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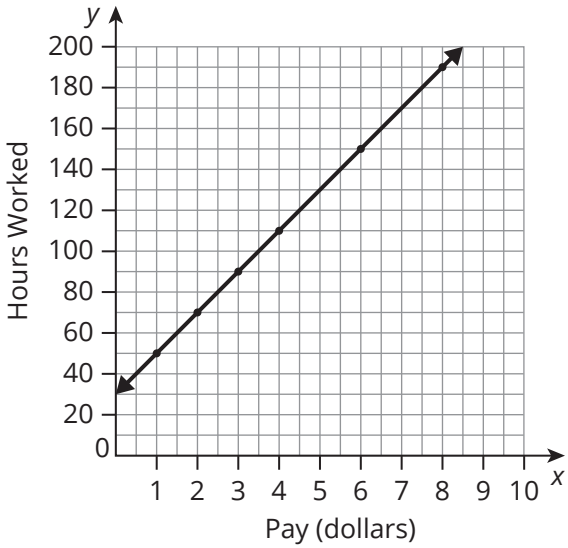
B.



C.



D.



C. Determine whether the relationship represents a proportional relationship. Explain your reasoning.

1. The table shows the relationship between the number of hours that a plumber works on a job and the amount the plumber charges for the job.

Number of Hours	Amount Charged (dollars)
3	$220
5	$340
6	$400

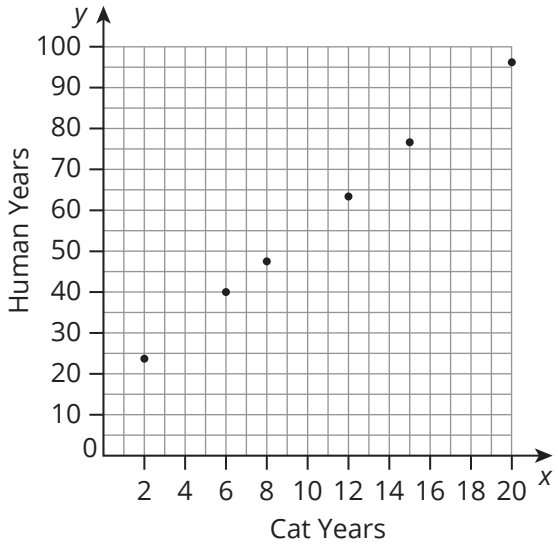
2. The cost to print a yearbook is $0.45 per page.

3. The table shows the relationship between the size of a painting and the cost of the painting.

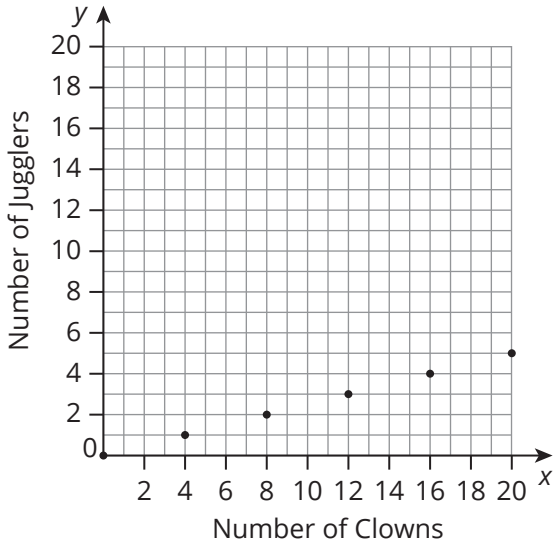
Size (square centimeters)	Cost (dollars)
240	$7.20
610	$18.30
900	$27.00

4. Sebastian bought $\frac{1}{2}$ pound of raisins for \$1.07, while Sarah bought $1\frac{1}{2}$ pounds of raisins for \$3.21.

5. The graph shows the relationship between the age of a cat and its corresponding age in "human years".



6. The graph shows the relationship between the number of clowns and number of jugglers needed for a performance.



Extension

Another way to classify varying quantities is as an inverse variation, or inversely proportional. The tables represent inverse variations. Study the tables of values and make a conjecture about the relationship between the quantities that illustrate inverse variation.

Number of Hours	Number of People
2	6
3	4
$\frac{1}{12}$	144

Width of Rectangle	Length of Rectangle
2	18
12	3
0.5	72

Spaced Practice

Use proportions to solve each question.

1. In a town, 3 out of 5 citizens who are eligible to vote did so in the fall election.

   a. Determine the number of citizens that voted in the fall election if 400 citizens were eligible.

   b. Determine the number of citizens that were eligible to vote in the fall election if 180 actually voted.

2. The student council at a local middle school determines that 3 out of 4 students prefer that all school assemblies be held on Friday afternoon.

   a. When 200 students are surveyed, how many will prefer that school assemblies be held on Friday afternoon?

   b. When 747 students prefer the school assemblies be held on Friday afternoon, how many students were surveyed?

Write a unit rate to represent the relationship between the given quantities. Round to the nearest hundredth, when necessary.

3. 2.5 liters $\approx$ 0.66 gallon

4. 430.6 centimeters $\approx$ 169.5 inches

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II. Constant of Proportionality

Topic Practice

A. Answer each question.

1. Camilla learned in her science class that every 2 minutes she spends in the shower, she uses 17 gallons of water. This rate is constant.

   a. When Camilla showers for 4 minutes, how many gallons of water will she use?

   b. When Camilla's sister used 119 gallons of water during her shower, how long was her sister's shower?

   c. Identify the constant of proportionality for the time in minutes to the number of gallons.

   d. Identify the constant of proportionality for the number of gallons used to the time in minutes.

2. A television time slot has 4 minutes of commercials for every 11 minutes of programming. This rate is constant.

   a. When a television program is 88 minutes long, how many minutes of commercials should a viewer expect?

   b. When there are 16 minutes of commercials, how long is the television program?

   c. Identify the constant of proportionality for the minutes of commercials to the minutes of programming.

   d. Identify the constant of proportionality for the minutes of programming to the minutes of commercials.

3. Each week, a store orders 8 boxes of socks for every 3 cases of shoes. This rate is constant.

   a. When the store orders 96 boxes of socks one week, how many cases of shoes would it order?

   b. This week, the store ordered 27 cases of shoes. How many boxes of socks did the store order?

   c. Identify the constant of proportionality for the boxes of socks to the cases of shoes.

   d. Identify the constant of proportionality for the cases of shoes to the boxes of socks.

4. In a survey that Gabriel conducted of the students in his school, he determined that 3 out of 8 students chose basketball as their favorite sport.

   a. How many students choose basketball as their favorite sport if Gabriel surveys 240 students?

   b. When 225 students chose basketball as their favorite sport, how many students did Gabriel survey?

   c. Identify the constant of proportionality for the students who chose basketball to the students surveyed.

   d. Identify the constant of proportionality for the students surveyed to the students who chose basketball.

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5. Logan is weighing pennies for a science experiment. When he weighs 2 pennies, the weight is 5 grams.

   a. How many pennies are on the scale when the weight measures 40 grams?

   b. How much would 12 pennies weigh?

   c. Identify the constant of proportionality for number of pennies to total weight.

   d. Identify the constant of proportionality for total weight to number of pennies.

6. The school's cross country track team is participating in a 3-day walk-a-thon to raise money for their favorite charity. They are asking each donor to pledge $18 for every 6 miles they walk.

   a. How much money will the team raise when it walks 150 miles during the walk-a-thon?

   b. How many miles does the team need to walk when they want to raise $615?

   c. Identify the constant of proportionality for miles walked to money raised.

   d. Identify the constant of proportionality for money raised to miles walked.

B. Answer each question.

1. During your morning workout, you run for 20 seconds for every 3 seconds you sprint.

   a. Determine the constant of proportionality for the ratio between the number of seconds you run and the number of seconds you sprint.

   b. Write a proportion that shows the relationship between the number of seconds you run, the number of seconds you sprint, and the constant of proportionality.

   c. Rewrite the proportion as an equation to represent the number of seconds you run in terms of the number of seconds you sprint.

2. Parker had pictures taken for his football team. The pictures come in different sizes. The ratio of each picture is a height of 7 inches by a width of 6 inches.

   a. Determine the constant of proportionality for the ratio between the height of each picture, in inches, and the width of each picture, in inches.

   b. Write a proportion that shows the relationship between the height of each picture, the width of each picture, and the constant of proportionality.

   c. Rewrite the proportion as an equation to represent the height of each picture in terms of the width of each picture.

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3. Avery played tennis for two hours. His activity watch showed that he burned 17 calories every 5 minutes.

   a. Determine the constant of proportionality for the ratio between the number of calories burned and the time Francis played tennis, in minutes.

   b. Write a proportion that shows the relationship between the number of calories burned, the time Francis played tennis, and the constant of proportionality.

   c. Rewrite the proportion that shows the relationship between the number of calories burned in terms of the number of minutes Francis played tennis.

4. Your class is going on a field trip to an art museum. For every 6 students going to the museum, there is 1 adult chaperone.

   a. Determine the constant of proportionality for the ratio between the number of students who visit the museum and the number of adults who visit the museum.

   b. Write a proportion that shows the relationship between the number of students, the number of adults, and the constant of proportionality.

   c. Rewrite the proportion as an equation to represent the number of students in terms of the number of adults.

5. Valentina is decorating mirrors from a craft kit he received. He can decorate 10 mirrors every 3 hours.

   a. Determine the constant of proportionality for the ratio between the number of mirrors he decorates and the time it takes, in hours.

   b. Write a proportion that shows the relationship between the number of mirrors he decorates and the time it takes, and the constant of proportionality

   c. Rewrite the proportion as an equation to represent the number of mirrors he decorates in terms of the time, in minutes.

6. Sarah is a landscaper. She knows that for every 25 pounds of topsoil he orders, she can cover an area of 13 square feet.

   a. Determine the constant of proportionality for the ratio between the number of pounds of topsoil and the area it covers, in square feet.

   b. Write a proportion that shows the relationship between the number of pounds of topsoil the area it covers, and the constant of proportionality.

   c. Rewrite the proportion as an equation to represent the number of pounds of topsoil in terms of the area, in square feet.

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C. Use the equation for the constant of proportionality, $\frac{y}{x} = k$, to determine each unknown value.

1. $k = \frac{3}{2}$ and $y = 15$

2. $k = \frac{1}{4}$ and $y = 5$

3. $k = \frac{7}{3}$ and $x = 21$

4. $k = 6$ and $y = 2$

5. $k = 0.18$ and $y = 450$

6. $k = \frac{5}{6}$ and $x = 126$

Extension

When a is inversely proportional to b, then the product of a and b is constant. Use this information to solve this problem.

When x is inversely proportional to y and is directly proportional to z, and when y and z are both 3 when $x = 5$, what is the value of $z - y$ when $x = 8$?

Spaced Practice

1. Sketch a graph that represents a linear, non-proportional relationship. Label your quantities.

2. Sketch a graph that represents a relationship that is proportional. Label your quantities.

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3. Carlos will be staying a month in one of the cities listed in the table. He wants to determine the average cost of public transportation for each city. He finds the following information.

City	Cost for Unlimited Public Transportation
New York City	$51.50 for 14 days
Miami	$100 for 1 month
Los Angeles	$17 for 1 week
Chicago	$14 for 3 days

a. Calculate the unit rate, or per day cost, for unlimited transportation in each city.
(Let 1 week = 7 days and 1 month = 30 days.)

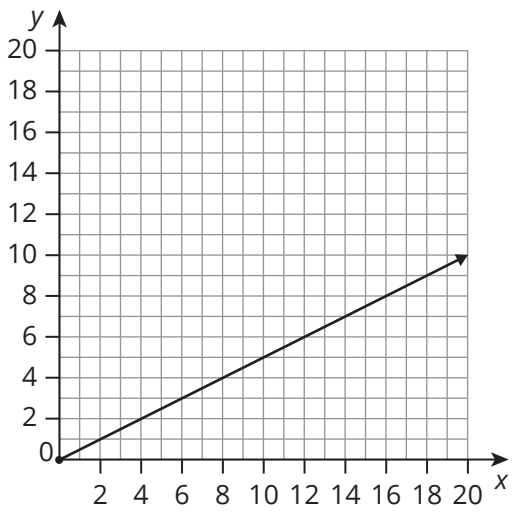
b. When Carlos stays in the city for a month, how much does he spend on transportation in each city?

III. Identifying the Constant of Proportionality in Graphs

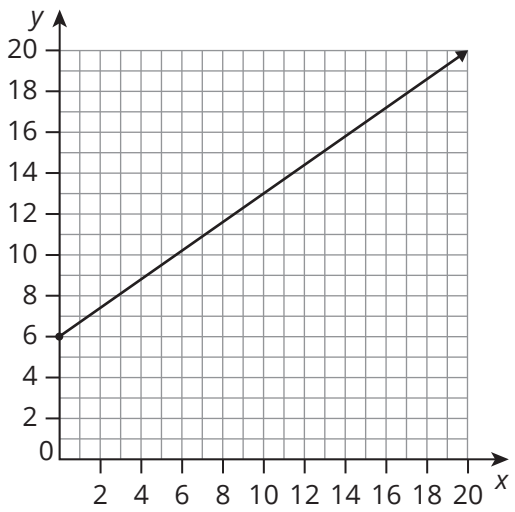
Topic Practice

A. Determine whether each graph represents a proportional relationship. When a proportional relationship occurs identify the constant of proportionality.

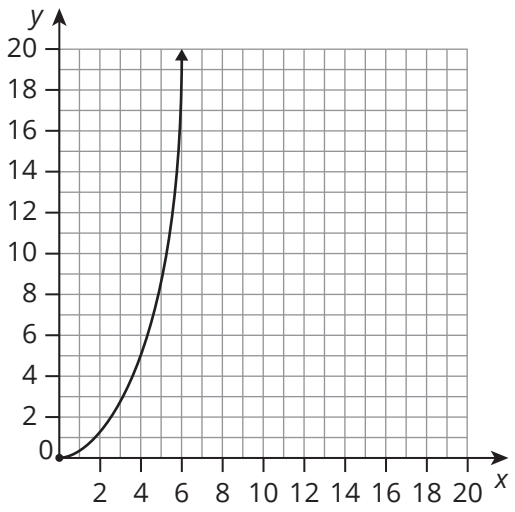
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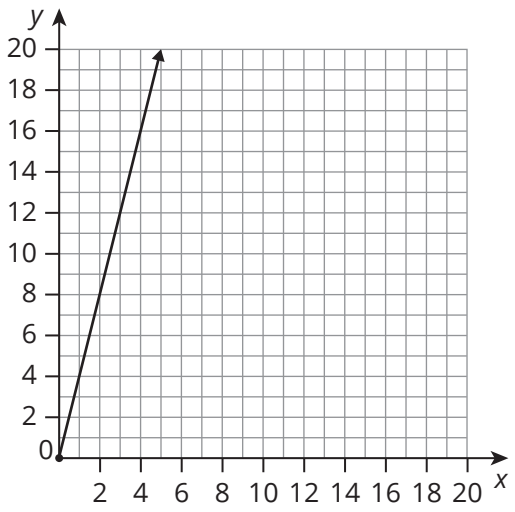
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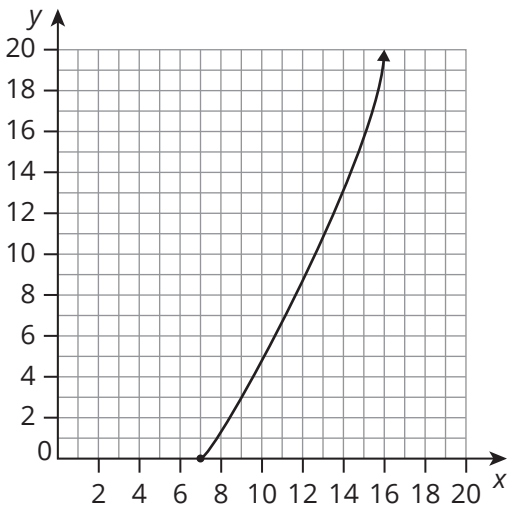
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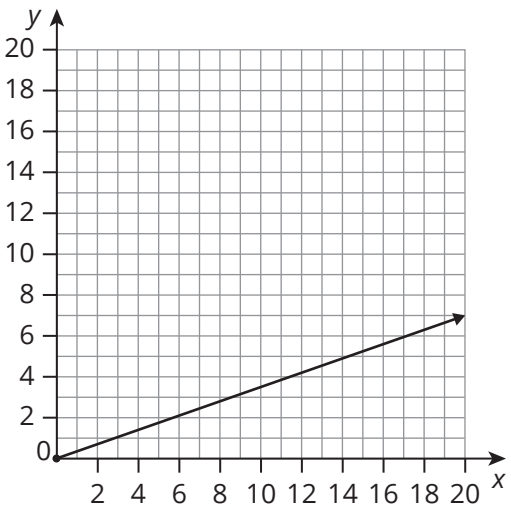
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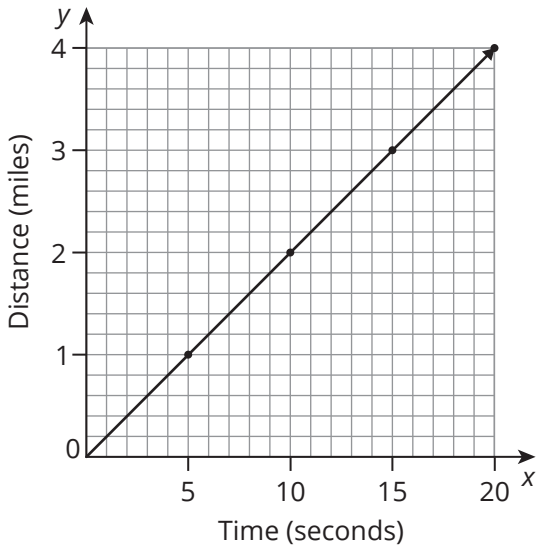

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x

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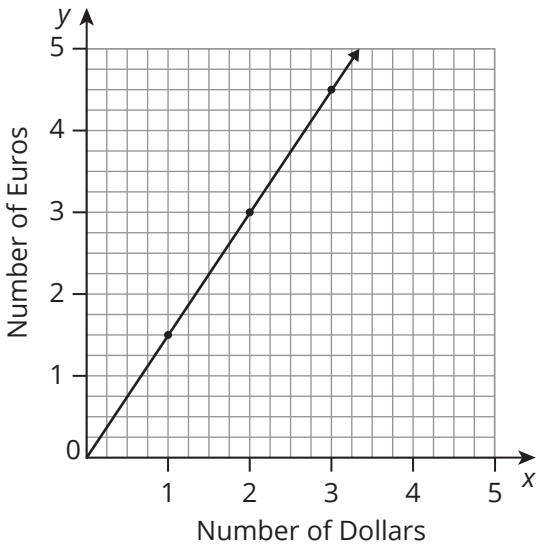

y
20
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10
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2
0
2 4 6 8 10 12 14 16 18 20
x

B. Determine the constant of proportionality k and interpret it in the context of each problem.

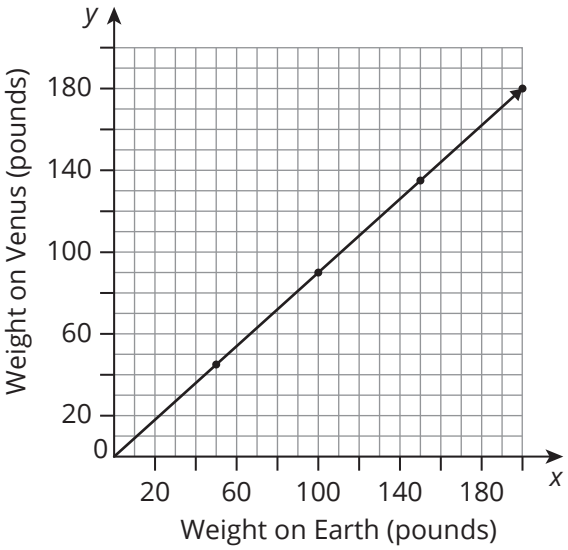
1. The graph shows the relationship between the distance in miles between you and a storm, and the number of seconds between when you see lightning and when you hear thunder.



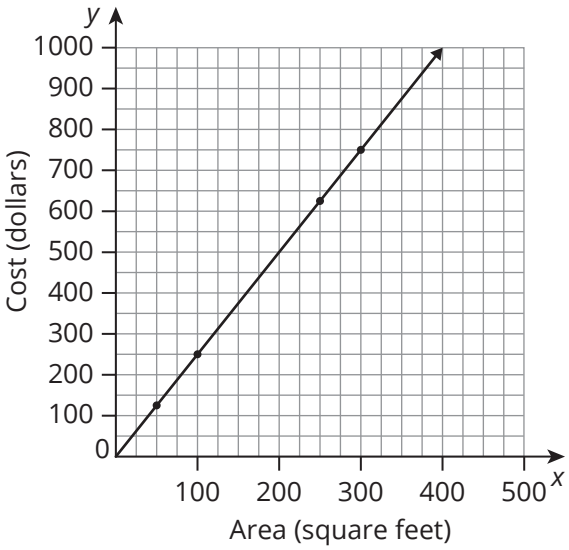
2. The graph shows the relationship between the number of Euros Lucas received and the number of dollars Lucas exchanged during his trip to Spain.



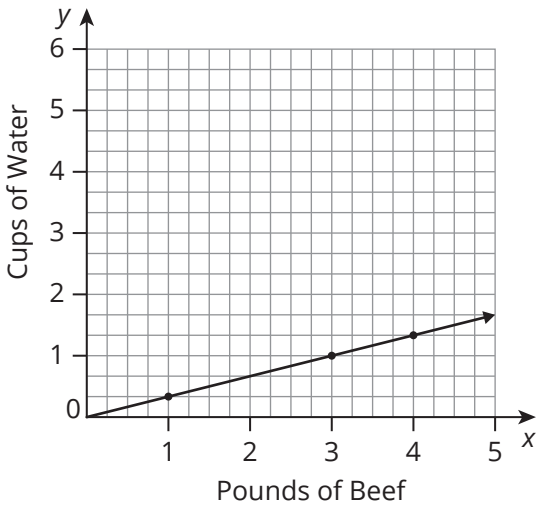
3. The graph shows the relationship between the weight of an object on Earth and the weight of the same object on Venus.



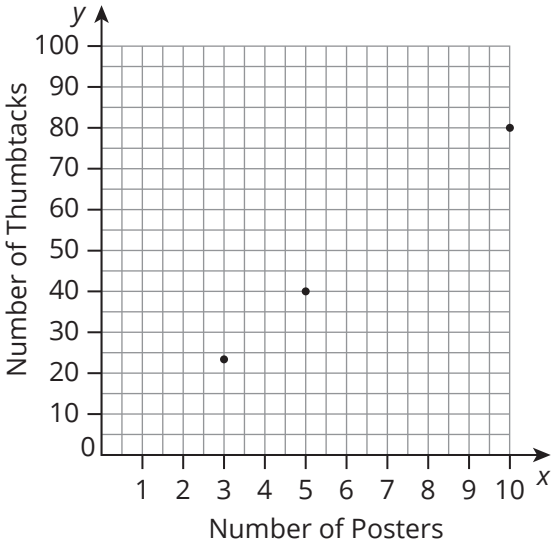
4. The graph shows the relationship between the area of a room in square feet and the cost of covering the floor with new tile.



5. The graph shows the relationship between the cups of water and pounds of beef needed for a beef casserole.



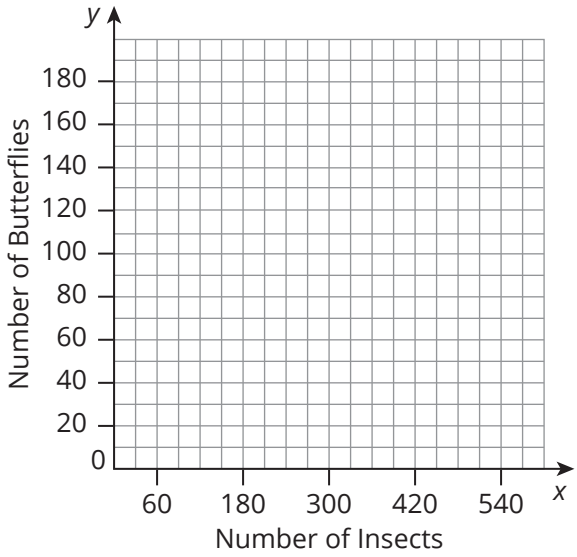
6. The graph shows the relationship between the number of posters in a classroom and the number of thumbtacks used to hold them up.



C. For each problem situation, create a graph using the table of values and write an equation in the form $y = kx$.

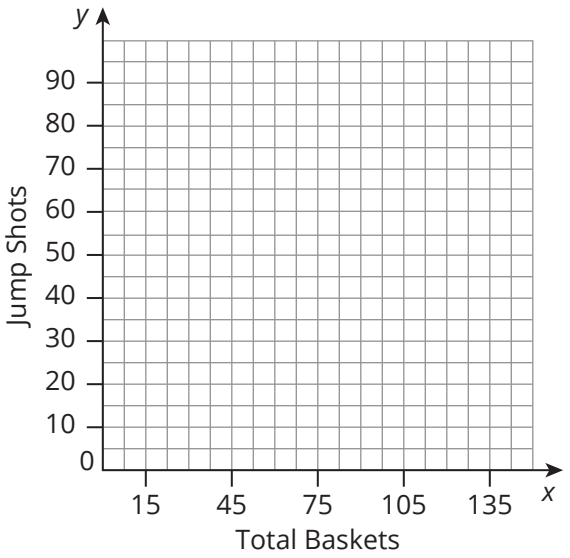
1. Jasmine spent many days at the city park last summer. She noticed that 4 out of every 15 flying insects she saw at the park were butterflies.

Number of Insects	Number of Butterflies
15	4
45	12
180	48
540	144



2. Your cousin plays shooting guard for his community basketball team. When he plays in a game, 3 out of every 5 baskets he scores for his team are jump-shots.

Total Baskets	Jump Shots
10	6
25	15
55	33
130	78



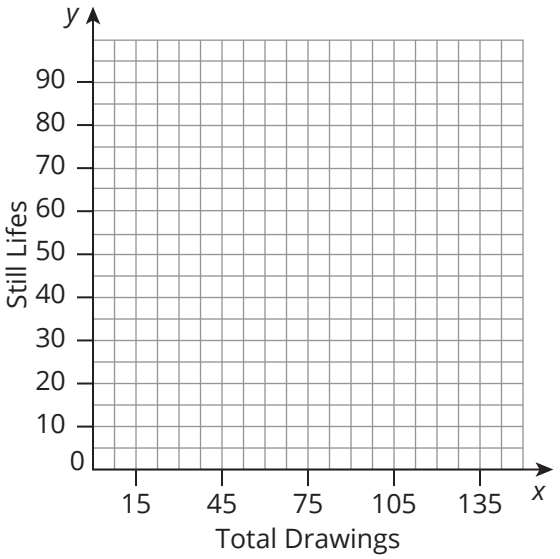
3. Luna looked at her household budget for the past several months and determined that 1 out of every 8 dollars she spent on groceries were spent on whole fruits and vegetables.

Amount Spent on Groceries	Amount Spent on Whole Fruits and Vegetables
Dollars	Dollars
88	11
224	28
232	29
248	31



4. Mason keeps all of his line drawings in portfolio folders. He notices as he sorts through the drawings that, in each folder, 2 out of every 5 drawings are still lifes.

Total Drawings	Still Lifes
15	6
30	12
65	26
140	56



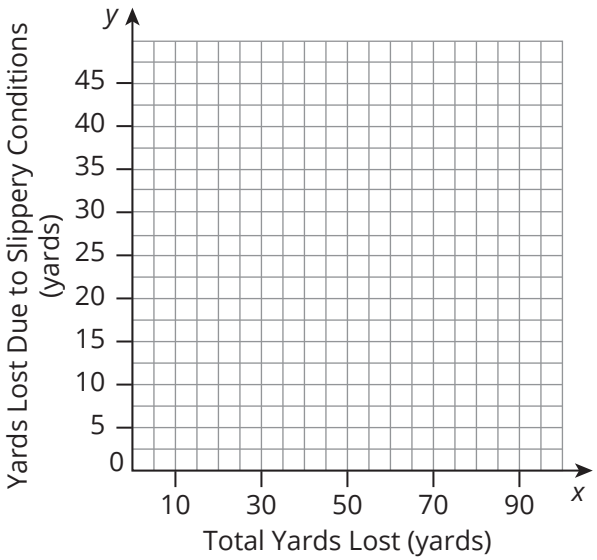
5. Isaiah looked at his household budget for the past several months and determined that 4 out of every 9 dollars he spent on groceries were spent on high protein foods.

Amount Spent on Groceries	Amount Spent on High Protein Foods
Dollars	Dollars
54	24
90	40
225	100
342	152



6. Avery keeps track of the yards gained or lost each quarter for the middle school football team. He noticed that 1 out of every 3 yards lost by the football team were due to the slippery conditions of the rainy game.

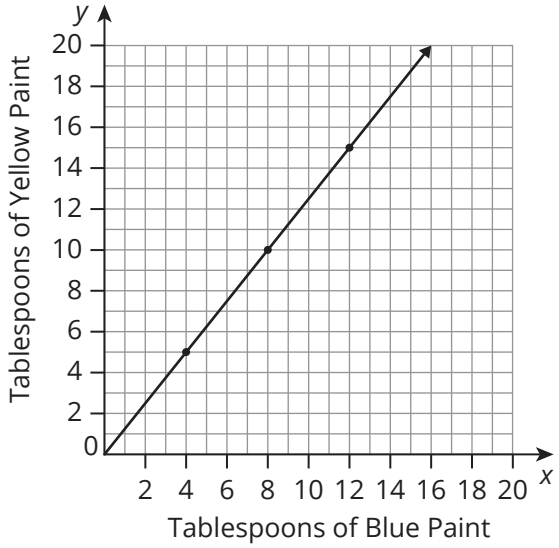
Total Yards Lost	Yards Lost Due to Slippery Conditions
12	4
15	5
45	15
75	25



D. Use the given information to answer each question.

1. The equation $x = 3y$ shows the relationship between the number of 7th-graders, x, and number of 8th-graders, y, needed for a musical. How many 8th-graders are needed when 21 7th-graders are in the musical?

2. The graph shows the relationship between the number of blue and the number of yellow tablespoons of paint an artist needs to make a shade of green. How many tablespoons of yellow paint does the artist need to mix with 44 tablespoons of blue paint?



3. The equation $r = \frac{7}{2}p$ shows the relationship between the number of rocks, r, and plants, p, in a garden design. How many rocks does a homeowner following this design need when he has 35 plants?

4. Mei redeemed 4000 gift points for a $20 gift card and 10,000 gift points for a $50 gift card. How many gift points does she need to get a $75 gift card?

5. The table shows the relationship between the height of a custom-built fence to enclose a given area and the cost of the fence. What would be the cost of a fence that is 8 feet high?

Height (feet)	Cost (dollars)
3	$225
5	$375
6	$450

6. The equation $a = 1.2p$ shows the relationship between the number of apples, a, and the number of pears, p, in a fruit basket. How many pears are in a basket when there are 12 apples?

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Extension

At any given time of the day, the length of your shadow is proportional to your height. Suppose a person who is 81 inches tall casts a shadow that is 94.5 inches long. Another person in the same place casts a shadow that is 84 inches long. How tall is the second person?

Spaced Practice

1. Use the equation for the constant of proportionality, $k = \frac{y}{x}$, to determine each unknown value.

   a. $k = \frac{3}{2}$ and $y = 15$

   b. $k = \frac{1}{4}$ and $y = 5$

2. Determine a unit rate for each scenario.

   a. $\frac{3}{4}$ of an inch of rain fell in $\frac{1}{2}$ hour.

   b. Heather charges a half-dollar for each eighth of a pizza.

3. Simplify each expression.

   a. $8 - 4(5) + 2^4$

   b. $10 \div (1 + 4) - 3^2$

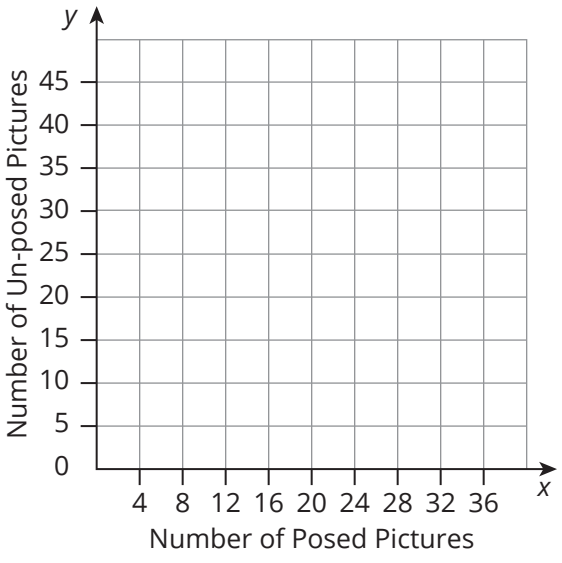
IV. Constant of Proportionality in Multiple Representations

Topic Practice

A. Graph each proportional relationship. Then, write an equation to represent the problem situation.

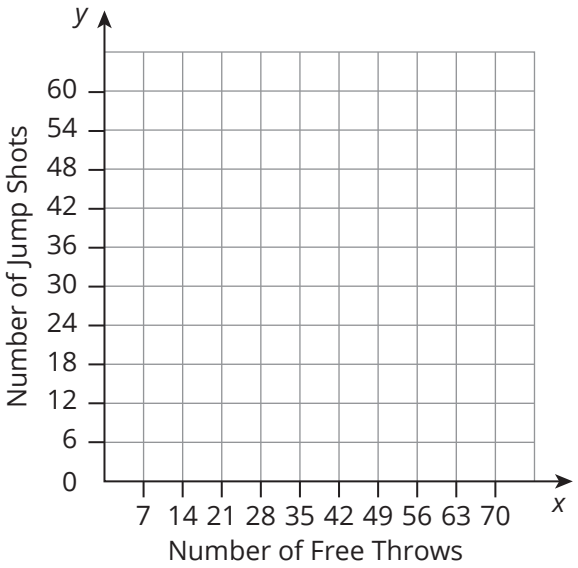
1. Diego is an event photographer. In his brochure he advertises that for every 4 posed pictures he takes of your event he will take 5 un-posed pictures. The table displays the possible number of posed pictures to the number of un-posed pictures.

Number of Posed Pictures	Number of Un-posed Pictures
p	u
16	20
24	30
32	40
36	45



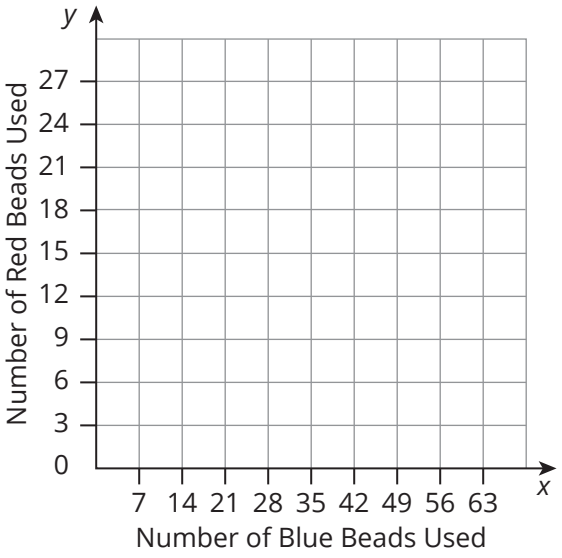
2. Valentina is practicing her shots for basketball. For every 6 jump shots she practices, she practices 7 free throws. The table displays the possible number of free throws she practiced and the number of jump shots she practiced.

Number of Free Throws	Number of Jump Shots
f	j
14	12
35	30
49	42
70	60



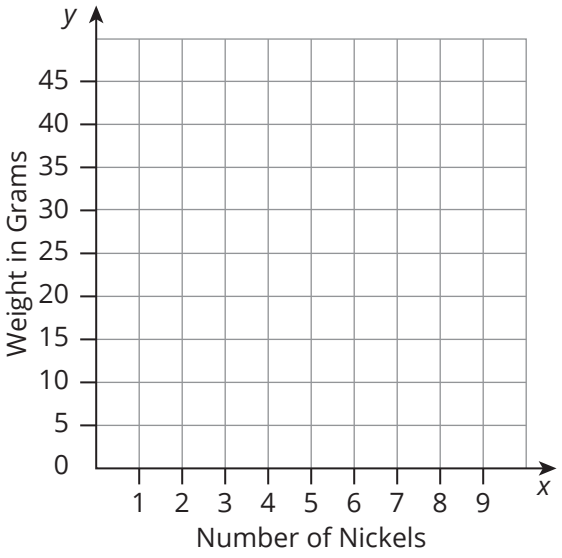
3. Lucas is making necklaces out of glass beads. For every 3 red beads he uses, he uses 7 blue beads. The table displays the possible number of blue beads used and the number of red beads used.

Number of Blue Beads Used	Number of Red Beads Used
b	*r*
28	12
42	18
56	24
63	27



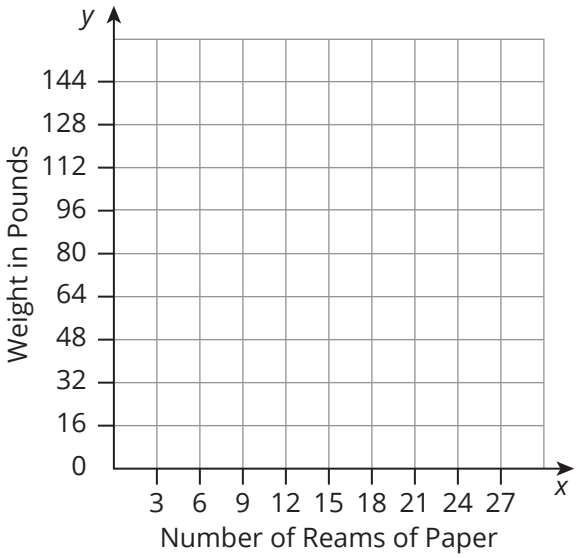
4. Adriana is weighing money on a scale. She determines that 1 nickel weighs 5 grams. The table displays the possible number of nickels weighed and their weight in grams.

Number of Nickels	Weight in Grams
n	g
2	10
6	30
7	35
9	45



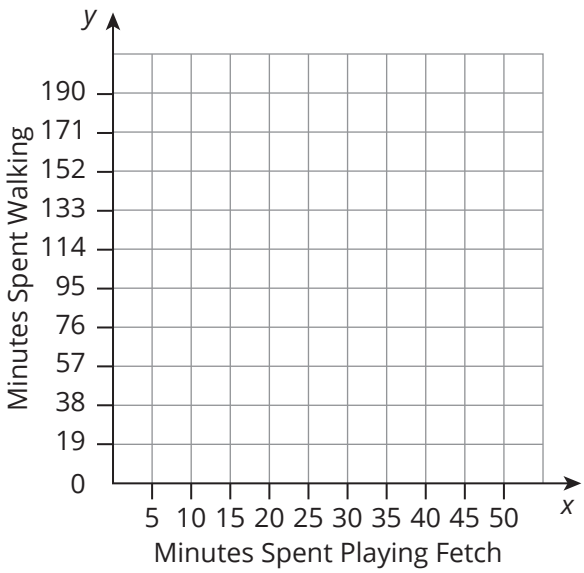
5. Sebastian is ordering reams of paper for his company using a website. He determines that every 3 reams of computer paper weigh 16 pounds. The table displays the possible number of reams of paper and the weight in pounds for each shipment.

Number of Reams of paper	Weight in Pounds
r	p
9	48
15	80
24	128
27	144



6. Isaiah takes his new puppy outside to get exercise every evening. For every 19 minutes Nicholas and his puppy walk, they play fetch for 5 minutes. The table displays the possible number of minutes Nicholas and his puppy walk and the number of minutes they play fetch.

Minutes Spent Playing Fetch	Minutes Spent Walking
f	w
20	76
25	95
40	152
50	190

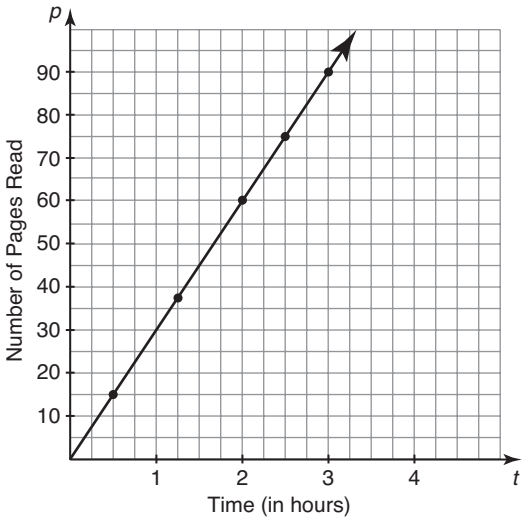


Extension

A map of the United States is drawn such that 1 inch is equal to 600 miles. What is the approximate distance, on the map, between New York and Los Angeles?

Spaced Practice

1. Suppose the number of pages (p) that Sarah can read is directly proportional to the amount of time (t) in hours she spends reading. Determine the constant of proportionality and describe its meaning.

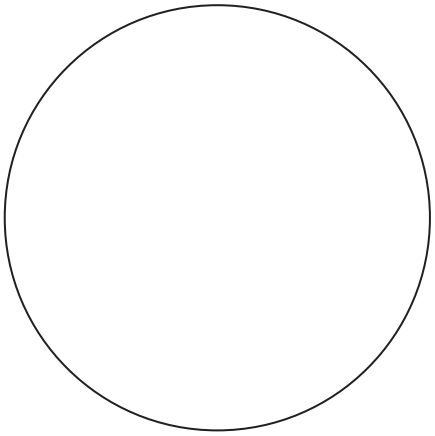


2. In the first quarter (3 months), a store sold 32 limited-edition action figures. Suppose this quarter's sales represent a typical sales pattern. How many action figures should they expect to sell in a year?

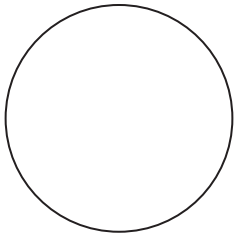
3. A recipe calls for $3\frac{1}{2}$ cups of flour and $\frac{3}{4}$ cup of sugar. Suppose you want to make the recipe with 6 cups of flour. How much sugar will you need?

4. Determine the area of each circle.

   a. Circle *A* with a diameter of 6 in.



   b. Circle *B* with a circumference of 25.12 cm



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GRADE 7

MODULE 2

Applying Proportionality

TOPIC 1: Proportional Relationships

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Name _____ Date _____

I. Introducing Proportions to Solve Percent Problems

Topic Practice

A. Model each scenario. For Questions 1–3, use a strip diagram. For Questions 4–6, use a ratio table. Then use your model to answer the question. Explain your thinking.

1. A shirt costs $40. When it was on sale for 25% off, what was the discount?

2. A jacket is on sale for 20% off, which is $15 off. What is the original price of the jacket?

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3. A sofa originally costs $400. During a sale, it costs $240. What percent does a customer save with the sale?

4. A shirt costs $40. When it was on sale for 15% off, what was the discount?

5. A dress is on sale for 30% off, which is $36 off. What is the original price of the dress?

6. A chair originally costs $360. During a sale, it costs $288. What percent does a customer save with the sale?

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B. Set up and solve a proportion to solve each problem.

1. Mr. Sanchez works as the art teacher at a summer day camp. Six hundred campers participate in the camp every day. Yesterday, Mr. Sanchez helped 6 campers on an art project. What percent of the campers did Mr. Sanchez help yesterday?

2. Malik is saving up to purchase a small flat screen television for his bedroom. He has saved $80, which is 64% of the total cost of the television. How much does the television cost?

3. Luis saved $75 over the summer from his part-time job. He withdrew 40% of the money to buy new clothes. He kept the rest of the money in his bank account. How much money did Luis spend on new clothes?

4. Huyen raises animals and trains them to appear in Hollywood movies. Currently, 23 of her penguins are appearing in a film about global freezing. That is 92% of the penguins Huyen has raised. How many penguins has she raised?

5. Mr. Rodriguez teaches dance at the middle school. His classes are 90 minutes long, and he spends 94% of class time teaching strength and conditioning. How many minutes do Mr. Rodriguez's students spend on strength and conditioning in each class?

6. Angel plays quarterback for a neighborhood football team. During his team's first game, he executed 60 plays, 42 of which were successful. What percent of Angel's plays were successful?

C. Solve each problem.

1. William purchases a guitar for $78.44. He has a coupon for 20% off the price. How much does William pay for the guitar after using the coupon?

2. Madison is purchasing ink cartridges for his computer. Each ink cartridge costs $35.99 and comes with a $10 rebate. How much will Madison pay for one ink cartridge after the rebate?

3. Koda purchased an antique chair for $15. He later sold the chair for $27 to an antique dealer. What was the percent markup of the chair?

4. Amir purchases comic books at garage sales and marks them up 75% before reselling them to comic book dealers. If Amir purchases a comic book at a garage sale for $4, how much will he charge the comic book dealer for it?

5. If a store marks up the price of an item by 45% and sells it to customers for $58, what was the original price the store paid for the item?

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6. Jacob's favorite store is having a sale. All clothing is 40% off, and Jacob has a coupon for another $10 off his purchase. He buys a sweater for $65.99. How much does Jacob pay for the sweater after the discounts?

7. Maria needs to buy new shoes for the soccer season. The local sporting goods store is having a sale, and all shoes are 30% off. Maria will also receive 10% off her purchase with her student ID. The list price of Maria's shoes are $75.00. How much will Maria pay for the shoes after the discounts?

8. Gabriela is purchasing a new bedspread. The list price of the bedspread is $139.99. She has a coupon for 15% off the item and another for $20 off the item. She can only use one coupon. Which should she use to get the best deal on the bedspread?

9. Destiny needs to buy new chairs for her dining room. She has found some she likes at two different stores. The chairs at Store A have a list price of $149.99, and she has a coupon for 35% off. The chairs at Store B have a list price of $132.95 and include a $25 rebate. Which chairs should she buy if she wants to pay the least amount for them?

10. Two stores are having sales on the couch that Jacob wants to buy. Store A sells the couch for $859 but is having a sale for 25% off that price. Store B sells the couch for $975 and is having a sale for $\frac{1}{3}$ off. Where should Jacob buy the couch to get the best deal?

11. Fernando is buying holiday socks to give as gifts. The table shows the prices and advertised sales for the same type of holiday socks at three different stores.

Store	Price per Pair	Advertised Sale
H	$4.50	Buy 1 pair get 1 pair half off.
J	$5.95	Buy 2 pairs get one pair free.
K	$4.25	Buy 6 pairs get 15% off the total price.

Based on the advertised sales, at which store will Fernando get the lowest price on 6 pairs of socks?

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Extension

While Olivia is shopping with her friend Jacob, they notice a sign in the front of the store.

BACK-TO-SCHOOL SALE!

- 20% off all purchases
- $10.00 student discount

They also notice that the two cashiers are applying the discounts differently. The cashier on their left is taking 20% off the total bill and then subtracting $10.00. The cashier on their right is subtracting $10.00 first and then taking 20% off the total.

To get a better deal, should Olivia and Jacob go to the cashier on the left or the right? Or does it not matter? Show all your work and explain your reasoning.

Spaced Practice

1. Ana is cutting out stars to decorate the gym for the school dance. The number of stars (s) she can cut out is directly proportional to the time (t) in minutes she spends cutting out the stars.

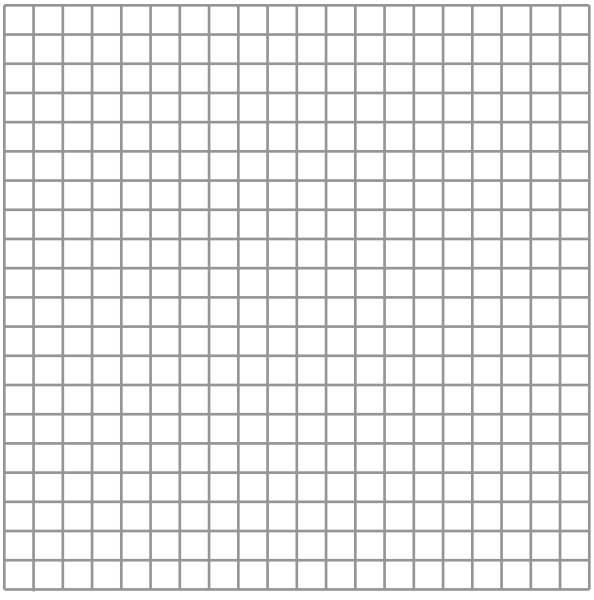
   a. Write an equation to show the relationship between s and t.

b. Complete the table to show the number of stars Ana is able to cut out for various amounts of time.

Time (t) (in minutes)	Number of Stars (s)	$\frac{s}{t} = k$
	0	.....
12	6	
	15	
44		
50		

c. Write an equation to represent the relationship between s and t using the value of k you determined from the table.

d. Graph the data. Label the x- and y-axes and title your graph.



e. Did the graph turn out as you expected? Explain.

f. Explain how to determine the constant of proportionality using the graph.

2. Determine whether there is a proportional relationship between the two quantities. Explain your reasoning.

a.

A	B
35	92
23	80

b.

C	D
20	8
12.5	5

II. Calculating Tips, Commission, and Simple Interest

Topic Practice

A. Answer each question by solving both a percent equation and a proportion in the table shown.

1. You want to buy a sweater that is 25% off. If the original price of the sweater is $38, how much will your discount be?

Use a Percent Equation	Use a Proportion

2. If you ate a 315-calorie meal and 95 calories are from fat, about what percent of the meal is fat?

Use a Percent Equation	Use a Proportion

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3. You want to leave a tip for a meal that costs $17.95. If all you have is $3.00, what percentage tip will you be able to leave?

Use a Percent Equation	Use a Proportion

4. If the 480 children's books represent 15% of the books in the library, how many total books are in the library?

Use a Percent Equation	Use a Proportion

5. A town's population is 760 in one year and 798 the next year. By what percent did the population grow?

Use a Percent Equation	Use a Proportion

6. Abby gets a $50 allowance each month (4 weeks). She spends $5 per week and saves the rest. What percentage of her allowance does she save?

Use a Percent Equation	Use a Proportion

7. A solution is 45% saline. If 27 mL of saline was added to make the solution, what is the total amount of the solution?

Use a Percent Equation	Use a Proportion

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8. Luis read 166 pages of a 415-page novel. What percentage of the book does he have left to read?

Use a Percent Equation	Use a Proportion

B. Write an equation in the form of $y = kx$, where y represents the tip or commission amount, k represents the tip or commission percent, and x represents the bill amount. Use your equation to solve the problem.

1. You want to leave a tip for a meal that costs $18.75. If all you have is $3.00, what percentage tip will you be able to leave?

2. Malik earns a 15 percent commission on each piece of artwork that he sells. If a customer purchases a painting for $68.00, how much commission does Daniel receive?

3. Gabriela wants to leave an 18% tip for her meal. If her meal costs $26, what should she leave for a tip?

4. Destiny always tips her hair stylist 20 percent of whatever her services cost. On her most recent trip to her hair stylist, Destiny tipped the stylist $33. How much did Destiny's services cost?

5. Maria works at a shoe store and earns a commission for her sales. A customer purchases $260 in shoes, and Maria receives $31.20 in commission. What percent commission does Maria earn?

6. The Chens ate out at a restaurant, and their bill was $57.55. If the Chens tipped 20%, how much did they leave for a tip? How much did they pay for their meal, including the tip?

C. Solve each problem.

1. Determine the simple interest if the principal is $225, the interest rate is 6%, and the time is 2 years.

2. Determine the simple interest if the principal is $1500, the interest rate is 4%, and the time is 3 years.

3. Determine the simple interest if the principal is $300, the interest rate is 7%, and the time is 5 years.

4. Determine the simple interest if the principal is $600, the interest rate is 5%, and the time is 4 years.

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5. Michael is purchasing a new baseball bat. He has two coupons for the local sporting goods store, but he can only use one of the coupons. One coupon is for 15% off the list price of any bat. The other is for $35 off. The list price of the bat Michael wants is $395. Which coupon should Michael use to get the best deal?

6. Fernando needs a new oven for his home. The hardware store is having a sale on the oven he wants for 30% off the list price. The list price of the oven at the hardware store is $985. Fernando also has a coupon for the appliance store for $250 off. The list price of the oven at the appliance store is $938. Should Fernando purchase the oven at the hardware store or at the appliance store?

7. Huyen earned $235 babysitting. She decides to deposit the money into a bank account that earns 3% interest. If she leaves the money in the account for 2 years, how much interest will she earn?

8. Javier earned $800 cutting grass this summer. He decides to deposit the money into a bank account that earns 4% interest. If he leaves the money in the account for 2 years, what is the total amount that Javier will have in the account?

9. Javier is looking to buy some new sneakers. He has two pairs that he would like to buy at the shoe store. The store is having a buy one, get one half off deal. So, Javier will pay full price for one pair of sneakers, and the second pair will be 50% off. Javier also has a coupon for 20% off each pair of sneakers. He cannot use the coupon if he takes the buy one, get one half off deal. Each pair of sneakers Javier wants is $74.99. Should Javier use the coupon or take the deal?

10. Fernando needs a new oven for his home. The hardware store is having a sale on the oven he wants for 30% off the list price. The list price of the oven at the hardware store is $985. Fernando also has a coupon for the appliance store for $250 off. The list price of the oven at the appliance store is $938. Should Fernando purchase the oven at the hardware store or at the appliance store?

Extension

Ana goes to dinner at a restaurant in Oklahoma where the combined sales and local tax on meals is 9%. She leaves a tip that is 175% of the amount of sales tax. When her total bill—including tax and tip—is $45, what was the cost of her meal and what tip as a percent did she leave?

Spaced Practice

1. Hannah has started a home business making and selling all-natural goat milk soaps.

   a. When the cost of the materials for a basic bar of soap is $2.50 and Hannah sells each bar of soap for $4.50, what is the markup percent?

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b. Hannah sells intricately shaped holiday soaps for $9 each. After each holiday, she marks the related soaps down to $6.75. What percent discount should she advertise on her social media site?

2. Alexander is selling homemade granola to raise money to support having a pet iguana. He makes a batch of granola and then divides it into 14 individual bags for sale. The total cost of the ingredients is $35.

   a. Alexander sells each bag at a markup of 50%. How much does each bag cost? How much money does Alexander make?

   b. When Alexander has not sold all of the granola after 3 days, he sells the remaining bags for 60% of the cost. What is the sale price of the individual bags of granola?

3. Jacob works in a men's clothing store. The amount of money *(m)* he makes is directly proportional to the number of hours *(h)* he works.

   a. Complete the table to show the amount of money Jacob earns for different amounts of time that he works.

Time (hours)	Money Earned (dollars)
3	
	56.25
6	75.00
7.5	

b. Determine the constant of proportionality.

c. Write an equation to show the relationship between m and h.

d. How many hours does Jacob have to work to make $100?

e. How much money does Jacob earn when he works 40 hours?

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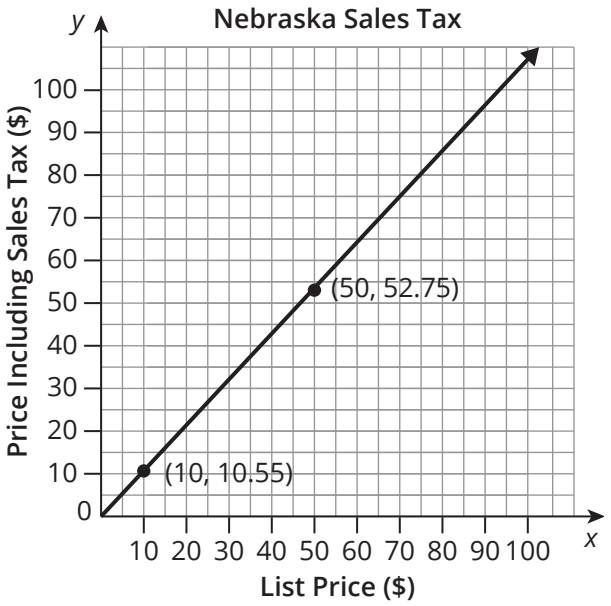
III. Sales Tax, Income Tax, and Fees

Topic Practice

A. Answer each question using the data provided.

Arizona Sales Tax	
List Price ($)	Price Including Sales Tax ($)
5.00	5.33
8.50	9.06
10.25	10.93
13.00	13.86

Nevada Sales Tax
$y = 1.0685x$, where x is the list price in dollars and y is the price including sales tax, in dollars.



1. What is the sales tax percentage in Arizona? Show your work.

2. In Nebraska, what is the cost, including sales tax, of an item with a list price of $50?

3. Which state has the highest sales tax? Show your work.

4. Madison lives in Nevada and is purchasing two new movies. The list price of each movie is $13. What will be the total price of the movies including sales tax?

5. Olivia lives in Arizona and is purchasing a new laptop. The list price for the laptop is $400. Olivia has $420 in cash to pay for the laptop. Can she afford the laptop?

6. Abby purchases a new refrigerator for her kitchen. The list price is $1500. What is the price, including sales tax, if Abby lives in Nebraska?

7. Amir bought a souvenir while on vacation. The item cost $22, but the total bill was $23.43. What percent was the sales tax?

8. Huyen buys a sweatshirt for $30. The sales tax in her state is 7%. What is the total amount Karen will pay for the sweatshirt, including sales tax?

9. Koda paid $3.30 in sales tax on an item that cost $60. What percent sales tax did he pay?

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B. Use the given information from various states to answer each question.

1. Income: $95,500
   State Income Tax Rate: 6.5%
   What is the state income tax paid?

2. Income: $118,000
   State Income Tax Rate: 3.4%
   What is the income tax paid?

3. Income: $47,500
   State Income Tax Rate: 6.5%
   What is the income remaining?

4. Income: $95,750
   State Income Tax Rate: 4.5%
   What is the income remaining?

5. State Income Tax Rate: 5%
   Amount Paid: $2500
   What is the income?

6. State Income Tax Rate: 4.5%
   Amount Paid: $1350
   What is the income?

C. Use the table of tax brackets and rates for 2023 to answer each question. Use a calculator to help with your calculations.

Federal income tax is not a flat rate. The 2023 tax brackets and rates are listed in the table.

Tax Rate	For Single Filers	For Married Individuals Filing Joint Returns	For Heads of Households
10%	$0 to $11,000	$0 to $22,000	$0 to $15,700
12%	$11,000 to $44,725	$22,000 to $89,450	$15,700 to $59,850
22%	$44,725 to $95,375	$89,450 to $190,750	$59,850 to $95,350
24%	$95,375 to $182,100	$190,750 to $364,200	$95,350 to $182,100
32%	$182,100 to $231,250	$364,200 to $462,500	$182,100 to $231,250
35%	$231,250 to $578,125	$462,500 to $693,750	$231,250 to $578,100
37%	$578,125 or more	$693,750 or more	$578,100 or more

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For federal income tax, you pay one rate on part of your income and a higher rate on income above a set amount based on how you file your taxes.

1. Determine the federal income tax for a single filer with an income of $24,000.

2. Determine the federal income tax for married individuals filing joint returns with a combined income of $96,000.

3. Determine the federal income tax for a head of household with an income of $75,000.

4. Determine the federal income tax for a single filer with an income of $100,000.

5. Determine the federal income tax for married individuals filing joint returns with a combined income of $80,000.

6. Determine the federal income tax for a head of household with an income of $40,000.

Extension

In 2015, a person working in the United States paid 10% federal income tax for income up to $9225. Income between $9226 and $37,450 was taxed at 15%. Suppose William earns $9225. How much of his earnings does William take home after taxes? If he were to get a raise and William's entire check was taxed at 15%, how much more would he need to earn to take home more than his current take-home pay?

Spaced Practice

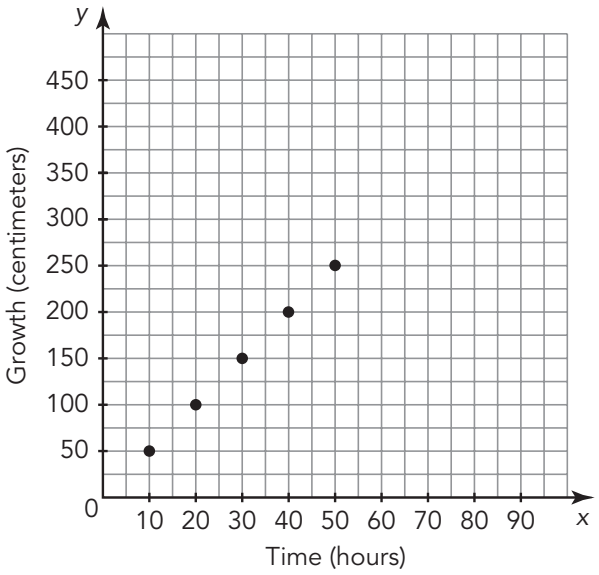
1. Determine each total cost, including a 20% tip, for the following bill amounts.

   a. $45.80

   b. $103.65

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2. The graph shows how many centimeters a bamboo plant can grow and the number of hours that the plant has been growing. Determine the constant of proportionality and explain what it means.



3. In the middle school and high school jazz bands, the number of 7th-graders is proportional to the total members. Write a constant of proportionality for this situation and explain what it means.

Jazz Band	Number of 7th-Graders	Total Members
Middle School	6	15
High School	8	20

4. Write each as a unit rate.

   a. $180 in 5 hours

   b. $1 in tax for $20 spent

IV. Percent Increase and Percent Decrease

Topic Practice

A. Determine each percent increase or percent decrease.

1. The local animal shelter had 12 dogs at the beginning of the week. Since then, the number of dogs at the shelter has decreased by 9. What is the percent change in the number of dogs at the animal shelter this week?

2. Hannah has a collection of necklaces. Last month, she had 40 necklaces. She now has 76 necklaces. What is the percent change in the number of necklaces in Hannah's collection from last month to now?

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3. Last month, Gabriela had 72 dollars in a checking account. The current balance is 126 dollars. What is the percent change in the account balance from last month to this month?

4. Last month, you conducted a survey for the student newspaper. Of the students that you surveyed, 20 thought that the student council president was doing a good job. You conduct the same survey this month. After surveying the same students, you find that 11 think that the student council president is doing a good job. What is the percent change in the number of students who think that the student council president is doing a good job from last month to this month?

5. Last season, your favorite basketball team won 20 games. So far this season, your favorite basketball team has won 31 games. What is the percent change in the number of games that your favorite team won from last season to this season?

6. Maria collects baseball cards and is trying to complete a special edition set of cards. Last month, she collected 25 cards. This month, she collected 19 cards. What is the percent change in the number of cards collected from last month to this month?

7. The Italian restaurant near your house sold 60 plain pizzas last week. They sold 39 fewer plain pizzas this week than last week. What is the percent change in the number of plain pizzas sold from last week to this week?

8. At the beginning of the month, Ana's Used Car Dealership had 80 cars on the lot. Today, there are 100 cars on the lot. What is the percent change in the number of cars on the lot this month?

9. Last month, you joined an online strategy game. When you joined, there were 25 members. This month, there are 47 members. What is the percent change in the number of members from last month to this month?

10. At a local toy store, their most popular toy sold is a scooter. Last summer, the toy store sold 20 scooters. This summer, the store sold 27 scooters. What is the percent change in the number of scooters sold from last summer to this summer?

11. The peach tree in Angel's backyard produced 56 pounds of peaches in one summer. The next summer, it produced 14 pounds less than the previous year. What is the percent change in the number of pounds of peaches produced from one summer to the next?

12. In summer, you want to put the wind chill factor to work for you. You know that using ceiling fans can make you feel 23 degrees cooler in a house that is 92 degrees, so you turn on your ceiling fans. What is the percent change in the temperature after the ceiling fans are turned on?

B. Answer each question.

1. Mr. Jackson opened a new general store in the downtown area. On the day of the grand opening, he had 10 customers. The next day, he had 80% more customers than on the grand opening day. How many customers did Mr. Jackson have on the second day?

2. Luis creates pottery. He brought 40 pieces to a show at the fall festival. When he went to the spring carnival, he brought 15% more pieces than he brought to the fall festival. How many pieces of pottery did Luis bring to the spring carnival?

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3. A recital hall is located on the campus of The University of Texas at Austin. One day before a piano recital was to take place, 30 tickets had been sold. Happily for the concert organizers an additional 80% of the 30 seats that were previously sold were sold on the actual day of the concert. The result was a sellout. How many seats does the recital hall have?

4. Malik is scaling down a photograph that has an area of 8 square inches. He plans to reduce its area by 25%. What will be the area in square inches of the reduced photograph?

5. The heart of a black bear beats about 50 times per minute during normal sleep in the fall. When the animal hibernates in winter, its heart rate decreases by 84%. How many times per minute does a black bear's heart beat during hibernation?

6. Your aunt is a web designer. When she tones a photo for a website, she works with it in an image quality of 25 dots per inch (dpi). When she uploads it to the website, she reduces the quality by 60%. What is the dpi your aunt uses for a photo that she uploads to a website?

7. Your sister works as a tutor in the evenings. Last school year, she charged $25 per hour for her services. After taking some certification classes over the summer, she increased her hourly charge by 40%. How much does your sister now charge per hour for her tutoring services?

8. Your MP3 player has 40 gigabytes of music on it. During the next sync, you add 10% more music to it and it is full. How many gigabytes does the MP3 player hold now?

9. The local take-out pizza place sold 50 pepperoni pizzas last month. They sold 6% more pepperoni pizzas this month than last month. How many pepperoni pizzas did they sell this month?

10. Last season, your favorite hockey team won 20 games. So far this season, the team has won 90% more games than last season. How many games has your favorite team won so far this season?

11. Abby has a collection of sports cards. Last month, she had 50 sports cards. Since last month, her collection has decreased by 46%. How many sports cards does Abby have now?

12. Each morning, Ana makes 20 cinnamon bagels for her customers. Because of a recent increase in the popularity of cinnamon bagels, she has increased the number she bakes each morning by 80%. How many cinnamon bagels does Ana now bake each day?

Extension

Can you write a percent decrease as a negative ratio? Provide an example of a percent decrease written as a negative ratio and describe what it means in context.

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Spaced Practice

1. A T-shirt that costs $14 without tax costs $14.98 with tax. What is the sales tax percent?

2. A car that costs $14,000 without tax costs $14,700 with tax. What is the sales tax percent?

3. Identify the constant of proportionality in each situation.

   a. The temperature rises 4 degrees each hour for 10 hours.

   b. Two thirds of the floats in the parade have flowers.

V. Scale and Scale Drawings

Topic Practice

A. Use the given information to answer each question.

The Tyrannosaurus rex model has a scale factor of $\frac{1}{40}$.



1. If the Tyrannosaurus rex model is 0.15 meter tall, how tall would an actual Tyrannosaurus rex have been?

2. If an actual Tyrannosaurus rex was 12 meters long, how long is the model?

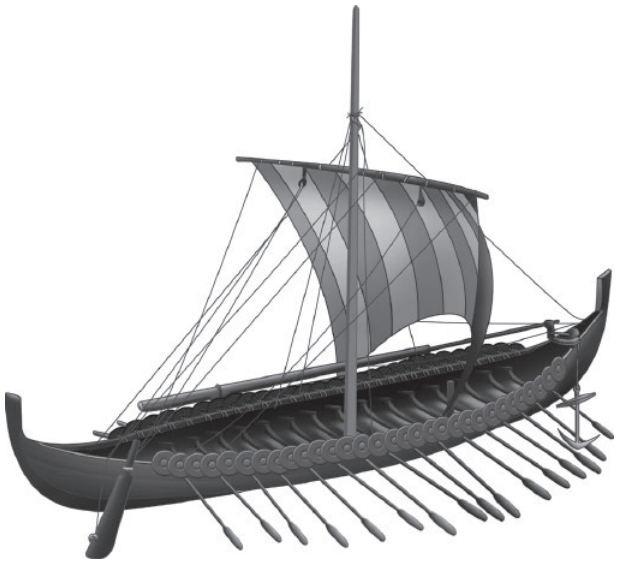
The skyscraper model has a scale factor of $\frac{1}{60}$.



3. If the skyscraper model is 5 feet tall, how tall is the actual skyscraper?

4. If a window in the actual skyscraper is 9 feet tall, how tall is the window in the model?

The model of the historic Gokstad Viking ship has a scale factor of $\frac{1}{64}$.



5. If the ship model is 15 inches long, how long is the actual ship in feet?

6. If the mast on the actual ship is 32 feet tall, how tall is the mast on the model in inches?

7. A scale model of a skyscraper was built at a scale of 1 : 250 and is 1.4 meters tall. What is the height of the original skyscraper?

8. Luis created a scale model of a bank check to present to a charity. The model was created at a scale of 8 : 1 and is 4 feet long. What is the length of the original check?

9. The height of the U.S. Capitol Building is 287 feet. The height of a scale model of the building is 2.87 feet. What is the scale of the model?

10. The length of a pencil is 7 inches. Shawna created a scale model of the pencil for art class. The model is 35 inches long. What is the scale of the model?

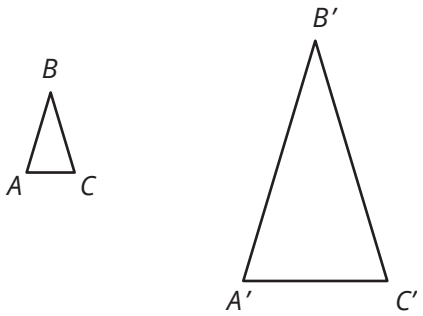
11. Koda made a scale model of the Washington Monument. The monument has an actual height of 555 feet. Koda's model used a scale in which 1 inch represents 150 feet. What is the height in inches of Koda's model?

12. A car has a height of 4.8 feet and a length of 16.2 feet. On a scale model of the car the height is 2 inches. What is the length of the car on the scale model in inches?

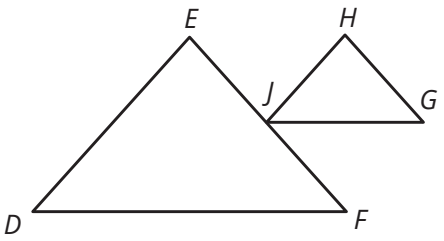
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B. Identify the congruent corresponding angles and write ratios to identify the proportional sides of each triangle.

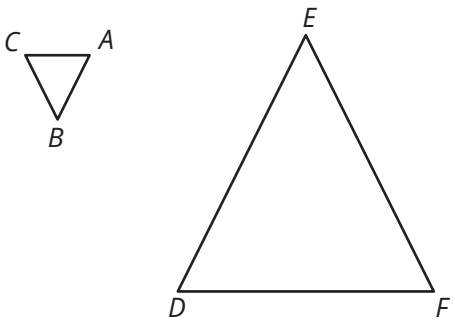
1. $\triangle ABC \sim \triangle A'B'C'$



2. $\triangle DEF \sim \triangle GHJ$



3. $\triangle ABC \sim \triangle DEF$



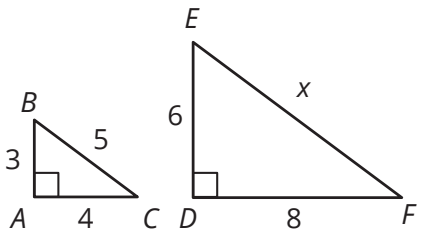
4. $\triangle RST \sim \triangle XYZ$

5. $\triangle XYZ \sim \triangle GHJ$

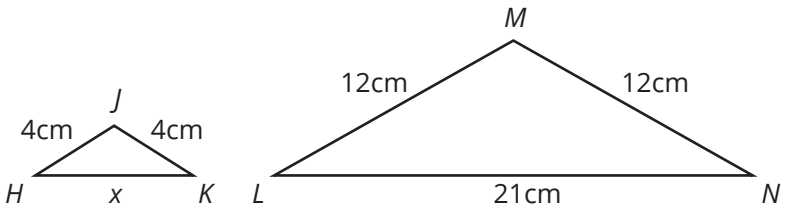
6. $\triangle KLM \sim \triangle RST$

C. For each pair of similar triangles, write and solve a proportion to determine the length of the missing side, *x*.

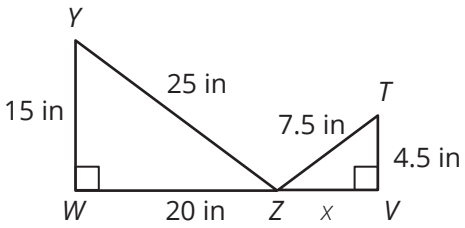
1. $\triangle ABC$ is similar to $\triangle DEF$.



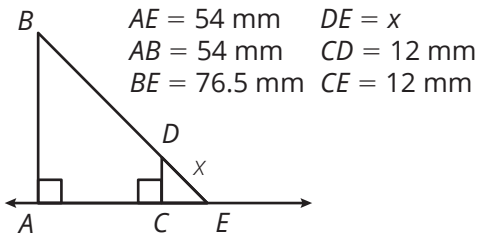
2. $\triangle HJK$ is similar to $\triangle LMN$.



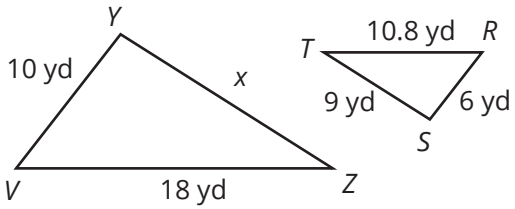
3. $\triangle WYZ$ is similar to $\triangle VTZ$.



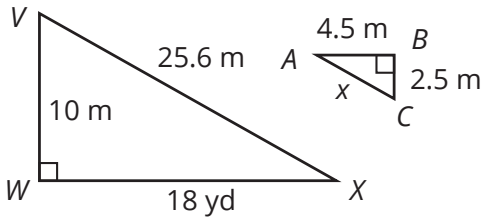
4. $\triangle ABE$ is similar to $\triangle CDE$.



5. $\triangle VYZ$ is similar to $\triangle RST$.

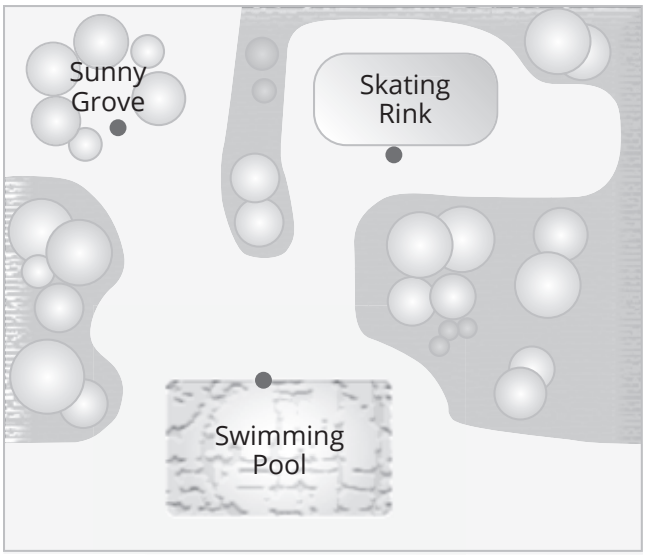


6. $\triangle VWZ$ is similar to $\triangle CBA$.



D. Solve each problem.

1. Gabriela is helping to organize Family Fun Day at the local park. Gabriela is responsible for organizing the relay race. On a map of the park, she plans the first leg of the relay race to start at Sunny Grove and end at the swimming pool. The second leg of the relay race will run from the swimming pool to the skating rink.



On the map:

- The distance between Sunny Grove and the swimming pool is 3.5 inches.
- The distance between the swimming pool and the skating rink is 3.2 inches.
- On the map scale, 1 in. represents 400 ft.

What is the length of the actual race?

2. Huyen enjoys planning vacations almost as much as going on them. This year, she is spending her vacation in the city. Looking at a map, she plans to start at her hotel. From there, she will go to the fine arts museum and then to the sculpture garden. She will walk between each location.



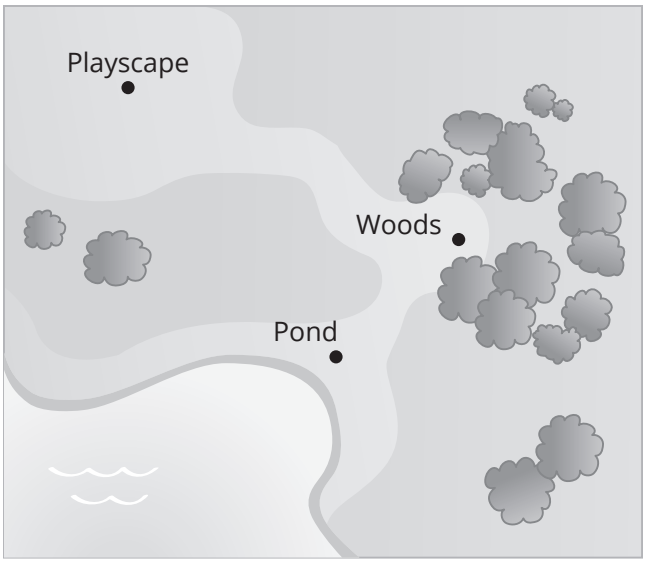
On the map:

- The distance between the hotel and the fine arts museum is 1.1 inches.
- The distance between the fine arts museum and the sculpture garden is 1.3 inches.
- On the map scale, 1 in. represents 3 km.

What is the distance that Huyen walked from the hotel to the sculpture garden?

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3. You have been looking forward to the music festival all year. The festival is held at the local park. Using a map of the music festival, you plan to start at the pond, where Mozart is being played. Then, you will walk to a spot in the woods, where Beethoven is being played. Finally, you'll continue to the playscape, where Bach is being played.

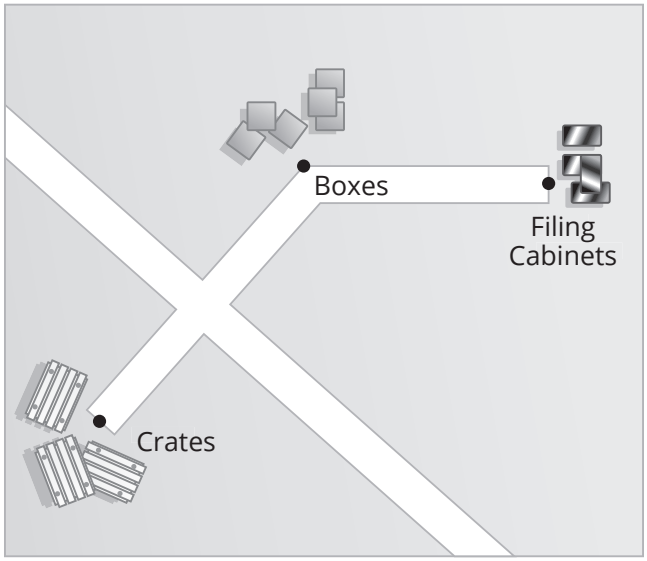


On the map:

- The distance between the pond and the woods is 1.4 inches.
- The distance between the woods and the playscape is 3.1 inches.
- On the map scale, 1 in. represents 40 yd.

What is the distance you walk from the pond to the playscape?

4. William is looking at a map of his warehouse to track down shipment #452A7. He begins in the crate section. When he does not find it there, he looks among the boxes. Finally, he searches in the filing cabinets.



On the map:

- The distance between the crates and the boxes is 2 centimeters.
- The distance between the boxes and the filing cabinets is 1.6 centimeters.
- On the map scale, 1 cm represents 80 m.

What is the distance William walks from the crates to the filing cabinets?

5. You look at a map of a department store to see how far the following three departments are from the other: Accessories, Shoes, and Clothing.

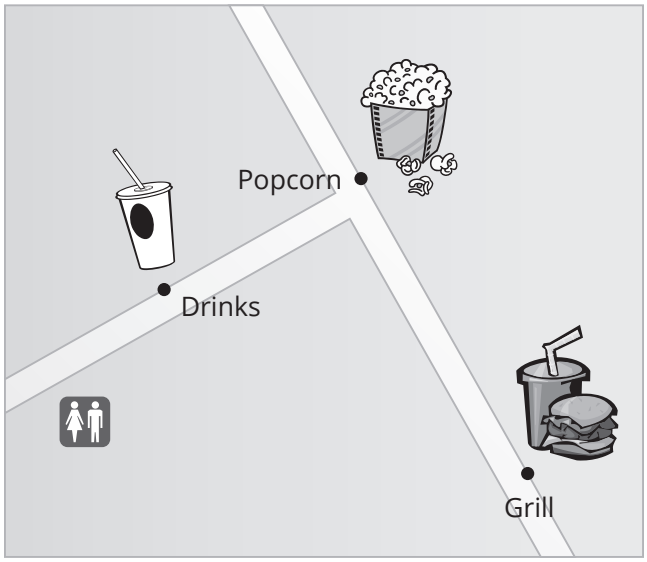


On the map:

- The distance between Accessories and Shoes is 0.5 inches.
- The distance between Shoes and Clothing is 1.2 inches.
- On the map scale, 1 in. represents 50 ft.

What is the actual distance between the shoes and the clothing departments?

6. You and your friends are at the high school football stadium watching the game. You volunteer to get snacks for yourself and your friends. You check out the map for concession stands. There are three different concession stands. One is for drinks, one is for popcorn, and one is for the grill.



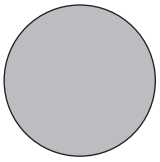
On the map:

- The distance between the drinks and the popcorn is 2 inches.
- The distance between the popcorn and the grill is 3 inches.
- On the map scale, 1 in. represents 60 ft.

What is the actual distance between the drinks and the popcorn concession stands?

Extension

You may have seen the star Betelgeuse (BEETLE juice) in the night sky. It is a red giant star, which has a radius of 821.3 million kilometers. By comparison, our Sun has a radius of 0.5 million kilometers.



Suppose the circle shown represents our Sun. How big would the model of Betelgeuse be when you drew it to scale?

Spaced Practice

1. Determine each percent increase or decrease.

   a. Original: \$340 New: \$34

   b. Original: 75 New: 225

2. Solve each proportion.

   a. $\frac{4}{x} = 9$

   b. $\frac{7.5}{26} = \frac{75}{p}$

3. Convert each measure to the unit indicate. Round each measure to the nearest tenth.

   a. 120 pounds to kilograms

   b. 10 kilometers to miles

   c. 5 gallons to liters

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Name _____ Date _____

I. Simple and Compound Interest

Topic Practice

A. Determine the total value of each investment given the principal, simple interest, and time.

1. Principal: $200
   Simple Interest Rate: 3%
   Time: 5 years

2. Principal: $1800
   Simple Interest Rate: 2.5%
   Time: 20 years

3. Principal: $650
   Simple Interest Rate: 5%
   Time: 12 years

4. Principal: $2000
   Simple Interest Rate: 4%
   Time: 10 years

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5. Principal: $4050
   Simple Interest Rate: 2%
   Time: 30 years

6. Principal: $7000
   Simple Interest Rate: 5%
   Time: 20 years

B. Determine the simple interest rate for each given principal, time, and simple interest earned.

1. Principal: $500
   Time: 20 years
   Simple Interest: $250

2. Principal: $850
   Time: 10 years
   Simple Interest: $255

3. Principal: $1200
   Time: 15 years
   Simple Interest: $720

4. Principal: $2000
   Time: 5 years
   Simple Interest: $441

5. Principal: $2000
   Time: 20 years
   Simple Interest: $2000

6. Principal: $5250
   Time: 10 years
   Simple Interest: $2100

C. Calculate the compound interest earnings to determine the total value of each investment. Use a calculator to complete questions 3–6.

1. Principal: $5000
   Compound Interest Rate: 4%
   Time: 1 year

2. Principal: $850
   Compound Interest Rate: 5%
   Time: 2 years

3. Principal: $1400
   Compound Interest Rate: 2.5%
   Time: 12 years

4. Principal: $2830
   Compound Interest Rate: 3%
   Time: 15 years

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5. Principal: $3500

   Compound Interest Rate: 2.25%

   Time: 20 years

6. Principal: $6000

   Compound Interest Rate: 4%

   Time: 5 years

D. The table shown represents the total value over time of a $5000 investment earning money in accounts with a 3% interest rate.

Number of Years Invested	Total Value in a Simple Interest Account ($)	Total Value in a Compound Interest Account ($)
1	$(5000)(0.03)(1) = 150$ $5000 + 150 = 5150$	$(5000)(1 + 0.03)^1 = 5150$
2	$(5000)(0.03)(2) = 300$ $5000 + 300 = 5300$	$(5000)(1 + 0.03)^2 = 5304.50$
3	$(5000)(0.03)(3) = 450$ $5000 + 450 = 5450$	$(5000)(1 + 0.03)^3 = 5463.64$
4	$(5000)(0.03)(4) = 600$ $5000 + 600 = 5600$	$(5000)(1 + 0.03)^4 = 5627.54$
5		
10		
20		
30		

1. Use a calculator to complete the last four rows of the table.

2. How much more money does the compound interest account earn in year 5?

3. How much more money does the compound interest account earn in year 10?

4. How long will it take to double the investment if the account earns simple interest?

5. Look at your table to estimate how long it would take to double the investment if the account earns compound interest.

6. Your friend Angel wants to invest money for the next ten years in order to save for college. Which type of account would you suggest that Angel use? Explain your reasoning.

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Extension

Determine how much more money is made in a compound interest account than a simple interest account for the given principal, rate, and time.

Principal: $12,250

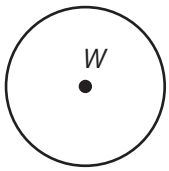
Rate: 2.25%

Time: 15 years

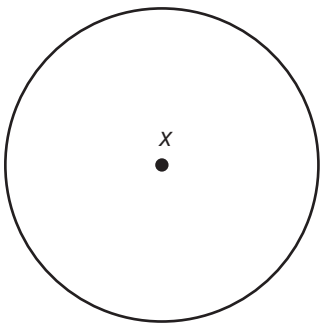
Spaced Practice

Use a string and a centimeter ruler to measure the radius and circumference of each circle. Calculate the ratio of the circumference of the circle to its diameter.

1.



2.



3. What is the formula for the circumference of a circle with radius a?

4. What is the formula for the area of a circle with radius b?

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II. Net Worth Statements

Topic Practice

A. Identify each item as a liability or asset. Explain your reasoning.

1. The mortgage on your house

2. Money in your savings account

3. A car that is paid off

4. A loan used to pay for college

5. Money put away for retirement

6. A credit card with unpaid charges on it

B. Analyze each set of accounts. Create a net worth statement, then determine each person's net worth.

1. Luis's accounts:
   - School loans: $15,000
   - Savings account: $4000
   - Car: $17,600
   - 401(k) account: $45,000
   - Credit card: $4300

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

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2. Malik's accounts:
   - Business loan: $200,000
   - 403(b): $65,780
   - Vehicle loan: $65,900
   - Certificate of deposit: $30,000
   - Home: $230,000
   - Investments: $35,000

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

3. Huyen's accounts:
   - Video game collection: $800
   - School loans: $8130
   - Car: $10,540
   - Medical bills: $1675
   - Credit cards: $1535

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

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4. Olivia's accounts:
   - Mortgage: $125,000
   - Home value: $160,000
   - Car loan: $15,980
   - Bank accounts: $9800
   - 403(b) account: $11,750
   - Home equity loan: $6450

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

5. Alexander's accounts:
   - Checking account: $2245.16
   - Medical bills: $567.50
   - Home: $180,000
   - Mortgage: $135,000
   - Coin collection: $1400
   - Certificate of deposit: $10,000
   - Car loan: $26,500

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

6. Luis's accounts:
   - Investments: $3675
   - 403(b): $22,050
   - Credit cards: $4523.18
   - Bank accounts: $10,467.29
   - Car loan: $16,900

Assets		Liabilities	
Type	Amount	Type	Amount
Total:		Total:	

Extension

In 2019, the net worth of the average American was $102,700. Create a list of realistic assets and liabilities that leads to this net worth. Include at least four assets and four liabilities and be sure to show your work.

Spaced Practice

Write and solve a proportion to answer each question.

1. What is 78% of 50?

2. What is 54% of 450?

3. The number 110 is what percent of 500?

4. The number 21 is what percent of 75?

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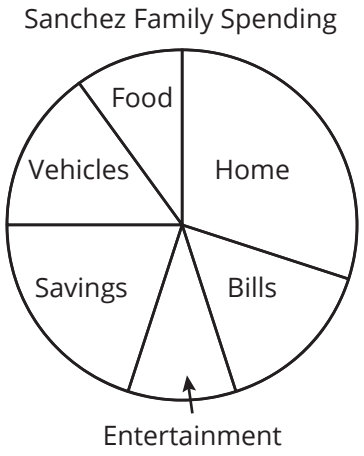
5. The number 88 is 44% of what number?

6. The number 57 is 76% of what number?

III. Personal Budgets

Topic Practice

A. The circle graph represents how the Sanchez family spent and saved its $98,000 in earnings this year. Use the graph to answer each question. Explain your reasoning.



1. Suppose the Sanchez family is a family of four. Use a family budget estimator to determine the minimum household budget needed for a family of four to meet its basic needs in your region of the state.

2. Which category did the Sanchez family spend the most on?

3. Which categories did the Sanchez family spend the least on?

4. Estimate the percent of earnings and the amount of money the Sanchez family spent on their vehicles this past year.

5. Estimate the percent of earnings and the amount of money the Sanchez family put into their savings this past year.

6. How much more did the Sanchez family spend on their home than on entertainment this year?

7. The Sanchez family's gross income for the year is $108,600 before taxes. Estimate the percent of the family's gross income that is taken out in taxes.

8. Determine the average hourly wage necessary to earn enough money to support a family of four in your region of the state.

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B. For each expense, determine the percent of the total expenses for each category.

1. The Jackson family's expenses:
   - Household: $700
   - Living: $280
   - Savings: $420

2. The Rodriguez family's expenses:
   - Household: $800
   - Living: $400
   - Savings: $400

3. The Chen family's expenses:
   - Mortgage: $1500
   - Utilities: $400
   - Credit cards: $250
   - Savings: $350

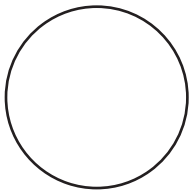
4. The Jackson family's expenses:
   - Mortgage: $1900
   - Utilities: $600
   - Car loan: $800
   - Savings: $700

5. The Rodriguez family's expenses:
   - Mortgage: $1500
   - Utilities: $300
   - School loans: $480
   - Miscellaneous: $120

6. The Sanchez family's expenses:
   - Mortgage: $4000
   - Utilities: $800
   - Vacation: $1280
   - Credit cards: $200
   - Savings: $120

C. Consider each family's budget and expenses.

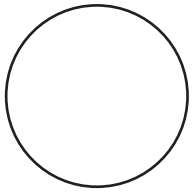
1. Create a circle graph to present the Jackson family's expenses:
   - Mortgage: $2250
   - Vehicle loans: $1125
   - Utilities: $450
   - Credit cards: $450
   - Savings: $225



Mortgage
Vehicle Loans
Utilities
Credit cards
Savings

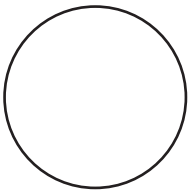
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2. Create a circle graph to present the Sanchez family's expenses:
   - Household expenses: $3100
   - Living expenses: $1550
   - Savings: $1550



Household expenses
Living expenses
Savings

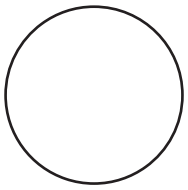
3. Create a circle graph to present the Rodriguez family's expenses:
   - Rent: $5100
   - Utilities: $2125
   - Car loan: $850
   - Entertainment: $425



Rent
Utilities
Car Loan
Entertainment

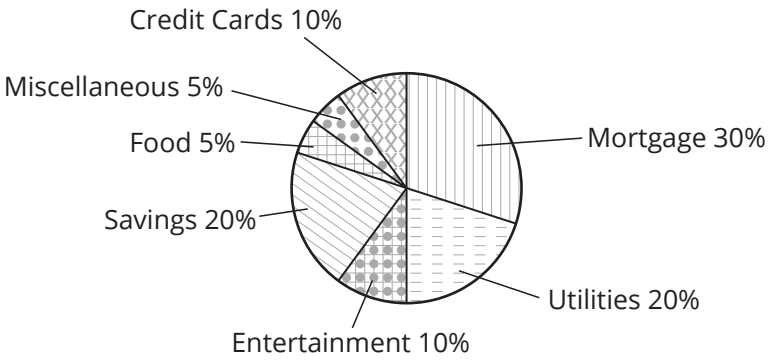
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4. Create a circle graph to present the Chen family's expenses:
   - Vacation: $2500
   - Car loan: $500
   - Retirement savings: $5000
   - Food: $500
   - Entertainment: $1000
   - Miscellaneous: $500



Vacation
Car Loan
Retirement Savings
Food
Entertainment
Miscellaneous

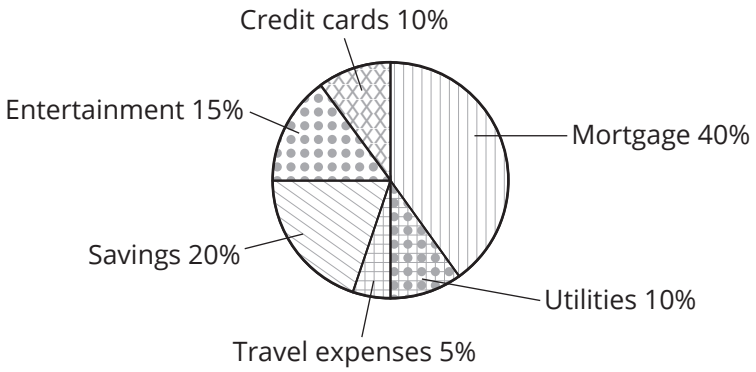
5. The Jackson family spends $25,000 quarterly. The pie chart represents the family's expenses.



a. Determine the amount the Jackson family spends on food quarterly.

b. Assume that 20% of the Jackson family's gross income is taken out in federal income tax. How much money must they make before taxes in order to maintain the family's current budget?

6. The Sanchez family spends $30,000 quarterly. The pie chart represents the family's expenses.



a. Determine the amount the Sanchez family spends on travel expenses and entertainment quarterly.

b. Assume that 25% of the Sanchez family's gross income is taken out in federal income tax. How much money must they make before taxes in order to maintain the family's current budget?

Extension

According to the Texas Quarterly Housing Report (2019), the statewide median price for a single-family home is $177,100. Research the average interest rate for a 30-year fixed-rate mortgage in your area. Use that information to calculate the total interest that someone would pay over the life of the loan.

Spaced Practice

Set up and solve a proportion to solve each problem.

1. Mr. Jackson works as the art teacher at a summer day camp. Six hundred campers participate in the camp every day. Yesterday, Mr. Jackson helped 6 campers on an art project. What percent of the campers did Mr. Jackson help yesterday?

2. Jacob is saving up to purchase a small flat screen television for his bedroom. He has saved $80, which is 64% of the total cost of the television. How much does the television cost?

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3. Madison saved $150 over the summer from his part-time job. He withdrew 20% of the money to buy new clothes. He kept the rest of the money in his bank account. How much money did Madison spend on new clothes?

4. Destiny harvests tomatoes from 18 plants. That is 75% of the tomato plants she planted. How many tomato plants did Destiny plant?

GRADE 7

MODULE 3

Reasoning Algebraically

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Name _____ Date _____

I. Adding and Subtracting Rational Numbers

Topic Practice

A. Sketch a Venn diagram to show all of the sets and subsets of numbers that you know. Use your Venn diagram to decide whether each statement is true or false. Explain your reasoning.

1. All integers are included in the set of natural numbers.

2. All whole numbers are included in the set of integers.

3. All rational numbers are included in the set of whole numbers.

4. $\frac{2}{9}$ is included in the set of integers.

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5. -3 is included in the set of rational numbers.

6. $\frac{3}{5}$ is included in the set of rational numbers.

B. Determine each solution.

1. The temperature in Chattanooga, Tennessee, is $-3°C$. The temperature in Mario's hometown is 18 degrees colder than that. What is the temperature in Mario's hometown?

2. Kaya owes $22.50 on her lunch account balance. She pays $15 toward her balance. What is the status of her lunch account balance now?

3. A roller coaster rises up to 50.6 feet above the ground before dropping 100.7 feet into an underground cavern. Describe the height of the roller coaster at the bottom of the cavern.

4. To qualify to compete in the high jump finals, athletes must jump a certain height in the semi-finals. Andrew jumped $1\frac{5}{8}$ inches below the qualifying height, but his friend Alejandro made it to $2\frac{1}{4}$ inches over the qualifying height. How much lower was Andrew's semi-final jump compared with Alejandro's?

5. A drilling crew dug to a height of $-32\frac{3}{4}$ feet during their first day of drilling. On the second day, the crew dug down $19\frac{2}{3}$ feet more than on the first day. What is the total distance that the drilling crew dug at the end of the second day?

6. The freezing point of helium is -458 degrees Fahrenheit. If you increase that temperature by 569.7 degrees Fahrenheit, you reach the freezing point of phosphorus. What is the freezing point of phosphorus?

C. Estimate each sum or difference. Then, calculate the actual sum or difference.

1. $-13.5 + 5.35$

2. $-\frac{3}{4} + \frac{2}{3}$

3. $2.89 + (-3.237)$

4. $5\frac{3}{4} + \left(-2\frac{1}{3}\right)$

5. $-\frac{3}{8} + \frac{5}{6}$

6. $-3.76 - (-2.9)$

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7. $\frac{2}{3} - \frac{3}{8}$

8. $-2\frac{2}{7} + 1\frac{1}{3}$

9. $\frac{5}{8} - \frac{3}{4}$

10. $42.71 + (-12.1)$

11. $0.23 - (-0.36)$

12. $1\frac{5}{6} + \left(\frac{-1}{4}\right)$

Extension

Determine each solution. Let $-3 = x$, $-5 = y$, and $-4 = k$.

1. $|x - y - y - k + y + x|$

2. $k - y - k + x + k$

3. $-k - y + x - y$

Spaced Practice

1. Determine each difference. Then, write a sentence that describes the movement on the number line that you could use to solve the problem.

   a. $7 - (-6)$

   b. $-5 - 13$

2. Samantha is riding her bicycle across the state of Texas to raise money for her favorite charity. The distance in miles that she can travel varies directly with the length of time in hours she spends riding. Assume that her constant of proportionality is 18. What does the constant of proportionality represent in this problem?

3. The constant of proportionality between the number of children on a field trip and the number of teachers on the trip is $\frac{14}{3}$. There are 70 children on a field trip. How many teachers are on the trip?

4. Determine two unit rates for each given rate.

   a. 12 students ate 4.5 pizzas.

   b. Trung painted $\frac{1}{3}$ of the wall in $\frac{1}{4}$ hour.

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II. Quotients of Integers

Topic Practice

A. Solve each problem.

1. A small submarine is at an elevation of $-45\frac{1}{2}$ feet compared to sea level. What is its elevation after it ascends 9.75 feet?

2. Eduardo is downloading songs on his electronic device. His device has $22\frac{1}{2}$ minutes of available space. How many $4\frac{2}{5}$-minute songs can Eduardo download?

3. The temperature changed $-2.3°F$ per hour for $7\frac{3}{4}$ hours. By how many degrees did the temperature change during that time period?

4. Paola rides her bike to and from work $3\frac{1}{8}$ miles each way. How many days will it take her to ride 100 miles?

5. The art club purchased 144 plain white t-shirts for $8.30 each. After painting the T-shirts, they sold $\frac{3}{4}$ of the T-shirts for $15.45 each. How much money did the art club make from the fundraiser?

6. The water in a bucket evaporated $\frac{5}{8}$ inch every hour. At 8:00 AM the water level in the bucket was $8\frac{3}{4}$ inches. What was the water level in the bucket at 11:30 AM?

B. Calculate each quotient.

1. $6\frac{2}{3} \div -\frac{2}{3} =$

2. $-12\frac{3}{4} \div -2\frac{1}{4} =$

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3. $-144.15 \div 15.5 =$

4. $-12\frac{2}{5} \div 15\frac{1}{2} =$

5. $-79.54 \div -9.7 =$

6. $7\frac{1}{2} \div -\frac{5}{6} =$

7. $33.33 \div -6.06 =$

8. $-16\frac{1}{2} \div -24\frac{3}{4} =$

9. $(-33.28 \div -5.2) \div -1.6 =$

10. $\left(-14\frac{7}{8} \div 1\frac{3}{4}\right) \div -\frac{1}{2} =$

Extension

Use what you know about multiplying signed numbers to evaluate each expression.

1. $\left(-\frac{1}{2}\right)^2$

2. $-\left(\frac{1}{2}\right)^2$

3. $\left(-\frac{1}{2}\right)^3$

4. $-\left(\frac{1}{2}\right)^3$

What do you notice?

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Spaced Practice

Represent each scenario as a multiplication or division problem. Then, solve the problem.

1. The temperature changed $-2°$ per hour for 5 hours. How many degrees did the temperature drop during that time period.

2. Paola missed 8 questions on her science final, which changed her final score by -32 points. If each question is weighted equally, how many points did she lose for each question?

Determine each product.

3. $2\frac{1}{2} \cdot \left(-3\frac{3}{4}\right)$

4. $-5\frac{1}{3} \cdot \left(-2\frac{1}{2}\right)$

Determine an 18% gratuity for each restaurant bill.

5. \$29.50

6. \$56.70

III. Simplifying Expressions to Solve Problems

Topic Practice

A. Solve each problem.

1. Elena is baking cookies. She has $6\frac{7}{8}$ cups of sugar. Each batch of cookies requires $\frac{3}{4}$ cup of sugar. How many full batches of cookies can Elena make? How much sugar will she have left over?

2. A construction company is building concrete pillars at the entrance of an auditorium. Each pillar requires 5.75 cubic yards of concrete. How many cubic yards will be required to construct 9 pillars?

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3. Eduardo needs to cut a 15-foot steel pipe into $2\frac{1}{3}$-foot pieces. How many $2\frac{1}{3}$-foot pieces can he cut from the pipe?

4. Chris is sowing a large field with alfalfa. Each acre requires 12.4 pounds of alfalfa seed. How many pounds of alfalfa will Chris use if she sows 7 acres?

5. A veterinarian is providing care to cattle. One bottle of medicine is 8 fluid ounces. How many $\frac{2}{3}$-fluid-ounce doses can the veterinarian get out of one bottle of medicine? How many fluid ounces of medicine will be left in the bottle after she draws the maximum number of doses out?

6. A nightlight uses $8\frac{1}{3}$ watts of power every hour. How many watts will the nightlight use every $6\frac{1}{2}$ hours?

7. Jorge feeds 21.9 fluid ounces of milk to 6 kittens. If each kitten drinks an equal amount, how many fluid ounces of milk does each kitten drink?

8. Eight divers recover 18.24 ounces of gold from a sunken ship. How many ounces of gold will each diver get if they divide the gold equally?

9. Mariana's truck uses $2\frac{2}{3}$ gallons of gas every hour on a long-distance trip. How many gallons does the truck use in $8\frac{1}{2}$ hours?

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10. Jaylen is cutting $5\frac{1}{2}$-foot strips of ribbon from a 60-foot roll. How many full strips can he cut from the roll? Once he cuts the maximum number of full strips from the roll, how many feet of ribbon will be left over?

B. Evaluate each expression for the given value.

1. Evaluate $\frac{5}{6}x$ for $x = -8$.

2. Evaluate $9\frac{1}{3} - m$ for $m = -1\frac{2}{3}$.

3. Evaluate $t \div 0.25$ for $t = 9.75$.

4. Evaluate $\frac{2}{5}k - 3.5$ for $k = 15$.

5. Evaluate $-3.25 - 2\frac{3}{4}z$ for $z = -4$.

6. Evaluate $\frac{3}{4}\left(x - 1\frac{1}{5}\right)$ for $x = 2$.

7. Evaluate $12.36 \div v$ for $v = -0.6$.

8. Evaluate $\left(-3\frac{1}{2}\right)n - 2\frac{2}{3}$ for $n = -3$.

9. Evaluate $x \div \left(-1\frac{1}{5}\right)$ for $x = 6\frac{3}{4}$.

10. Evaluate $2.25\left(7\frac{5}{6} - m\right)$ for $m = 4\frac{2}{3}$.

Extension

Solve each equation.

1. $\frac{4}{5}(p + 1) = 1$

2. $\frac{g}{8} - 5 = 1\frac{1}{2}$

Spaced Practice

Determine each product.

1. $-4\frac{1}{5} \cdot (-2.65)$

2. $3\frac{1}{5}\left(-4\frac{3}{8}\right)$

Determine each absolute value. Show your work.

3. $|-5 - (-7)|$

4. $\left|-\frac{3}{8} + \frac{1}{6}\right|$

Determine each quotient.

5. $\frac{3}{4} \div \frac{4}{3}$

6. $\frac{1}{8} \div \frac{1}{5}$

IV. Using Number Properties to Interpret Expressions with Signed Numbers

Topic Practice

A. For each equation, identify the number property used.

1. $3\frac{1}{5} + 6 = 6 + 3\frac{1}{5}$

2. $(3.4)(3.35)3 = 3.4(3.35)(3)$

3. $-\left(-5\frac{1}{4} + 8\frac{1}{3}\right) = -1\left(-5\frac{1}{4}\right) + -1\left(8\frac{1}{3}\right)$

4. $-4\frac{1}{8} + \left(-6\frac{1}{3} + 8\right) = \left(-4\frac{1}{8} + -6\frac{1}{3}\right) + 8$

5. $\frac{(4.6 + 8.1)}{4} = \frac{(4.6)}{4} + \frac{(8.1)}{4}$

6. $(-3.64)(-2.48) = (-2.48)(-3.64)$

B. Use the commutative, associative, or distributive property to simplify each expression.

1. $-10(-0.32 - 0.2)$

2. $18\frac{3}{4} + 9 - 3 + 1\frac{1}{4}$

3. $-8.17 + (8.17 + 6.54)$

4. $-3\left(3\frac{2}{3}\right) + -3\left(-1\frac{1}{3}\right)$

5. $\left(-5\frac{2}{5} + 2\frac{1}{2}\right) + \left(-4\frac{1}{2}\right)$

6. $(-4.2)(8.6) + (-4.2)(-4.6)$

7. $\frac{5}{12} \cdot \left(-\frac{8}{9}\right) \cdot \left(-\frac{12}{5}\right)$

8. $-48.23 - 8 + 20 + 2.23$

9. $94.45 - (4.45 + 9.87)$

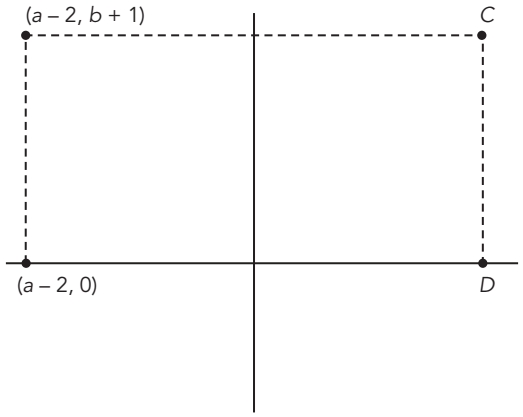
10. $-2\left(\frac{7}{2} - \frac{1}{4}\right)$

11. $(18 - 9.9) + 12.9$

12. $-\frac{5}{8} \cdot 7 \cdot 16$

Extension

The rectangle shown is formed by a reflection of points *C* and *D* across the *y*-axis of the coordinate plane. Point *C* has the coordinates (4, 4). Determine *a* and *b* and then calculate the perimeter of the rectangle.



Spaced Practice

1. Jamal and Matthew recorded how fast they ran 1 mile and 2 miles. Jamal recorded his times using fractions, and Matthew recorded his times using decimals.

Distance	Jamal	Matthew
1 mi	$10\frac{1}{2}$ min	10.4 min
2 mi	$22\frac{1}{4}$ min	22.3 min

   a. Who ran the mile faster, Jamal or Matthew? How much faster?

   b. Who ran 2 miles faster, Jamal or Matthew? How much faster?

2. A small submarine is at an elevation of -30 feet compared to sea level. What is its elevation after it ascends 9 feet?

3. On Tuesday, Ashley was \$45 short of her fundraising goal. The next day, she was \$5 over her goal. Write an equation to show how much she raised in one day.

4. What is 12% of 350?

5. What is 35% of 120?

V. Evaluating Algebraic Expressions

Topic Practice

A. Define a variable and write an algebraic expression for each problem. Evaluate the expression for the given values.

1. The charge for roller skating is $3 for the skate rental and $2 per hour to skate. How much will you pay if you skate for:

   a. 2 hours?

   b. 4 hours?

   c. $3\frac{1}{2}$ hours?

2. A birthday party at the skating rink costs $60 to reserve a party area and $2.50 per guest for skating and skate rental. How much will a party cost if you invite:

   a. 8 guests?

   b. 15 guests?

   c. 40 guests?

3. You have $20 to spend at the snack bar. All of the snacks at the snack bar cost $1.25. How much money will you have left if you buy:

   a. 2 snacks?

   b. 7 snacks?

   c. 12 snacks?

4. A cooking school is running a promotion on cooking lessons. For every twelve lessons you take, you get one free lesson. If you have already taken 7 lessons, how many free lessons will you get if you take:

   a. 5 more lessons?
   b. 29 more lessons?
   c. 53 more lessons?

5. A taxicab company charges $4.50 for each trip plus an additional $2.50 per mile traveled. How much will the company charge if the trip is:

   a. 5 miles?
   b. 16 miles?
   c. 12.5 miles?

6. Tiara has a prepaid phone card with $40 on it. It costs her $0.09 for each minute she spends on the phone. How much money will be left on the card if Tiara speaks for:

   a. 15 minutes?
   b. 60 minutes?
   c. 150 minutes?

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7. Josh puts 9 sports cards each on the front and back page of each page in his card album. How many pages are in Josh's album if he has:

   a. 90 cards?

   b. 144 cards?

   c. 180 cards?

8. There are 5 gallons of lemonade in a container. Lizzie fills glasses with $\frac{1}{8}$ of a gallon of lemonade from the container. How many gallons of lemonade are left in the container if Lizzie fills:

   a. 7 glasses?

   b. 20 glasses?

   c. 32 glasses?

9. A county fair costs $8 to enter plus an additional $1.50 per ticket for rides and food. What is the total cost for a visit to the fair if you purchase:

   a. 8 tickets?

   b. 25 tickets?

   c. 40 tickets?

10. The temperature when you got up this morning was $-4°C$. The temperature is predicted to increase by 2 degrees every hour. What will the temperature be after:

    a. 2 hours?

    b. 5 hours?

    c. 8 hours?

B. Evaluate each algebraic expression.

1. $20x$

    a. for $x = 2$

    b. for $x = -8$

    c. for $x = 0$

2. $3c + 17$

    a. for $c = 5$

    b. for $c = -2$

    c. for $c = -15$

3. $64 - 9p$

    a. for $p = 4$

    b. for $p = 9$

    c. for $p = -3$

4. $-w + 8.5$

    a. for $w = 12$

    b. for $w = -1.5$

    c. for $w = 5.3$

5. $46 + (-2k)$

   a. for $k = 3$

   b. for $k = 23$

   c. for $k = -2$

6. $n^2 - 25$

   a. for $n = -10$

   b. for $n = -5$

   c. for $n = 3$

7. $\frac{-7d + 14}{2}$

   a. for $d = 2$

   b. for $d = -2$

   c. for $d = 4$

8. $32.68 - 4.15q$

   a. for $q = 0$

   b. for $q = 10$

   c. for $q = -3$

C. Complete each table.

1.

b	$3b + 14$
-5	
-3	
0	
4	

2.

t	$-(t^2 - 6)$
2	
-5	
6	
1	

3.

v	1	2	5	-3.25
$6.75 - 6v$				

4.

f	4	8	-12	-1
$\frac{f}{4} - 3$				

5.

s	$34 - \frac{1}{6}s$
3	
-1	
2	
-3	

6.

z	1	2	4	9
$-2.5z + 1.7$				

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Extension

Evaluate each algebraic expression for the given quantity.

1. $-3(2x - 7.9)$ for $x = -18.1, -0.3, 14.4$

2. $-9.8t^2 + 20t + 8$ for $t = -2, 0, 3.5$

Spaced Practice

Rewrite each numeric expression by factoring out (-1).

1. $-7 + 5$

2. $3 + 8$

Determine each quotient.

3. $-8.9 \div -0.1$

4. $-4\frac{1}{3} \div \frac{2}{5}$

Write two unit rates for each given ratio.

5. $\frac{3}{4}$ inch : $\frac{1}{2}$ hour

6. $\frac{4}{5}$ gallon : $\frac{1}{4}$ cup

VI. Rewriting Expressions Using the Distributive Property

Topic Practice

A. Draw a model for each expression and calculate or simplify.

1. $3(x - 11)$



2. $-4(2x + 5)$



3. $\frac{a + 9}{3}$



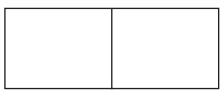
4. $8(-4b - 9)$



5. $-5(12x - 7)$



6. $\frac{12a - 28}{4}$



7. $\frac{-2b + 25}{-5}$



8. $-4.5(2x + 1.3)$



B. Evaluate each expression for the given value. Choose whether to simplify before evaluating or not. Show your work.

1. $5(-4a + (-13))$ for $a = 2.7$

2. $\frac{8x + 5}{11} - 9$ for $x = -2$

3. $-3(2x - 14)$ for $x = 1\frac{1}{6}$

4. $\frac{5.2(4a + 3.8)}{1.3}$ for $a = 4.3$

5. $\frac{3.2x - 5.6}{0.4}$ for $x = 7$

6. $\left(-1\frac{3}{4} + \frac{7}{12}a\right) - \frac{19}{24}$ for $a = -\frac{4}{7}$

C. Rewrite each expression by factoring out the greatest common factor.

1. $64x + 24$

2. $-5y - 35$

3. $36 - 8z$

4. $54n - 81$

5. $-36 + 18a$

6. $-7b - 21$

7. $42 + 27m$

8. $-24x + 9$

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Extension

1. Mario decides to grow and sell bean plants. Let p represent the number of plants he will grow and sell. After considering his expenses, the expression $-3p(p - 10) - 6p(p - 10)$ represents his profit.

   a. Rewrite and simplify the profit expression by factoring out the greatest common factor.

   b. Rewrite the expression in simplest form with no parentheses.

Spaced Practice

Evaluate each expression for the given value.

1. $-20a - 65$ for $a = 2.7$

2. $-6x + 52$ for $x = 1\frac{1}{6}$

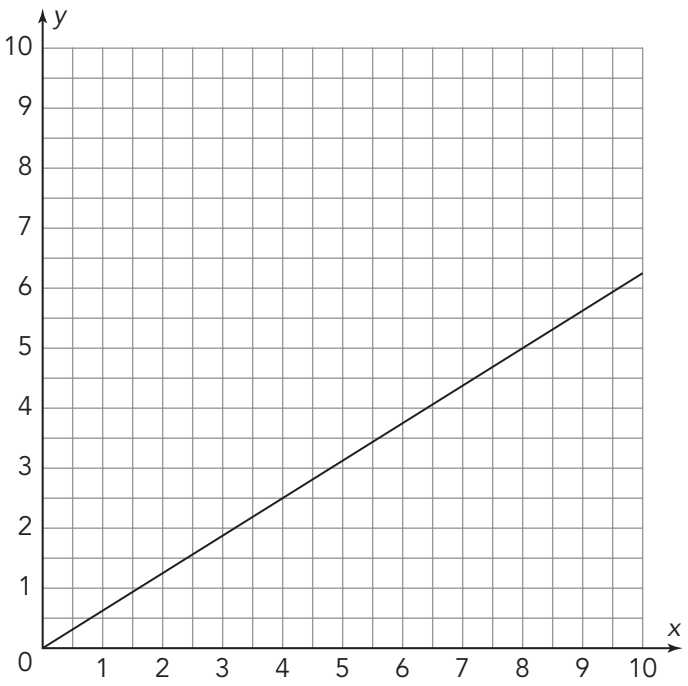
Determine each product.

3. $(-3.472)(0.89)$

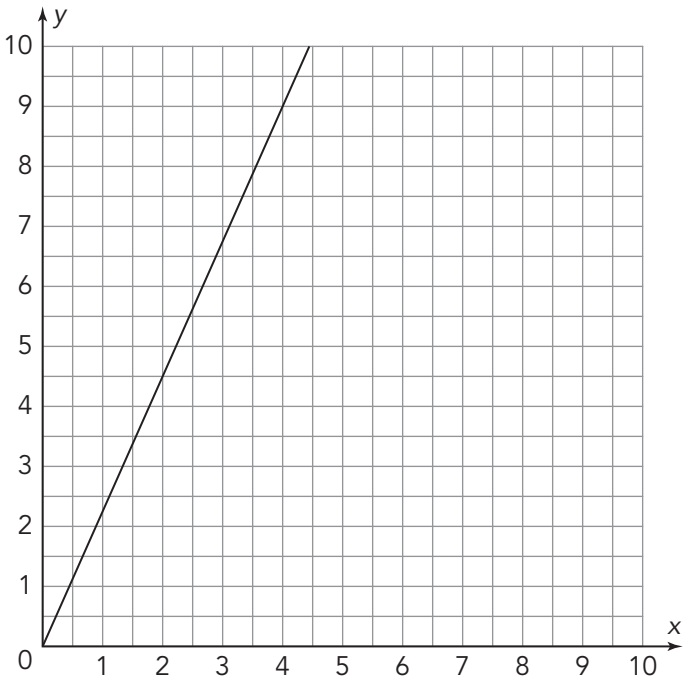
4. $\left(-2\frac{7}{8}\right)\left(-4\frac{4}{5}\right)$

Identify the constant of proportionality in each graph and use it to write an equation in the form $y = kx$.

5.



6.



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Name _____ Date _____

I. Modeling Equations as Equal Expressions

Topic Practice

A. Use a model to write an addition equation to represent each problem situation. Then, use your equation to answer the given question.

1. Ashley and Tiara have 82 pins together. Tiara has 34 more pins than Ashley. How many pins are in Tiara's collection? How many pins are in Ashley's collection?

2. Put together, Matthew and Josh have 110 total action figures. Josh's collection has 42 more action figures in it than Matthew's collection. How many action figures does Josh have? How many action figures are in Matthew's collection?

3. Tripp and Rico are two dogs. Tripp weighs exactly 35 pounds more than Rico. Together, they weigh exactly 49 pounds. How much does each dog weigh?

4. Lizzie buys bananas, grapes, and apples. She buys twice the amount of bananas as grapes. She buys 2 more pounds of apples than grapes. Altogether, Lizzie bought 14 pounds of fruit. How many pounds of each fruit did she buy?

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5. You and your friends Alyssa and Paolo decide to make some money during summer vacation by building and selling birdhouses. To get the business started, Alyssa contributes $22, and Paolo contributes $18 to buy equipment and materials. You all agree that each person will earn the same amount of money after Alyssa and Paolo get back what they invested. Your business earns a total of $280. How much does each person get at the end of the summer?

6. In a small town, there are two main sections called the Hill Section and the Lake Section. The town has a population of 4298. The number of people who live in the Hill Section is 188 more than twice the number of people who live in the Lake Section. How many people live in each section of the town?

B. Use a model to write a subtraction equation to represent each problem situation. Then, use your equation to answer the given question.

1. Mario's collection has 64 fewer refrigerator magnets in it than Andrew's collection. They have 112 refrigerator magnets together. How many refrigerator magnets does Mario have? How many refrigerator magnets does Andrew have?

2. Alejandro is 3 years younger than his sister, Natalia. The sum of the siblings' ages is 33. How old are Alejandro and Natalia?

3. Two friends pooled the tickets they won from playing video games to get a prize that requires 800 tickets. If one friend won 130 more tickets than the other friend, how many tickets did each friend win?

4. Of the 3120 books in the library, there are three times as many books in the fiction section as are in the nonfiction section. Also, there are 400 fewer books in the reference section than are in the nonfiction section. How many books are in each section?

5. Kaya, Samantha, and Trung are swimming laps to raise money for charity. Together, the three swimmers swam a total of 1875 laps. Samantha swam twice as many laps as Trung. Kaya swam 125 fewer laps than Samantha. How many laps did each person swim?

6. There are 7800 workers in the three main buildings downtown. Three hundred fewer people work in the second-largest building than the largest building and 900 fewer people work in the smallest building than the largest building. How many workers are in each building?

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C. Use a model to write an equation to represent each problem situation. Then, use your equation to answer the given question.

1. The members of the student council are selling raffle tickets. The school decides that the top three raffle ticket sellers will share a portion of the profits. The second-place seller will receive $8 more than the third-place seller. The first-place seller will receive twice as much as the second-place seller. The profit portion they will share is $104. How much will each of the top three sellers receive?

2. A park covers a total area of 644 acres. There are 482 more acres of woods than grassy areas in the park. How many acres are there of woods and how many acres are there of grassy areas in the park?

3. During the summer, Eduardo and Chris started their own business mowing lawns. Before starting any work, Eduardo spent $20 to fill up the gas tank for the lawnmower. The boys agreed that each person would earn the same amount after Eduardo was reimbursed the money he spent for gas. After a week of work, the boys were paid a total of $177. Eduardo filled up the gas tank just once. How much did each boy earn?

4. The ages of three siblings total 32 years. The middle child is 4 years older than the youngest, and the eldest is twice as old as the youngest. How old is each child?

5. Jorge and Elena spent $3043.51 to buy a new computer together. Jorge spent $438.47 more than Elena. How much did Jorge spend and how much did Elena spend?

6. In a 10,508-gallon swimming pool the deep end has 1295 more than twice the number of gallons in the shallow end. How many gallons are in the deep end of the pool? How many gallons are in the shallow end?

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Extension

Describe how to solve any equation in the form $ax + b = c$ for the variable x.

Spaced Practice

1. Simplify each expression by combining like terms.

   a. $3b + 2 + b$

   b. $\frac{1}{2}(h + 4) - \frac{1}{8}(h + 4)$

2. Rewrite each linear expression by factoring out the GCF.

   a. $25x - 5$

   b. $9n + 36$

3. A salesperson receives 12% commission on all the sales that she makes. Calculate the commission on each sale.

   a. A quarter-page ad for $250.00

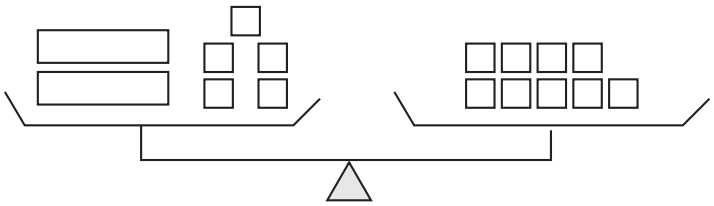
   b. A full-page ad for $800.00

II. Solving Equations Using Algebra Tiles

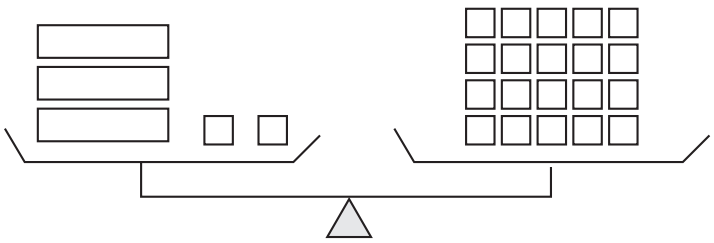
Topic Practice

A. Determine what will balance one rectangle. Explain your solution. Then, rewrite each representation as an equation.

1.

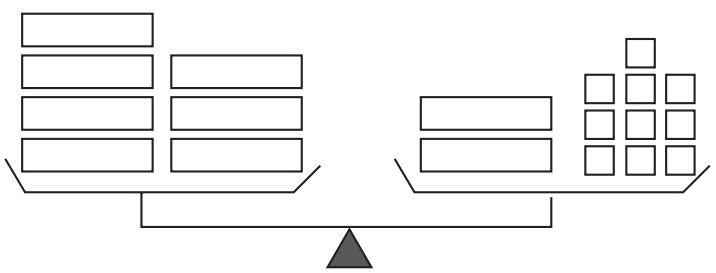


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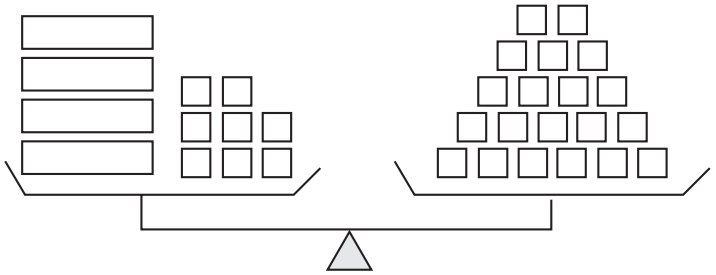


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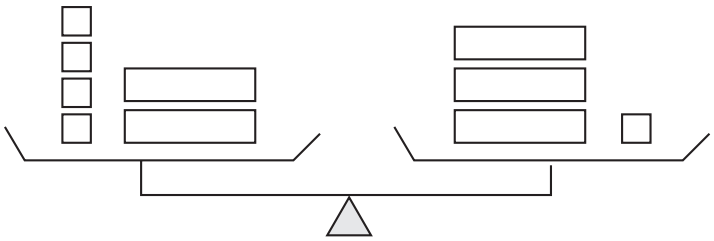
3.



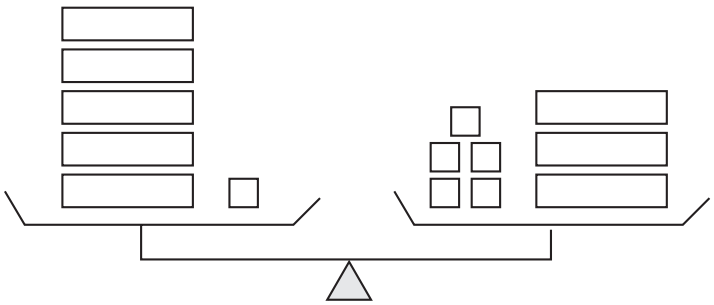
4.



5.

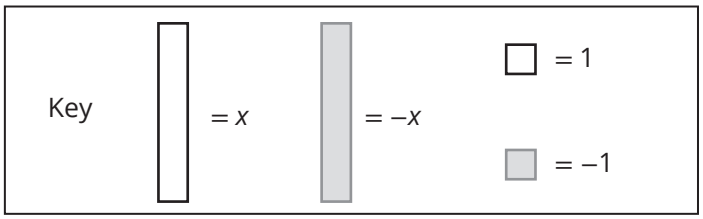


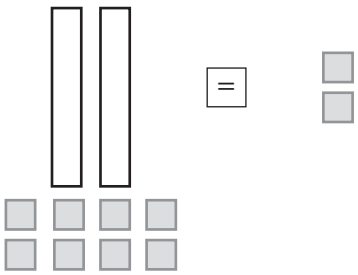
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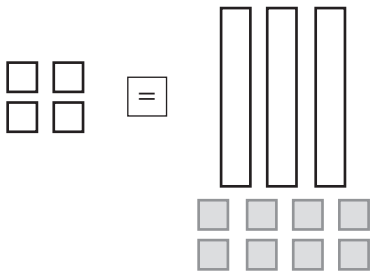


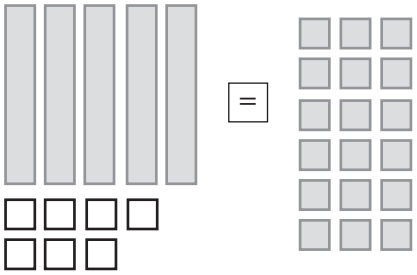
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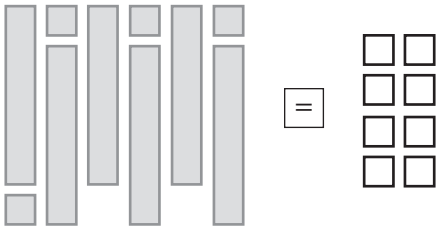
B. Use the key to write the equation represented in each algebra tiles diagram.



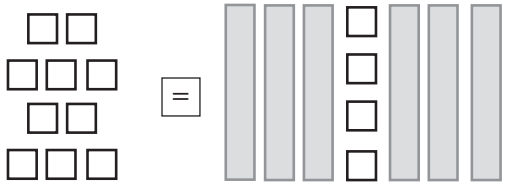
1. 

2. 

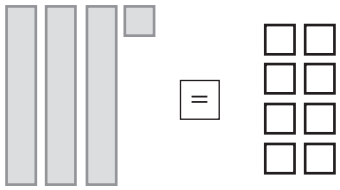
3. 

4. 

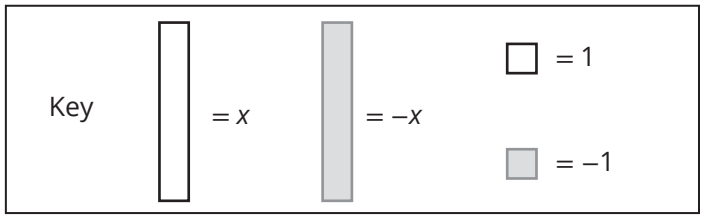
5.



6.



C. Use the key to model and solve each equation using algebra tiles.



1. $3x + 5 = -4$

2. $-2x - 3 = 7$

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3. $4x - 7 = 9$

4. $-5x + 12 = 2$

5. $4x + 1 = 13$

6. $6x - 10 = -4$

Extension

Model and solve each equation with algebra tiles.

1. $2(x + 6) = -4$

2. $5x + 3 = -2x + 11$

Spaced Practice

Calculate each percent increase or decrease. Round to the nearest whole percent when necessary.

1. Original amount: 20, new amount: 25

2. Original amount: 50, new amount: 40

3. Original amount: 48, new amount: 72

4. Original amount: 120, new amount: 102

For each family's expenses, determine the percentage of the total expenses for each category.

5. The Sanchez family's expenses:
   - Household: $1200
   - Living: $350
   - Credit Cards: $125
   - Savings: $250

6. The Rodriguez family's expenses:
   - Household: $1050
   - Living: $525
   - School Loans: $315
   - Savings: $475

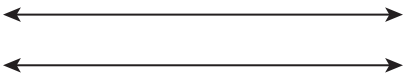
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III. Solving Equations on a Double Number Line

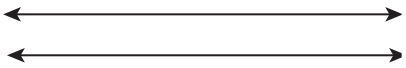
Topic Practice

A. Solve each equation using a double number line.

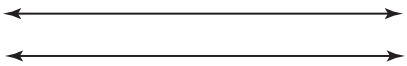
1. Solve the equation $2x + 8 = 20$.



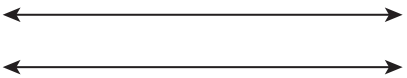
2. Solve the equation $23 = 4d + 5$.



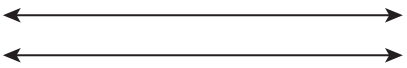
3. Solve the equation $\frac{1}{4}x + 2 = 10$.



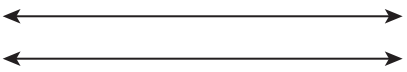
4. Solve the equation $31.8 = 5w - 6.7$.



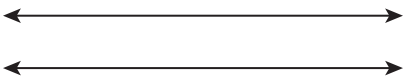
5. Solve the equation $6m + 7.2 = -2.8$.



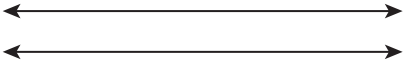
6. Solve the equation $\frac{1}{3}x - 1 = 11$.



7. Solve the equation $2y - 4.25 = -1.39$.

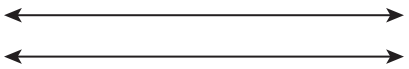


8. Solve the equation $3n - 3\frac{1}{4} = -7$.

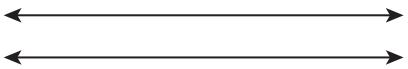


B. Solve each equation using a double number line.

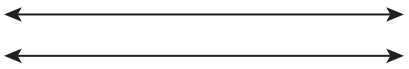
1. Solve the equation $-\frac{1}{2}m - 3 = 10$.



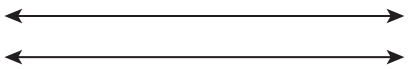
2. Solve the equation $-4y + 9 = 27$.



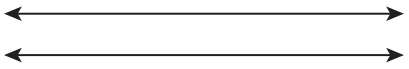
3. Solve the equation $-7x - 11 = -4$.



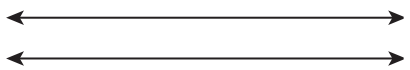
4. Solve the equation $-1.2s + 6.4 = 8.8$.



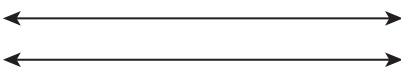
5. Solve the equation $-16 = 13 - g$.



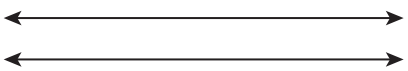
6. Solve the equation $41 = -9k - 4$.



7. Solve the equation $200 - \frac{1}{4}p = 215$.



8. Solve the equation $-50x + 70 = 80$.



Extension

What operation(s) could you use to solve the equation $x^2 + 5 = 86$? What is the solution?

Spaced Practice

1. During the summer, Matthew and Jaylen started their own business mowing lawns for people in the Lake Section. Before starting any work, Matthew spends $15 to fill up the gas tank for the lawnmower. The boys agree that each person will earn the same amount after Matthew is reimbursed the money he spent for gas. After a week of work, the boys earn a total of $243. Matthew filled up the gas tank just once. How much did each boy earn?

   a. Draw a bar model to represent the situation.

   b. Write an equation to represent the situation.

   c. Use the model to solve the problem.

2. Evaluate each algebraic expression for the indicated value.

   a. $9g + 5$, for $g = 1.5$

   b. $\frac{2x + 3}{4}$, for $x = 1$

3. Determine each product.

   a. $-6.2(9.1)$

   b. $-0.03(-15)$

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IV. Using Inverse Operations to Solve Equations

Topic Practice

A. Determine which the possible solution makes each equation true.

1. Equation: $\frac{c}{2} + 5 = 2$

   Possible solutions: $-6, 3, 6$

2. Equation: $-6 = 2p - 2$

   Possible solutions: $-4, -2, 4$

3. Equation: $2.1p - 7 = -15.4$

   Possible solutions: $-4, -2, 1$

4. Equation: $-3u + 8 = 23$

   Possible solutions: $-8, -5, 6$

5. Equation: $-7.5 = \frac{h}{9} - 4.9$

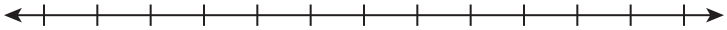
   Possible solutions: $-24.2, -23.4, -25.9$

6. Equation: $8 = \frac{z}{-3} + 4$

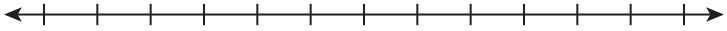
   Possible solutions: $-14, -12, -8$

B. Solve each equation and then graph the solution.

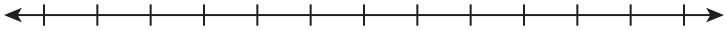
1. $8x = 56$



2. $144 = -12x$

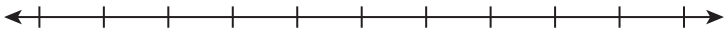


3. $\frac{-1}{4}x + 4 = 5\frac{3}{8}$



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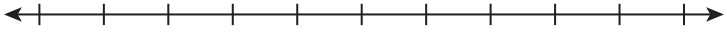
4. $-17 = 3 - 5x$



5. $21 - 9x = -6$



6. $27.8 = -11x - 71.2$



C. Write an equation to represent each situation. Define your variables, solve the equation, and verify your solution.

1. Ms. Patel charges her piano students $40 per lesson plus a semester recital fee of $55. How many lessons did Jamal take if he paid a total of $695 for lessons this semester?

2. A local nursery offers a spring flower deal. If a customer purchases at least one flat of 6 annuals, they will receive 3 free perennials. How many flats of annuals must you buy to get a total of 21 plants?

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3. The student council ordered 1000 pencils embossed with the school name to give to honor roll students. If they give each honor roll student two pencils and they have 840 pencils left after the first quarter, how many students are on the honor roll in the first quarter?

4. Josh and four of his friends had a car wash to earn some extra money. They split the profits, and Josh got an extra $18 to repay his parents for the car wash supplies. If Josh got $32, how much total money did they split among themselves?

5. Mario has a collection of 125 comic books. He gives each of his 3 friends the same number of comic books and keeps his favorite 38 comic books for himself. How many comic books did he give to each of his friends?

6. Mariana is planning a party at a restaurant. There is a flat fee of $250 to reserve the restaurant for the evening and a charge of $20 per person for food and soft drink. If Mariana has $500 to spend, what is the maximum number of people that can attend the party?

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D. Write a real-world situation that is modeled by the equation.

1. $25.75t + 30.55 = 82.05$

2. $\frac{c}{4} = 18$

3. $45.99c - 50 = 133.96$

4. $110 = 32.50s + 45$

5. $345 = 45 + 20p$

6. $30 = \frac{t}{2} - 30$

Extension

Solve each equation. Check your solution.

1. $1.95(6.2 - 3x) - 4.81 = -18.46$

2. $\frac{2}{3}\left(x - \frac{5}{2}\right) - \frac{7}{6} = -\frac{13}{3}$

Spaced Practice

Solve each equation using a double number line model.

1. $4x - 5 = 7$

2. $\frac{1}{3}x + 2 = 5$

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Evaluate each expression for the indicated value.

3. $-\frac{1}{2}a + \frac{5}{6}$, for $a = \frac{6}{7}$

4. $-5.3r - 7.6 + 0.4r$, for $r = -2.4$

Determine each quotient.

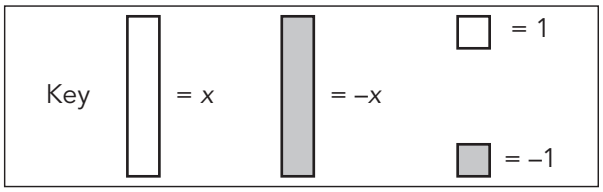
5. $2\frac{3}{8} \div -2\frac{1}{2}$

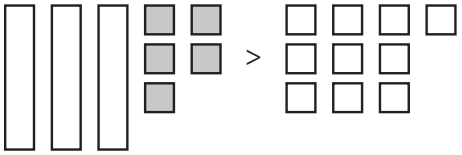
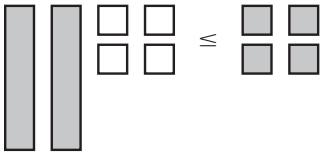
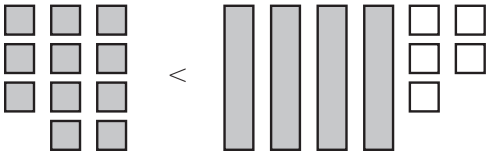
6. $-14.8 \div -1.2$

V. Using Inverse Operations to Solve Inequalities

Topic Practice

A. Use the key to complete the table.



Inequality	Algebra Tile Model	Solution to the Inequality
		
$-5 + 5x < -10$		
$7 + 2x > 13$		
		
$-5x + 2 \geq 12$		
		

B. Determine whether the possible solutions make each inequality true.

1. Inequality: $\frac{c}{3} + 4 \leq 3$
   Possible solutions: $-6, -3, 2$

2. Inequality: $-4 > 2p - 8$
   Possible solutions: $-4, 0, 5$

3. Inequality: $1.8p - 7 > -18.6$
   Possible solutions: $-9, -5, 3$

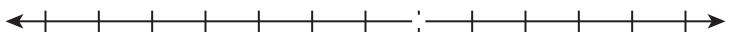
4. Inequality: $-3u - 8 < 10$
   Possible solutions: $-7, -5, 8$

5. Inequality: $10 \geq 3n - \frac{1}{2}$
   Possible solutions: $-2, 2, 9$

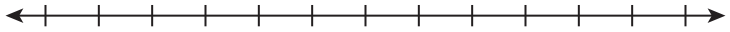
6. Inequality: $-2m - 10 \leq 4$
   Possible solutions: $-7, -2, 15$

C. Solve each inequality and then graph the solution.

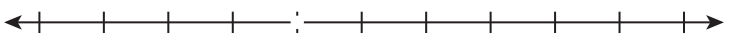
1. $6x > 42$



2. $36 \leq -3x$

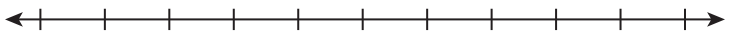


3. $-17 < 3 - 5x$

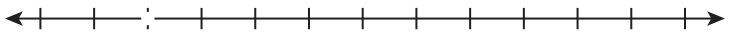


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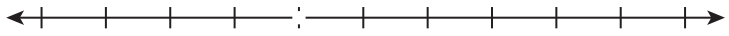
4. $21 - 9x \geq -6$



5. $31 < 2x - 5$



6. $-x + 14 < 37$



D. Write and solve an inequality for each situation. Explain the solution set in terms of the problem situation.

1. Eduardo needs to buy a book for school that costs $13. He also wants to get a book for each of his two sisters, and he wants to be sure he spends the same amount on each of their books. He only has $27 to spend. Let *b* represent the amount he can spend on each additional book.

2. Tiara rents a cart for her bike to carry tools and wood to school for her science project. Her toolbox weighs 20 pounds, and the cart can carry a maximum of 50 pounds. Each wood board weighs 3 pounds. Let *w* represent the number of wood boards she can carry.

3. There must be less than 36 people on one bus. There are already 17 people on the bus. Let *p* represent the additional number of people that can ride the bus.

4. A family of three has a coupon for $5 off their total bill when everyone orders the same meal. The family has $40 to spend on dinner. Let *m* represent the cost of the meal they can order.

5. Chris wants to keep the cost per person of his party under $15. The Party Place charges a flat fee of $250 for an all-inclusive party. Let *g* represent the number of guests, including himself, he can invite.

6. The temperature of the liquid starts at 72°F and drops 2 degrees per second. The liquid is not to go below 40°F. Let *s* represent the number of seconds.

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E. Write a real world situation that is modeled by the equation or inequality.

1. $13.75t + 8.50 < 82.05$

2. $\frac{c}{3} \geq 15$

3. $165 > 27.50s + 55$

4. $250 \leq 75 + 15l$

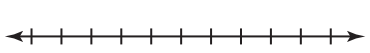
5. $15 > \frac{t}{2} - 20$

6. $55 \leq 5t + 15$

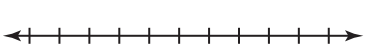
Extension

Solve each inequality and graph the solution set on a number line.

1. $78 < -9x - 3(-56 + 12x)$



2. $0.20x - 0.08(x - 10) \leq 24.80$

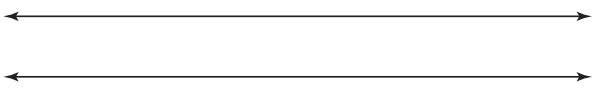


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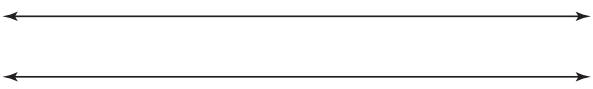
Spaced Practice

Solve each equation using a double number line model.

1. $5x - 8 = 22$



2. $\frac{1}{6}x + 4 = 6$



Evaluate each expression for the indicated value.

3. $-\frac{1}{3}a + \frac{5}{9}$, for $a = \frac{6}{7}$

4. $-2.7r - 1.4 + 0.6r$, for $r = -1.2$

Determine each quotient.

5. $2\frac{1}{8} \div \left(-2\frac{1}{4}\right)$

6. $(-12.8) \div (-1.2)$

Name _____ Date _____

I. Representing Equations with Tables and Graphs

Topic Practice

A. Identify the independent and dependent quantity in each scenario.

1. A forest fire can move at the rate of three meters per second in windy conditions. A fire started by a careless camper has already moved 45 meters.

2. Samantha's dog sleeps 9 hours at night and then takes several 2-hour naps during the daytime.

3. The cooking club sells stickers featuring Featherbrain the Turkey, the school's mascot. In one hour, they sell $28 worth of stickers. Each member who sells stickers is paid $1.

4. The music club takes polls each year about the popularity of musicians. Jazzy Joe's popularity peaked when he scored 20 points in the poll. Since then, his score has dropped 2 points every year.

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5. For the school's Track and Field Day, every class participated in the egg-in-spoon relay race. The eighth grade class started 14 meters behind the starting line to eliminate their age advantage, and the class walked at a rate of 2 meters per second.

6. You want to track your net savings from using a particular rechargeable battery. The rechargeable battery costs $19 more than a similar disposable battery, which costs $4. That means for every recharging of the battery, you save $4 that you would otherwise have spent on a new disposable battery.

B. Define variables and write an equation to represent each problem situation. Then, use your equation to answer the given question.

1. Paola's Flower Shop sells long-stem roses for $5 each. In addition, the shop charges a $15 shipping fee. How many roses can Chris purchase if he plans to spend $90?

2. Elena is practicing for her next track meet by running laps and recording her time. For each timed practice run, Elena runs a total of 2000 meters. Each lap is exactly 200 meters. If Elena has exactly 200 meters left to run, how many laps has she completed?

3. Jorge buys 40 yards of wire fence to create a triangular pen for his dog. One side of the pen will use 19 yards of fencing. The other two sides will be equal in length. Jorge would like his pen to use exactly 40 yards of fencing so that he doesn't have any left over. What is the length of each of the other two sides of the pen?

4. Your cable bill this month was exactly $105. The regular fee for cable is $97, but this month you rented 2 movies that each cost the same amount to rent. How much did each movie cost to rent?

5. Since beginning his artistic career, Jaylen has painted 6 paintings a year. He has sold all but two of his paintings. If Jaylen has sold 70 paintings, how many years has he been painting?

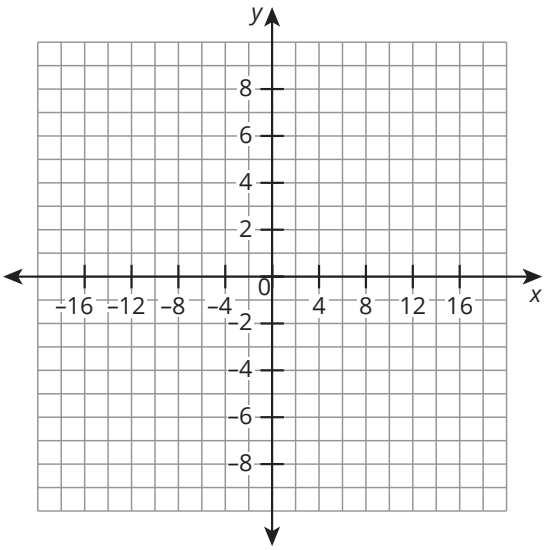
6. The student council started the year with a balance of $-\$15$ (they were in debt), but after they came up with the idea to sell tickets to a student vs. faculty basketball game, the fund grew by $15 per minute. By the time the student council had a balance of $90, how long had they been selling tickets?

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C. Solve each problem.

1. The library charges $1 to use the copier and $0.50 for each page copied. Complete the table. Then, use the table to graph the relationship.

Number of Pages	Total Cost (dollars)
2	
	6
15	
	10



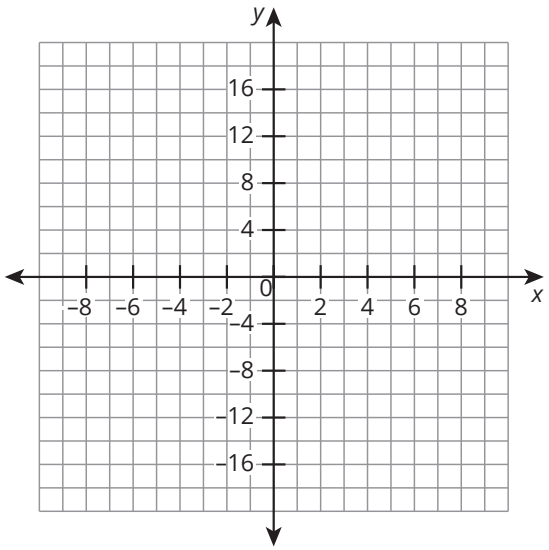
a. Write an algebraic equation to represent the situation.

b. How many pages were copied if the total cost was $7.50?

c. What is the total cost to copy 50 pages?

2. At a local farm it costs $5 to pick your own peck of apples. It costs $3 for each additional peck. Complete the table. Then, use the table to graph the relationship.

Number of Pecks	Total Cost (dollars)
	5
	11
4	
6	



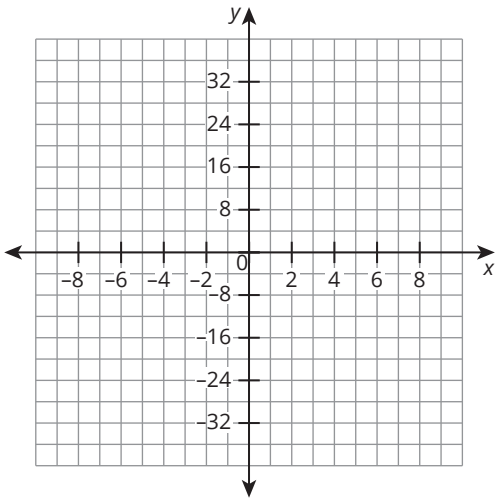
a. Write an algebraic equation to represent the situation.

b. How much will 11 pecks of apples cost?

c. How many pecks can you buy for $17?

3. A children's museum charges $10 admission for the first visitor and $5 for each additional visitor in a group. Complete the table. Then, use the table to graph the relationship

Number of Visitors	Total Cost (dollars)
1	
3	
	25
	40



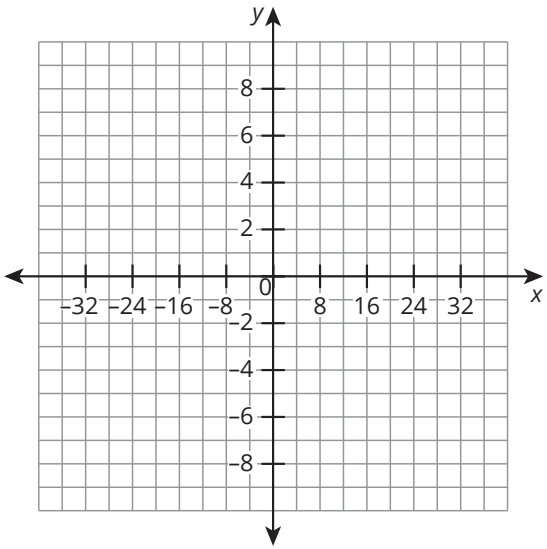
a. Write an algebraic equation to represent the situation.

b. How much will a group of 14 visitors cost?

c. How many visitors are in a group if the admission cost for the group is $50?

4. A submarine is diving at a rate of 0.25 meter per second. Complete the table. Then, use the table to graph the relationship.

Time (seconds)	Depth (meters)
8	
30	
	−9.25
	−10



a. Write an algebraic equation to represent the situation.

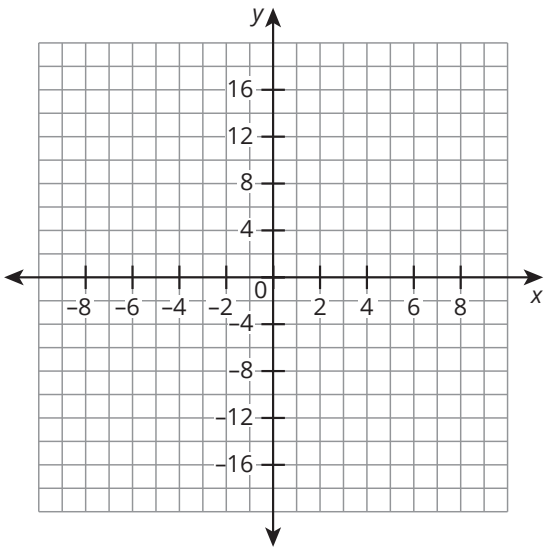
b. What is the submarine's depth after 24 seconds?

b. After how many seconds will the submarine be at a depth of −50 meters?

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5. A submarine starts at a depth of −15 meters and then dives down 0.5 meter every second. Complete the table. Then, use the table to graph the relationship.

Time (seconds)	Depth (meters)
	−15
1	
	−17.5
10	



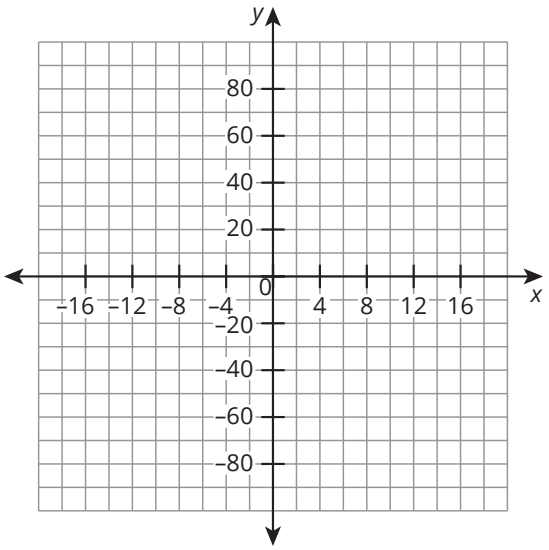
a. Write an algebraic equation to represent the situation.

b. How deep will the submarine be after 25 seconds?

c. After how many seconds will the submarine be at a depth of −30 meters?

6. At noon, the temperature was 92 degrees Fahrenheit. The temperature dropped 5 degrees every hour after that. Complete the table. Then, use the table to graph the relationship.

Time (hours)	Temperature (°F)
2	
5	
	42
	27



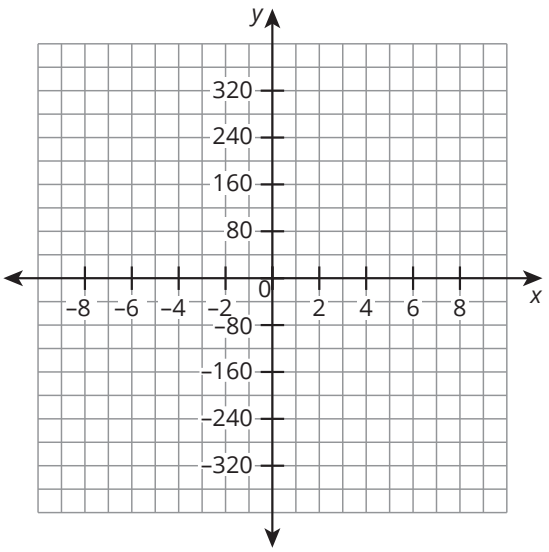
a. Write an algebraic equation to represent the situation.

b. After how many hours will the temperature be 74°F?

c. What will the temperature be in 8 hours?

7. Jamal is considering a new internet service provider. He has been using his current provider for 4 months and has already paid $160 for the service. His bills average $40 per month. Complete the table. Then, use the table to graph the relationship.

Time (months)	Total Cost (dollars)
−1	
	160
1	200
2	



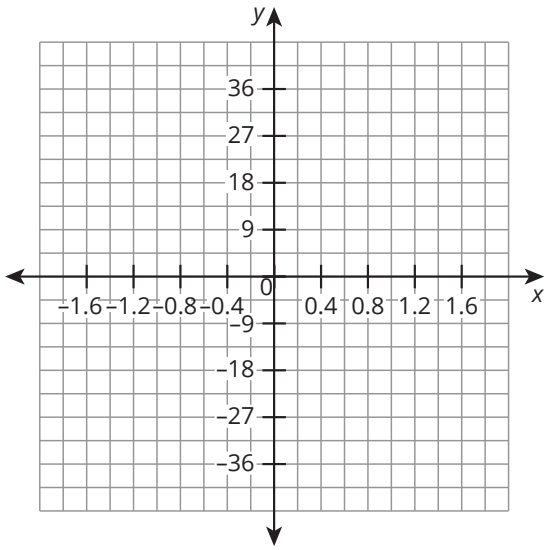
a. Write an algebraic equation to represent the situation.

b. When did the cost of Jamal's internet service exceed $100?

c. What had Jamal's internet service cost 3 months ago?

8. Right now, Matthew is 9 kilometers into a 36-kilometer race. He is running an average of 18 kilometers every hour. Complete the table. Then, use the table to graph the relationship.

Time (hour)	Distance (kilometers)
	9
0.5	
	22.5
1	



a. Write an algebraic equation to represent the situation.

b. How many kilometers of the race had Matthew completed half an hour ago?

c. How much longer will it take Matthew to complete the race?

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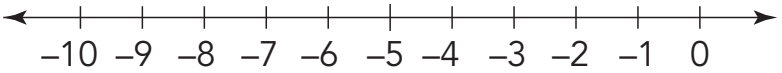
Extension

Write a linear problem situation in which negative values of both the independent and dependent variables are useful in analyzing the situation. Write the related equation and create a graph of the situation.

Spaced Practice

1. Mr. Davis has coins and old stamps for sale. He decides to advertise the items on an internet site for collectors. It will cost him $84 initially to advertise and $28 for each day he keeps the items on sale. If Mr. Davis does not want to spend more than $700 on advertising, what is the maximum number of days he should advertise? Write and solve an inequality to answer the question.

2. Solve and graph the inequality: $-2x + 3 < 12$



3. Solve each equation. Check your solution.

   a. $16 = 3x - 4$

   b. $1.2x + 5.3 = 5.9$

4. Use long division to convert each fraction to a decimal. Identify each decimal as terminating or non-terminating.

a. $\frac{5}{9}$

b. $\frac{11}{20}$

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II. Building Inequalities and Equations to Solve Problems

Topic Practice

A. Determine the constant rate of change and write an equation to represent each table of values.

1.

Label	Independent Quantity: Time	Dependent Quantity: Height
Units	seconds	meters
	0	0
	1	–15
	2	–30
	3	–45
	4	–60

2.

Label	Independent Quantity: Time	Dependent Quantity: Height
Units	seconds	meters
	0	108
	1	96
	2	84
	3	72
	4	60

3.

	Independent Quantity	Dependent Quantity
Label	Time	Height
Units	seconds	meters
	0	0
	1	–14
	2	–28
	3	–42
	4	–56

4.

	Independent Quantity	Dependent Quantity
Label	Time	Height
Units	seconds	meters
	0	520
	1	455
	2	390
	3	325
	4	260

5.

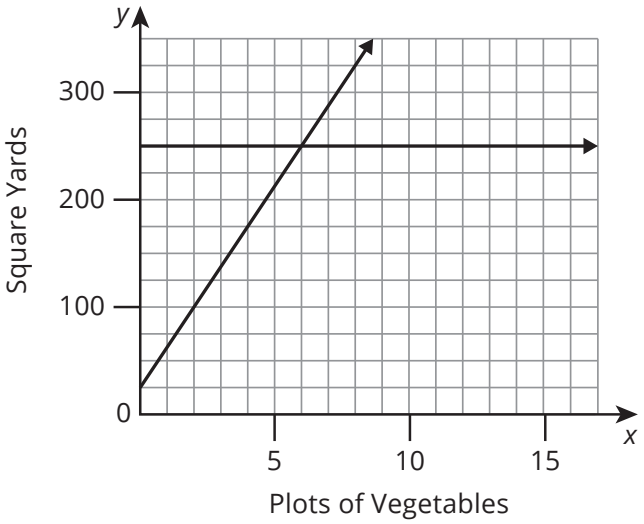
	Independent Quantity	Dependent Quantity
Label	Time	Height
Units	seconds	meters
	0	0
	1	–18.5
	2	–37
	3	–55.5
	4	–74

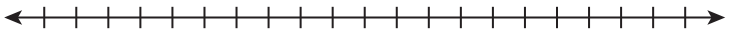
6.

	Independent Quantity	Dependent Quantity
Label	Time	Height
Units	seconds	meters
	0	0
	1	–13.2
	2	–26.4
	3	–39.6
	4	–52.8

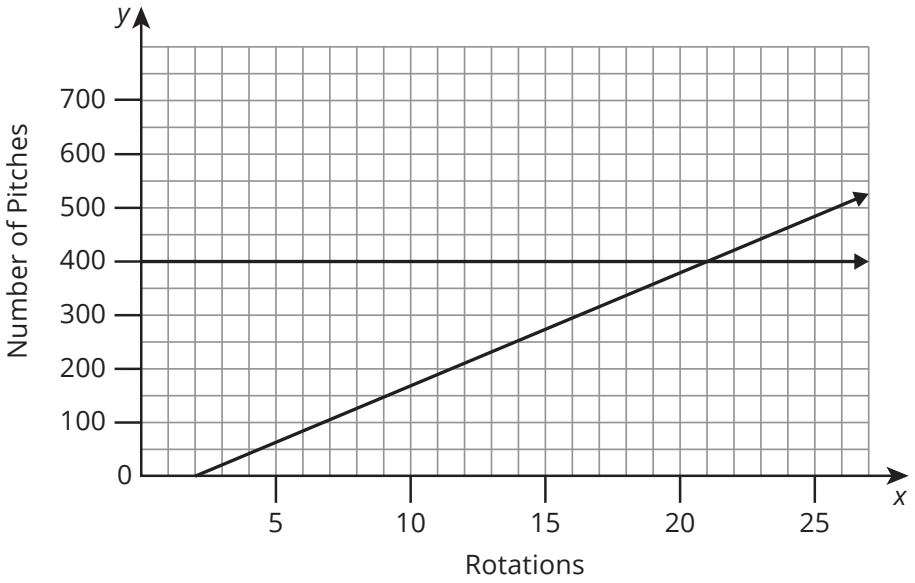
B. Analyze each graph to estimate the solution set, then write an inequality to represent the scenario. Solve the inequality and graph its solution on a number line.

1. Josh is creating a garden in his backyard. He has less than 250 square yards of space to use. He plans to use 25 square yards to plant flowers. He plans to divide the remaining space into plots of equal size for vegetables. Each vegetable plot will be 30 square yards. How many plots of equal size can Josh plan for vegetables?



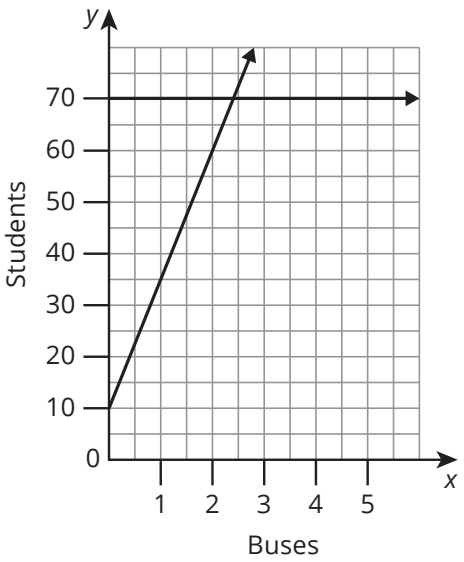


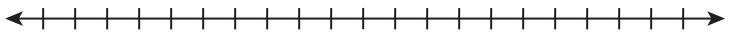
2. Mariana is practicing her pitching. She rotates pitching from the mound with the other pitchers on the team. Mariana throws 20 pitches each time she rotates to the mound. Her coach said she must throw more than 400 pitches in the strike zone during today's practice. How many rotations must Mariana take if a total of 20 of her pitches miss the strike zone?



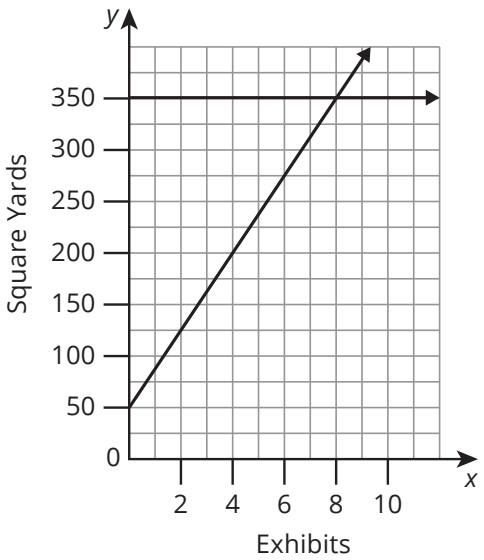


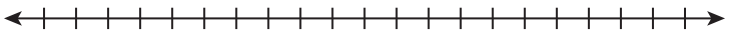
3. The principal of a local high school promised that the school will provide busing for more than 70 students to the homecoming game. The 9 senior athletes are taking part in a special awards ceremony, so the principal rents a large van to bring them to the game. He rents large buses for all of the other students. Each bus holds 25 students. How many buses will the principal need to rent to keep his promise?



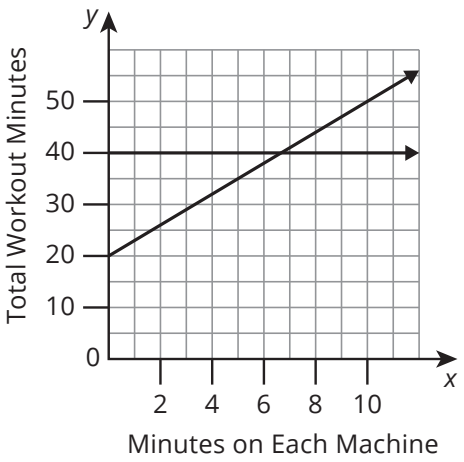


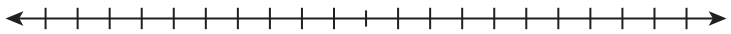
4. Ashley is setting up for a cat show. The convention center has set aside 350 square yards of space for the show. The fire code says there must be more than 40 square yards of free space for the walkway in the show. Ashley is planning for each exhibit to take up 40 square yards of space. How many exhibits can Ashley have in the show?



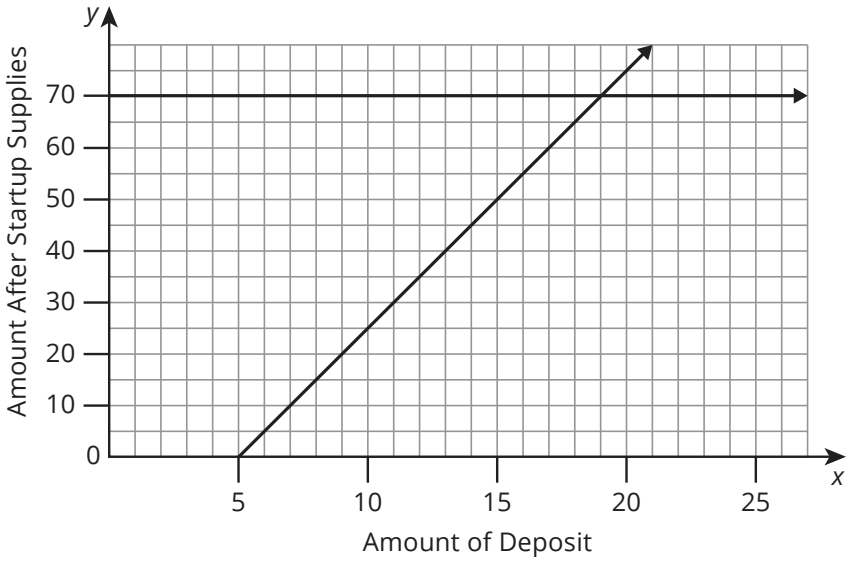


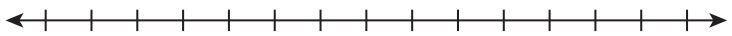
5. Tiara is planning her workout at her gym. She wants to spend more than 40 minutes exercising. Her workout plan includes 20 minutes lifting weights and the rest of the time on 3 different cardio machines. She wants to spend the same amount of time on each cardio machine. How many minutes should Tiara spend on each cardio machine?



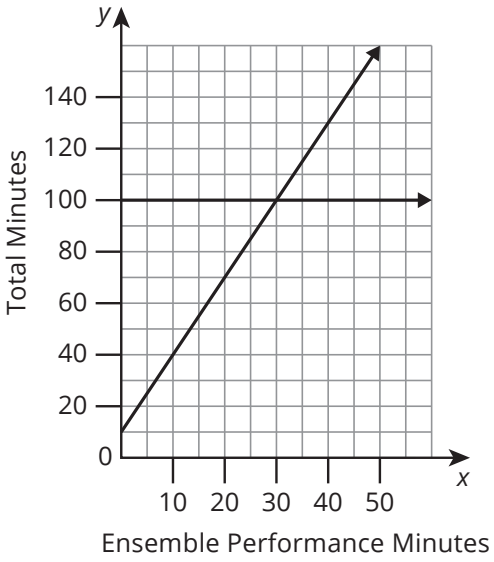


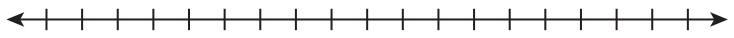
6. You and 4 friends are starting a business selling bagels. The 5 of you open a bank account strictly for the business. You would like to have at least $70 in the account after you buy the start-up supplies. You all estimate that the startup supplies will cost $25 and decide that each person must deposit the same whole-dollar amount of money into the account. How much money should each person deposit into the account so that you have at least $70 after buying start-up supplies?



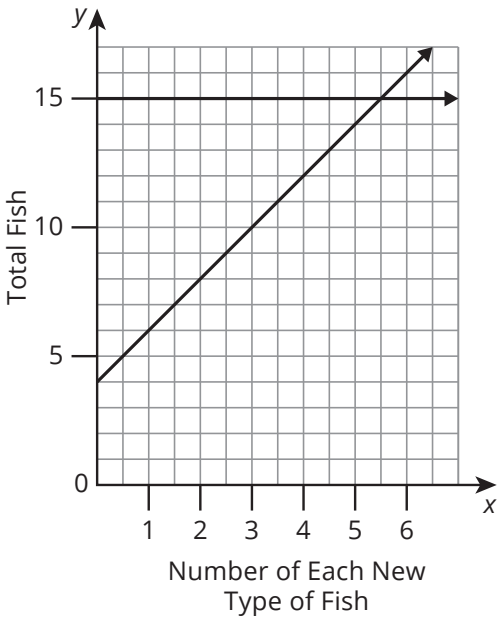


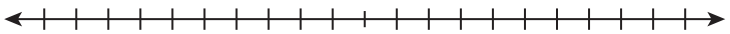
7. Ms. Ramirez is in charge of the school music assembly. The assembly is 100 minutes in length and contains music from 3 different ensembles. She would like less than 13 minutes of "down time" during the assembly, which includes the time it takes the ensembles to get on and off the stage. Each ensemble will have the same whole-number amount of time, in minutes, to perform. How many minutes should Ms. Ramirez allow for each ensemble?



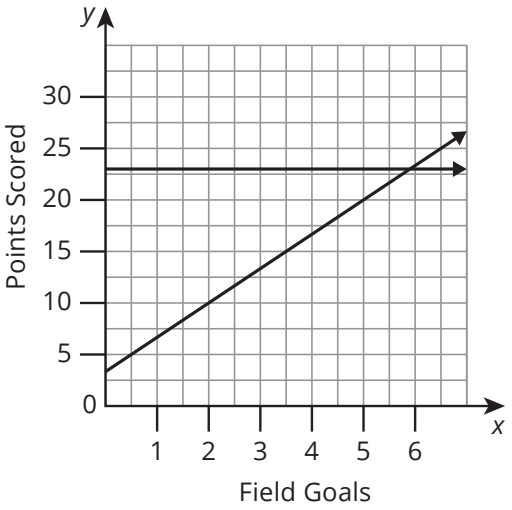


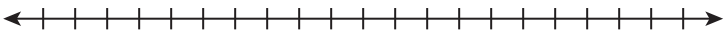
8. Lizzie read that she should have less than 15 fish based upon the size of her fish tank. She already has 4 tetras in her tank. She would like to add 2 new types of fish to her tank. She would like the same number of each new type of fish. How many of each new type of fish can Lizzie add to her tank?



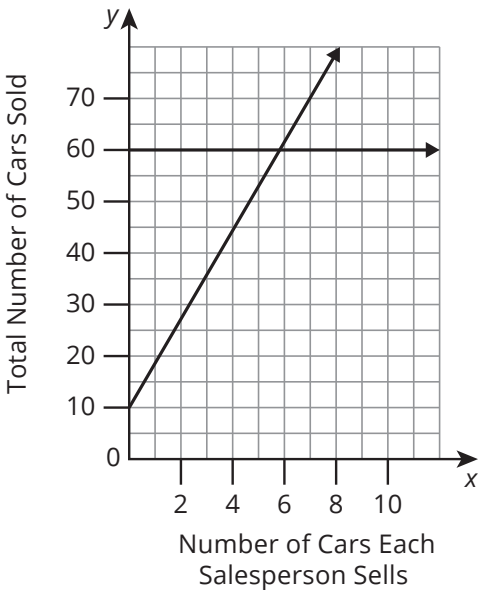


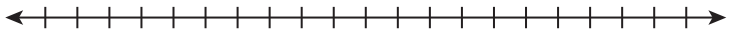
9. In a game against the Creek Side Crickets, the East Port Pandas football team scored one touchdown with an extra point, which gave them 7 points. Their kicker made every field goal he attempted for 3 points each. How many field goals did the Panda's kicker have to make to beat the Crickets' score of 23?



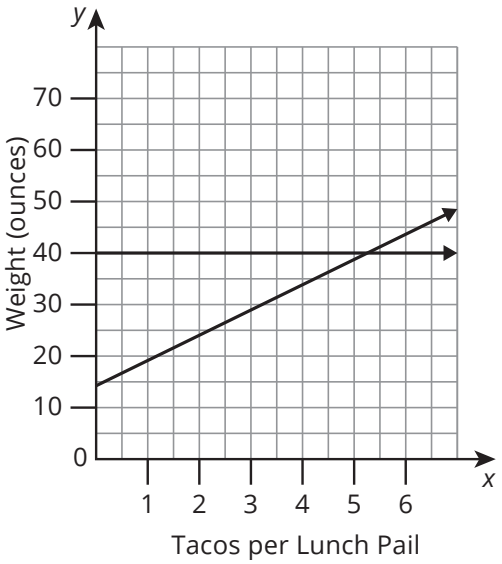


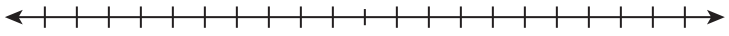
10. A car dealership must sell at least 60 cars per week to fulfill their quota. The owner, Ms. Patel, knows that she personally will sell 9 cars per week. She has 10 other salespeople that each work at her dealership. If each of Ms. Patel's salespeople sells the same number of cars, how many must each of them sell each week to meet the dealership's quota?



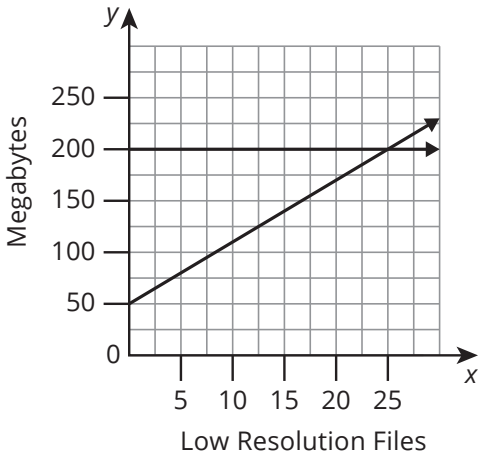


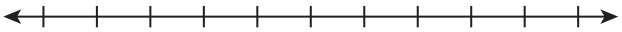
11. Alyssa makes fresh tacos each day to be shipped and sold in local grocery stores. She packages the tacos in collectible lunch pails. Each taco weighs 5 ounces. Each lunch pail weighs 14 ounces. Due to shipping regulations, the total weight of each taco lunch pail can be, at most, 40 ounces. How many tacos can Alyssa package in each lunch pail?





12. Mario is a graphic artist. He is saving files on a USB drive to give to a client. The USB drive can hold at most 200 megabytes of data. Mario has one high resolution file already on the USB drive. It is 50 megabytes. Mario wants to add some low resolution files to the USB drive. Each low resolution file is 6 megabytes. How many low resolution files can Mario add to the USB drive?





Extension

Andrew and his manager have discussed the use of an herbicide to help decrease the growth of plants that will grow near the trees, because they will take nutrients away from the tree and thus the trees will grow at a slower rate. They decide to do some research on the subject to decide. They find a study that indicates that the growth of the seedlings without using herbicides was $8(2h + 2) - 4(2h + 9)$ and the growth of the seedlings with herbicides was $7h + 1\frac{3}{4}(4h - 2\frac{1}{8})$. Graph each expression. Sketch the portion of the graphs that make sense to this problem. Are the two growth rates the same? Explain your reasoning.

Spaced Practice

1. Rewrite each expression with the fewest terms possible.

   a. $(-2y + 3) + (-7y - 14)$

   b. $(9x - 4) - 5(2x - 7)$

2. Solve each equation for the variable.

a. Solve for z: $-2 + 10z = 28$.

b. Solve for a: $\frac{a}{9} - 10 = 8$.

c. Solve for w: $-11 = 9 + 10w$.

d. Solve for x: $-10 = -5x + 5$.

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III. Using Multiple Representations to Solve Problems

Topic Practice

A. Use the given information to answer each question.

1. Natalia is running a 26-mile marathon. The table shows how far she ran at different times during the race. Define the independent and dependent variables and the constant rate of change. (Assume Natalia runs at a constant rate.) Write an equation that represents the data shown in the table. Complete the table.

Time	Distance
Hours	miles
0.1	1
0.2	2
0.3	3
	10
	20
	26

2. Kaya is refilling her fish tank after cleaning it. The table shows the amount of water in the tank while she is filling it. Define the independent and dependent variables and the constant rate of change. (Assume the tank is filled at a constant rate.) Write an equation that represents the data shown in the table. Complete the table.

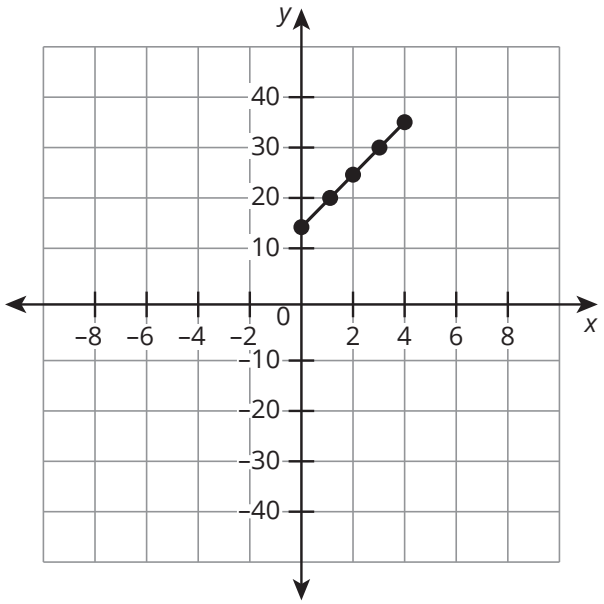
Time	Water
minutes	gallons
1	8
2	16
3	24
4	
5	
6	

3. Samantha is saving money for a new car. The table shows the amount of money in her savings account over a 5-month period. Define the independent and dependent variables and the constant rate of change. (Assume Samantha saves the same amount of money each month.) Write an equation that represents the data shown in the table. Complete the table.

Time	Savings
months	dollars
0	1350
1	1500
2	1650
3	
4	
5	

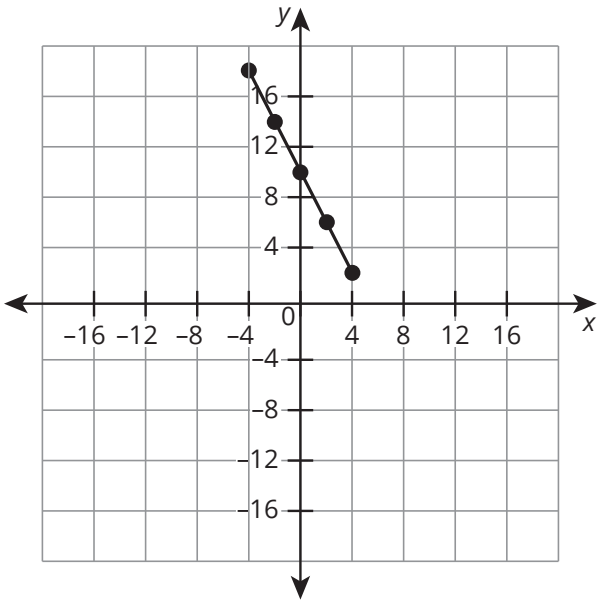
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4. The graph shows the relationship between two quantities. Complete the table. Define the independent and dependent variables and the constant rate of change. Write an equation that represents the data shown.



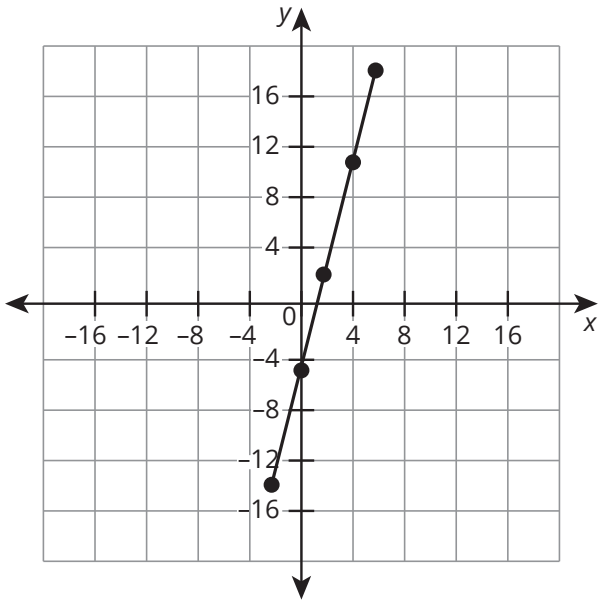
x	y

5. The graph shows the relationship between two quantities. Complete the table. Define the independent and dependent variables and the constant rate of change. Write an equation that represents the data shown.



x	y

6. The graph shows the relationship between two quantities. Complete the table. Define the independent and dependent variables and the constant rate of change. Write an equation that represents the data shown.



x	y

B. Write a real-world problem that could be represented by the given information.

1.

Number of Toppings	Total Cost (dollars)
0	7.50
1	8.00
4	9.50
5	10.00

2.

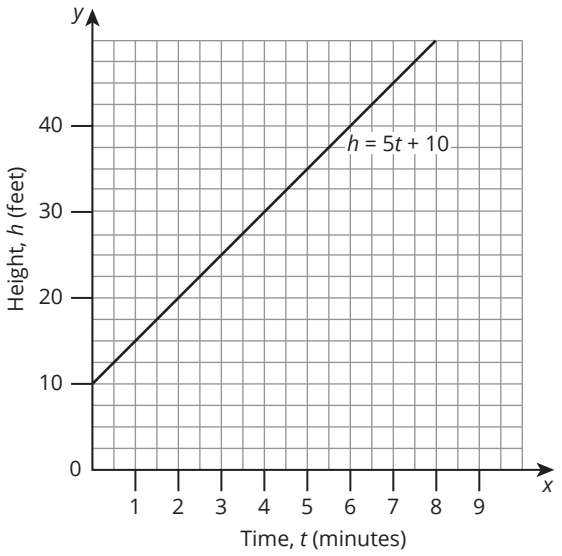
Number of Games	Total Cost (dollars)
0	18
1	20
2	22
4	26

3.

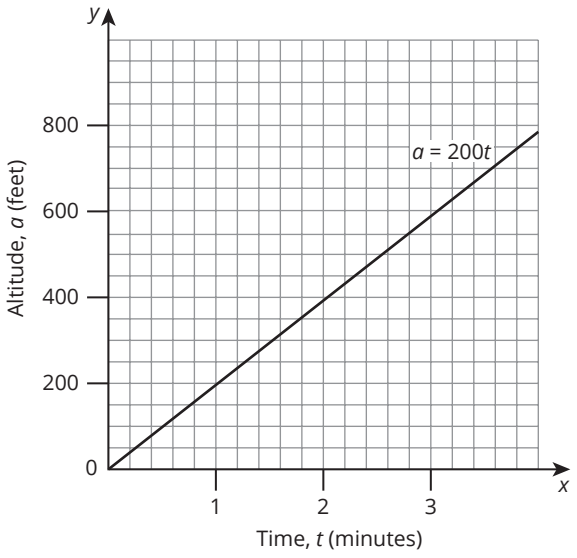
Number of Text Messages	Total Cost (dollars)
0	4.50
1	4.75
4	5.50
6	6

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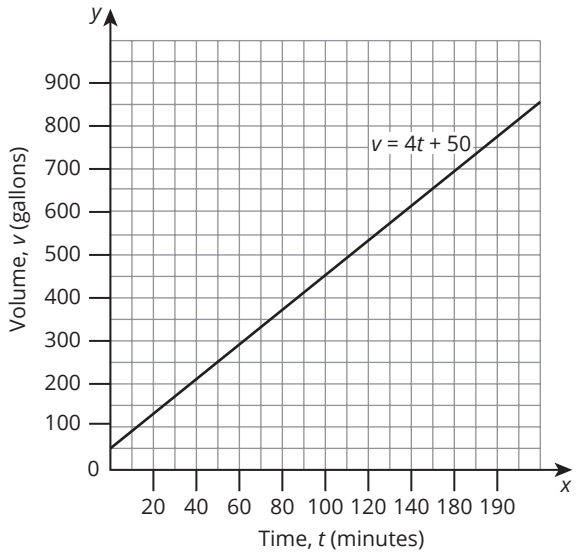
4.


y
40
30
20
10
0
h = 5t + 10
Height, h (feet)
1 2 3 4 5 6 7 8 9
x
Time, t (minutes)

5.


y
800
600
400
200
0
a = 200t
Altitude, a (feet)
1 2 3
x
Time, t (minutes)

6.



Extension

How could you graph the solutions of an inequality on a coordinate plane? Create a situation that can be modeled with an equation on the coordinate plane. Then, show how to model inequalities and their solutions on the coordinate plane.

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Spaced Review

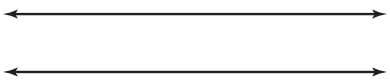
1. Paola is using a garden hose to fill her backyard pool at a rate of 10 gallons per minute. The pool already contains 9000 gallons of water. The capacity of the pool is 12,000 gallons.

   a. Define the independent and dependent variables.

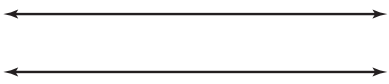
   b. Define the constant rate of change.

2. Use double number lines to solve each equation.

   a. $2x + 2 = 10$

   b. $-x + 5 = 0$

3. Solve for each unknown.

   a. $\frac{1.6}{2.8} = \frac{x}{7}$

   b. $\frac{2}{d} = \frac{0.4}{5}$

GRADE 7

MODULE 4

Analyzing Populations and Probabilities

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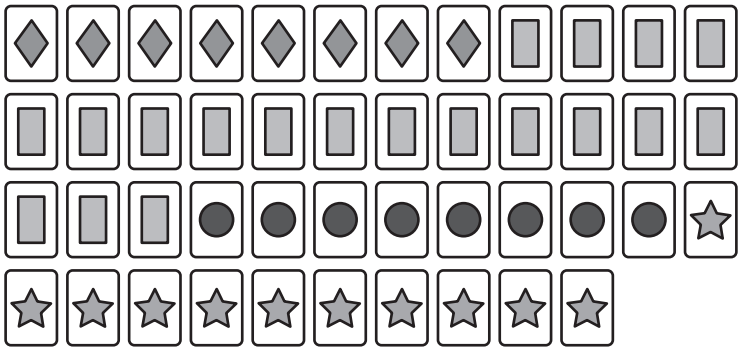
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Name _____ Date _____

I. Defining and Representing Probability

Topic Practice

A. You choose a card from the deck of 46 cards shown. Determine each probability.



1. *P*(Diamond)

2. *P*(Rectangle)

3. *P*(not a Circle)

4. *P*(Rectangle or Star)

5. *P*(Star or Diamond)

6. *P*(complement of *P*(star))

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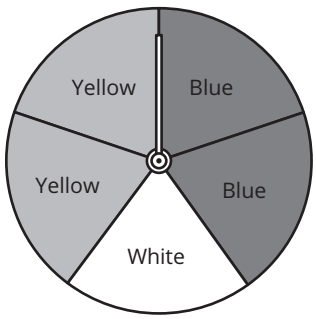
7. *P*(Rectangle or Circle)

8. *P*(Circle or Star)

9. *P*(Diamond or Rectangle)

10. *P*(Circle or Diamond)

B. You spin a spinner with equal-sized sections, as shown. Determine each probability. Then, identify and calculate the complement of each event. Describe the relationship between each probability and its complement.



1. *P*(landing on white)

2. *P*(landing on yellow)

3. *P*(landing on blue)

4. *P*(not landing on blue)

5. *P*(not landing on yellow)

6. *P*(not landing on white)

C. Determine whether the event is impossible, just as likely as unlikely, or certain to occur. Write 0, $\frac{1}{2}$, or 1 to indicate the most appropriate probability for each event.

1. It will snow in Houston, Texas in July.

2. A coin is flipped and lands on heads.

3. A six-sided number cube is rolled and lands on an integer.

4. The next tiger at your local zoo will be a male.

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5. The sun will shine in Long Beach, California, in July.

6. You will live to be over 900 years old.

Extension

1. Create a spinner with 4 sections, *A* through *D*, so that each section has the given probability.

Section *A*: 10%

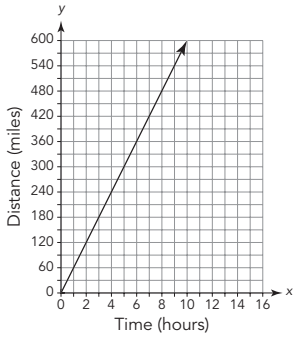
Section *B*: 20%

Section *C*: 30%

Section *D*: 40%

Spaced Practice

1. Linh is driving north from Austin along Interstate 35. The graph represents the relationship between the time that Linh has driven and the distance that she has driven.



   a. How far does Linh drive in 5 hours?

b. How fast is Linh driving?

c. Write an equation to determine the number of miles that Linh drives for any number of hours. Be sure to define your variables.

2. Jackson is researching a type of fish called *carp*. He discovers that one variety of carp can grow 5 pounds during each year of its life. He decides to purchase a very young carp of this variety that weighs 2 pounds.

   Define variables and write an equation that represents the relationship between the amount of time in years that Louis has the carp and the weight of the carp.

3. Solve each equation using any method.

   a. $\frac{x}{3} + 2 = 14$

   b. $6n - 13 = 27$

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II. Probability Models

Topic Practice

A. Construct a probability model for each situation. Determine whether the model is a uniform probability model or a non-uniform probability model.

1. Roll a 10-sided number polyhedron

Outcome										
Probability										

2. Select a painted rock from a bag at random that contains 4 purple rocks, 3 green rocks, 3 orange rocks, and 2 blue rocks

Outcome				
Probability				

3. Spin a spinner with 8 numbered sections of equal size

Outcome								
Probability								

4. Select 1 of 5 members of your hockey team at random to take the first shot in an overtime shootout

Outcome					
Probability					

5. Spin a spinner with colored sections of equal size. The spinner has 3 blue sections, 3 red sections, and 2 yellow sections

Outcome			
Probability			

6. Select a member of the math club at random whose name starts with a vowel; The members are Ricardo, Alejandra, Gracie, Omar, Antonio, Ben, James, and Juliana.

Outcome		
Probability		

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7. Select a day of the week at random to give your dog a bath by writing each day of the week on a slip of paper and choosing a slip of paper from a bag

Outcome							
Probability							

8. Choose a sock from a drawer at random that contains 4 black socks, 2 brown socks, and 2 blue socks

Outcome			
Probability			

9. Toss a coin two times

Outcome				
Probability				

10. Spin a spinner with equal sections; Four of the sections contain numbers and eight of the sections contain letters.

Outcome		
Probability		

11. Select a colored marble from a bag at random that contains 5 red marbles, 5 blue marbles, 5 green marbles, 5 yellow marbles, and 5 purple marbles

Outcome					
Probability					

12. Select a coin from a jar at random that contains 14 quarters, 26 dimes, 12 nickels, and 8 pennies

Outcome				
Probability				

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B. Use the probability model to answer each question.

Outcome	1	2	3	4	5	6
Probability	$\frac{3}{18}$	$\frac{2}{18}$	$\frac{1}{18}$	$\frac{3}{18}$	$\frac{5}{18}$	$\frac{4}{18}$

1. What is the probability of an outcome of 4?

2. What is the probability of an outcome of 6?

3. What is the probability of an outcome that is less than 6?

4. What is the probability of an outcome that is greater than 8?

5. What is the probability of an outcome that is an odd number?

6. What is the probability of an outcome that is less than 10?

Use the probability model to answer each question.

Outcome	A	B	C	D	E	F
Probability	$\frac{5}{24}$	$\frac{6}{24}$	$\frac{3}{24}$	$\frac{7}{24}$	$\frac{2}{24}$	

7. What is the probability of an outcome of *B*?

8. What is the probability of an outcome of *F*?

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9. What is the probability of an outcome that is not *C*?

10. What is the probability of an outcome that is a consonant?

11. What is the probability of an outcome that is not *A*?

12. What is the probability of an outcome that is a vowel?

C. Xavier brought a bag of hard candy to soccer practice to share with his friends. The table shows the number of candies of each flavor that Xavier has in the bag.

Candy Flavor	Number
Cherry	8
Watermelon	3
Pineapple	4
Lemon	2
Orange	5
Grape	7
Blueberry	1

1. How many pieces of candy does Xavier have in his bag?

2. Create a probability model for selecting a piece of candy at random from the bag.

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3. Use the probability model to determine the probability of choosing a pineapple flavored candy at random.

4. Use the probability model to determine the probability of choosing a candy that is not grape at random.

5. Suppose cherry and watermelon candies are both red. Use the probability model to determine the probability of choosing a red candy at random.

6. Use the probability model to determine the probability of choosing a candy that is not red at random.

7. Suppose pineapple and lemon candies are both yellow. Use the probability model to determine the probability of choosing a candy that is yellow at random.

8. Suppose pineapple and lemon candies are both yellow. Use the probability model to determine the probability of choosing a candy that is not yellow at random.

Extension

1. Nakota flipped a coin 10 times and got 70% heads and 30% tails. What will happen to these percents as Nakota continues flipping the coin? Try it out to test your prediction.

Spaced Practice

1. A drawer contains 15 T-shirts. There are 4 blue, 9 green, and 2 black T-shirts. A T-shirt is grabbed at random from the drawer. Which statement(s) correctly describe(s) the likelihood of an event? Select True or False and explain your reasoning.

   a. It is unlikely that a black T-shirt will be selected. True False

   b. It is certain that a green T-shirt will be selected. True False

   c. It is impossible that a red T-shirt will be selected. True False

   d. It is likely that a blue T-shirt will be selected. True False

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2. A local park rents cabins for people who want to vacation by the forest. The fee for the rental is $27 per night. There is also a $55 cleaning and maintenance charge that is added to the total bill.

   a. Define variables for the number of days that a cabin is rented and the cost of the rental. Use the variables to write an equation that represents the cost to rent the cabin given the number of days that the cabin is rented.

   b. Use the equation to determine how many days the cabin can be rented for $190. Show all of your work.

3. Use the distributive property to rewrite each expression.

   a. $-7(-5g + 12) - 27$

   b. $\frac{-6.4y + 14.4}{-0.16}$

III. Determining Experimental Probabilities of Simple Events

Topic Practice

A. Determine each experimental probability.

1. Suppose you toss a coin 20 times and record the results shown in the table. Complete the table and calculate the experimental probability of tossing tails.

Result	Tally	Total
Heads	𝍸 III	
Tails	𝍸 𝍸 II	

2. Suppose you roll a number cube 40 times and record the results shown in the table. Complete the table and calculate the experimental probability of rolling an even number.

Result	Tally	Total
1	𝍸	
2	𝍸 II	
3	IIII	
4	𝍸 I	
5	𝍸 𝍸	
6	𝍸 III	

3. Suppose you put two white socks and one brown sock into a bag and you choose one sock without looking. You repeat this 15 times, and you record the results shown in the table. Note that you always put the sock you chose back into the bag before choosing the next sock. Complete the table and calculate the experimental probability of choosing the brown sock.

Result	Tally	Total
White	𝍸 𝍸 II	
Brown	III	

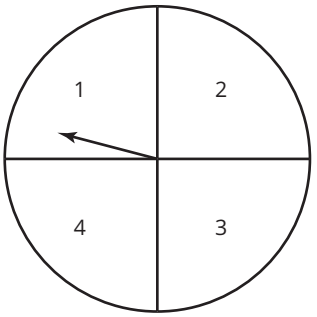
4. Suppose you write the letters A, B, C, and D on four equal-size slips of paper. Then, you put them in a bag and choose one slip from the bag without looking. You repeat this 40 times and record the results shown in the table. Note that you always put the slip you chose back into the bag before choosing the next slip. Complete the table and calculate the experimental probability of choosing D.

Result	Tally	Total
A	𝍸 II	
B	𝍸 𝍸 II	
C	𝍸 𝍸 I	
D	𝍸 IIII	

5. Suppose you put 2 dimes, 2 nickels, and 1 penny into a bag. Then, you choose one coin from the bag without looking and record the results shown. You repeat this experiment 25 times. Note that you always put the coin you chose back into the bag before choosing the next coin. Complete the table and calculate the experimental probability of choosing a nickel.

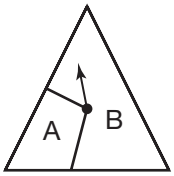
Result	Tally	Total
Dime	𝍸 𝍸 II	
Nickel	𝍸 IIII	
Penny	IIII	

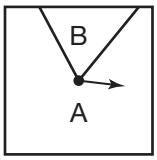
6. Suppose you use a paper clip as the arrow part of the spinner. You spin the spinner 30 times and record the data shown in the table. Complete the table and calculate the experimental probability of spinning a number greater than 1.

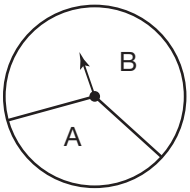


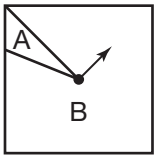
Result	Tally	Total
1	𝍸 I	
2	𝍸 IIII	
3	𝍸 II	
4	𝍸 III	

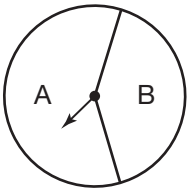
B. Predict *P*(*A*) for a single spin of each spinner. Write your answer as a fraction.

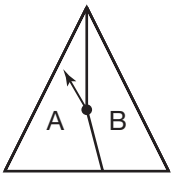
1. 

2. 

3. 

4. 

5. 

6. 

C. Suppose the probabilities for the colors on a spinner are known to be:

P(pink) = $\frac{1}{3}$ P(blue) = $\frac{1}{6}$ P(orange) = $\frac{1}{2}$

Predict the number of times you would land on each letter if you were to spin the spinner the number of times given.

1. You spin the spinner 18 times.

P(pink) : *P*(blue) : *P*(orange) :

2. You spin the spinner 54 times.

P(pink) : *P*(blue) : *P*(orange) :

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3. You spin the spinner 72 times.

P(pink) :

P(blue) :

P(orange) :

4. You spin the spinner 90 times.

P(pink) :

P(blue) :

P(orange) :

5. You spin the spinner 198 times.

P(pink) :

P(blue) :

P(orange) :

6. You spin the spinner 450 times.

P(pink) :

P(blue) :

P(orange) :

D. Use the given information to answer each question.

The table shows the results of James tossing a coin several times.

Result	Total
Heads	16
Tails	24

1. Determine the percent error for tossing heads and interpret the meaning.

2. Determine the percent error for tossing tails and interpret the meaning.

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Hailey stood at an intersection where the theoretical probability for turning left or right is $\frac{1}{2}$ for either direction. She recorded whether cars turned left or right for one hour. The table shows the data.

Result	Total
Left	24
Right	12

3. Determine the percent error for turning left and the meaning.

4. Determine the percent error for turning right and interpret the meaning.

Alejandra recorded the results of spinning a game spinner several times, where the sections are of equal size. She recorded the data in the table.

Result	Total
Red	5
Yellow	7
Green	2
Orange	8
Blue	3

5. Determine the percent error for landing on red and interpret the meaning.

6. Determine the percent error for landing on green and interpret the meaning.

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Extension

1. Suppose you were to flip a coin and spin a spinner with four equal sections labeled A, B, C, and D.

   a. What are all of the possible outcomes?

   b. What is the probability of landing on heads and not landing on section B?

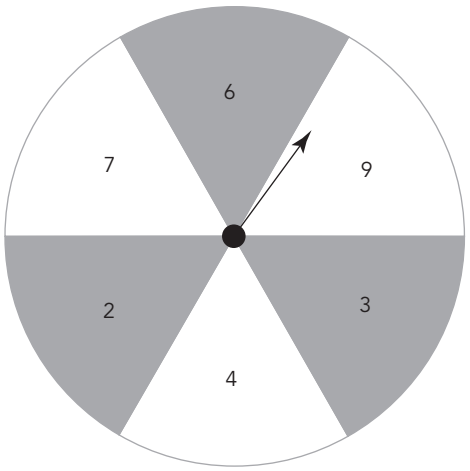
   c. What is the probability of landing on heads or tails and a consonant?

Spaced Practice

1. Ricardo got a new board game that came with the spinner shown.

   a. Complete the probability model for using this spinner.

Outcome	2	3	4	6	7	9
Probability						



b. What is the sum of the probabilities in the probability model?

c. What is the probability that Charlie spins the spinner and gets an even number?

2. Nia is researching her smartphone data plan. She currently gets 2 gigabytes of data per month. She looks at her past usage and notices that she uses an average of 0.04 gigabytes of data per day.

   a. Write an equation to represent the relationship between the number of days and the amount of data Nia has left for the month.

   b. Does she have enough data in her monthly plan for her average usage? Should she change plans?

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3. Use long division to convert each fraction to a decimal. Show all your work. Label each decimal as *terminating* or *non-terminating*.

a. $\frac{5}{6}$

b. $\frac{15}{16}$

IV. Simulating Simple Experiments

Topic Practice

A. Conduct each experiment as described and record your results in the table. Use your results to determine the experimental probability.

1. A school assembly is made up of half seventh-graders and half eighth-graders. Suppose a student is selected at random to lead the pledge of allegiance. Flip a coin to model choosing the grade of the student who will lead the pledge. Perform 20 trials of the experiment. Record the results in the table using tally marks.

Result	Tally	Total	Percent (total/20)
Seventh-Graders			
Eighth-Graders			

2. What is the experimental probability of selecting a seventh-grade student at random to lead the pledge?

3. What is the experimental probability of selecting an eighth-grade student at random to lead the pledge?

4. A bucket of crayons has red, orange, yellow, green, blue, and purple. There are an equal number of each color in the bucket. Suppose you reach into the bucket and select one crayon at random. Roll a number cube to model selecting each crayon color. Perform 40 trials of the experiment. Record the results in the table using tally marks.

Result	Tally	Total	Percent (total/40)
Red			
Orange			
Yellow			
Green			
Blue			
Purple			

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5. What is the experimental probability of selecting a green crayon?

6. What is the experimental probability of selecting an orange crayon?

7. A large snack bin in the cafeteria is filled with bag of chips, pretzels, and popcorn. $\frac{1}{2}$ of the bin is chips, $\frac{1}{4}$ is pretzels, and $\frac{1}{4}$ is popcorn. Suppose you reach into the bucket without looking to select a snack. Use 4 equal-size slips of paper to model choosing each type of snack. Label two slips of paper as *chips*, one as *pretzels*, and one as *popcorn*. Perform 40 trials of the experiment, where each trial consists of pulling a slip of paper from a bag without looking. Be sure to return the paper you chose back into the bag before choosing again. Record the results in the table.

Result	Tally	Total	Percent (total/40)
Chips			
Chips			
Pretzels			
Popcorn			

8. What is the experimental probability of selecting pretzels from the snack bin?

9. What is the experimental probability of selecting chips from the snack bin?

10. A streaming website allows customers to download movies. The most popular genres are comedy, drama, science fiction, and documentary. The percent of movies downloaded for each genre is shown in the table.

Movie Type	Comedy	Drama	Science Fiction	Documentary
Percent of Movies Downloaded	30%	40%	25%	5%

The streaming website is trying to determine whether to advertise for an upcoming comedy movie. Perform a simulation to determine the probability that out of the next 5 movie downloads, at least 1 will be a comedy. Consider the data provided. Describe how you could assign two-digit numbers to represent the percent of movie downloads for each genre.

11. Perform 10 trials of the simulation, where each trial consists of selecting 5 two-digit numbers from a random number table and determining how many of those numbers represent comedy movie downloads. A random number table is provided at the end of this question.

Trial Number	Numbers	Number of Comedy Movie Downloads
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

12. What is the experimental probability that out of 5 movie downloads, at least 1 is a comedy?

Random Number Table										
Line 1	65285	97198	12138	53010	94601	15838	16805	61404	43516	17020
Line 2	17264	57327	38224	29301	18164	38109	34976	65692	98566	29550
Line 3	95639	99754	31199	92558	68368	04985	51092	37780	40261	14479
Line 4	61555	76404	86214	11808	12840	55147	97438	60222	12645	62090
Line 5	78137	98768	04689	87130	79225	08153	84967	64539	79493	74917

B. Describe a simulation to model each situation and then describe one trial.

1. One in every 4 cereal boxes has a coupon for a free box of cereal. How many boxes of cereal should you expect to buy before you find a coupon?

2. A bag contains 5 lemons and 1 lime. You choose a fruit without looking. What is the probability that you choose the lime?

3. From past experience, you know that your probability of getting a ringer in horseshoes is about 20%. You throw 3 horseshoes. What is the probability that all 3 throws are ringers?

4. A stack of cards in a game contains 10 cards that tell the player to move forward a certain number of spaces and 5 cards that tell the player to move back a certain number of spaces. A player selects a card. What is the probability that the player will move back?

5. Joey's batting record shows that his probability of striking out is about 40%. Joey will go to bat 8 times at baseball practice. What is the probability that he strikes out 5 times or more?

6. A test has 20 true/false questions. What is the probability of getting at least 12 questions correct just by guessing?

Extension

1. You will learn about compound probability in the next topic. However, you can always use experimental probability to help you make a better guess about a theoretical probability that you don't know about.

   Determine the experimental probability of rolling two ones in a row on a number cube. Use your results to reason about determining the theoretical probability for this compound event.

Spaced Practice

1. Determine if each probability can be determined experimentally, theoretically, or both. Explain your reasoning.

   a. Humans will land on Mars in the next 10 years.

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b. A number cube is rolled two times and the product of the two numbers is recorded.

c. A box contains red, white, and blue marbles, and you are not allowed to look inside the box. You reach in and grab a blue marble.

d. A coin is tossed ten times and the results are recorded.

e. The next car to pass you will be silver.

2. Write an equation to represent each situation. Define your variables and solve the equation.

a. Alejandra has to earn $230 for her dance team fundraiser selling candy bars. If she has already earned $165, how many more candy bars does she have to sell at $1.50 each to meet her goal?

b. Lucia is making a 60-minute playlist of her favorite songs. If each song is approximately 4 minutes and 30 seconds long, how many songs will be in the playlist?

3. Determine each sum. Show your work.

a. $-44.3 + 94.2$

b. $6\frac{4}{5} + \cdot\left(-10\frac{2}{3}\right)$

4. Identify each item as a liability or asset. Explain your reasoning.

a. rent on an apartment

b. an investment account

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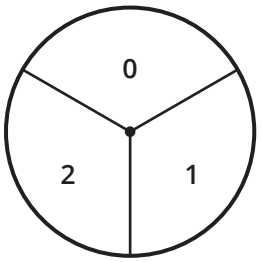
Name _____ Date _____

I. Using Arrays to Organize Outcomes

Topic Practice

A. Use the given information to answer each set of questions.

A spinner divided into 3 equal sections is labeled 0, 1, and 2.
You spin the spinner 3 times and calculate the sum of the numbers.



Outcome	Tally	Probability
0		
1		
2		
3		
4		
5		
6		

1. What is the sample space for this situation?

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2. List each possible outcome in the first column of the table.

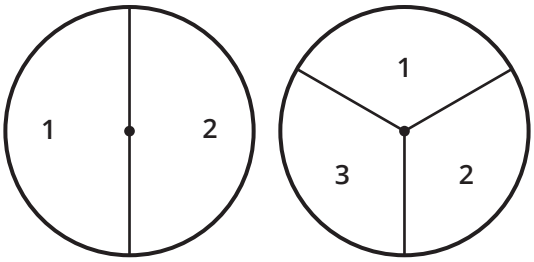
3. Are all outcomes equally likely? Explain your reasoning.

4. Conduct 50 trials of the experiment and record your results in the second column of the table.

5. Calculate the experimental probability for each outcome and complete the last column of the table. Write the probability fraction, decimal, and percent.

6. According to your experiment, list the most likely sum(s). Explain your reasoning.

A spinner is divided into two equal sections labeled 1 and 2. A second spinner is divided into three equal sections labeled 1, 2, and 3. You spin each spinner once and then calculate the sum of the numbers.



Outcome	Tally	Probability
2		
3		
4		
5		

7. What is the sample space for this situation?

8. List each possible outcome in the first column of the table.

9. Are all outcomes equally likely? Explain your reasoning.

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10. Conduct 25 trials of the experiment and record your results in the second column of the table.

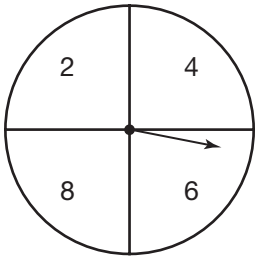
11. Calculate the experimental probability for each outcome and complete the last column of the table. Write the probability fraction, decimal, and percent.

12. According to your experiment, list the most likely sum(s). Explain your reasoning.

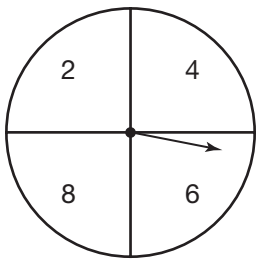
B. Make an array to show the possible outcomes for each experiment and then use the array to determine the theoretical probability.

1. Two number cubes are rolled, and the product of the two numbers shown is calculated. Calculate *P*(multiple of 6).

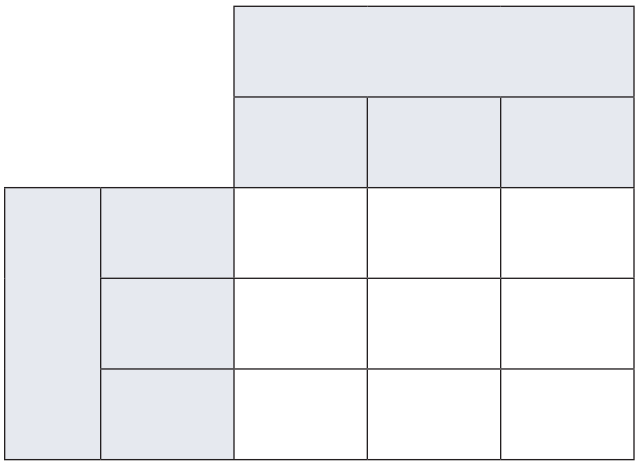
2. Juliana spins the spinner two times. She determines the product of the two numbers. Calculate *P*(product is between 20 and 50).



3. Juliana spins the spinner two times. She determines the sum of the two numbers. Calculate *P*(sum $<$ 8).

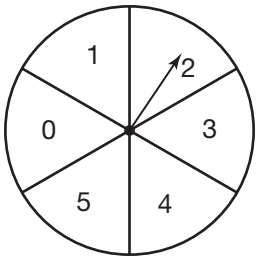


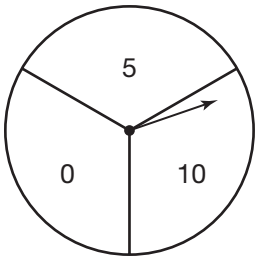
4. Jackson writes the numbers 1 through 3 on papers and puts them in a bag. He chooses one paper from the bag without looking, writes the number down, returns it to the bag, and chooses another paper at random. He subtracts the smaller number from the greater number. Calculate $P(1)$.



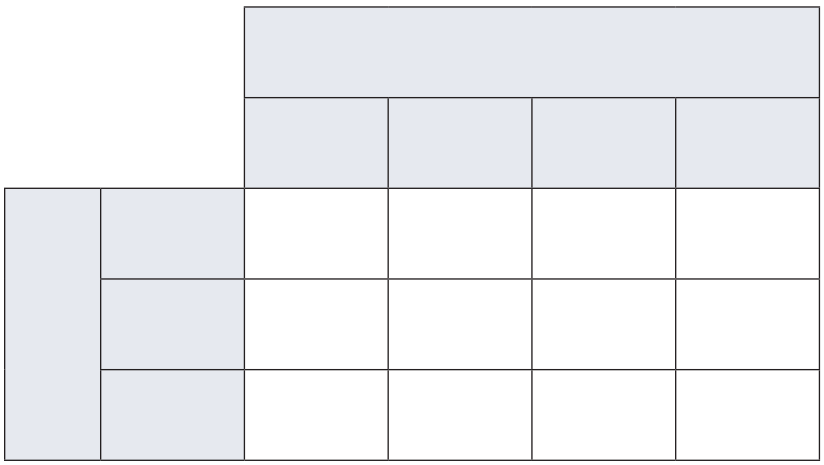
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5. Ricardo spins each spinner one time. He determines the product of the two numbers. Calculate *P*(multiple of 10).





6. Jackson writes the letters *M*, *A*, *T*, and *H* on papers of equal size and puts them in bag 1. He writes the letters *Y*, *E*, and *S* on papers of equal size and puts them in bag 2. He selects one paper from bag 1, without looking, writes the letter down, selects one paper out of bag 2 without looking, and writes the letter next to the letter from bag 1. Calculate the probability that the two letters spell a word. (The words are MY, ME, HE, and AS.)



C. Predict the number of times you would get each outcome given the theoretical probability of the outcome and the number of times you spin the spinner.

1. $P(\text{red}) = \frac{3}{8}$; you spin 40 times.

2. $P(\text{multiple of 5}) = \frac{3}{4}$; you spin 200 times.

3. $P(4) = \frac{7}{12}$; you spin 60 times.

4. $P(\text{blue}) = \frac{8}{9}$; you spin 450 times.

5. $P(\text{odd number}) = \frac{1}{2}$; you spin 100 times.

6. $P(3) = \frac{9}{40}$; you spin 2000 times.

Extension

1. There is a famous probability problem known as the *Monty Hall problem*—named after the original host of the game show *Let's Make a Deal*. In this problem, there are three doors. Behind one of the doors is a prize. Behind the other two doors are donkeys. You choose one door. The game show host opens one of the doors that you did not choose to reveal a donkey. Then, the host asks you if you would like to stay on the door you chose or switch to the other unopened door. Should you stay or switch? Does it matter?

Spaced Practice

1. Since 1903, the National League has played the American League in the World Series. The World Series is usually won by the team winning the best out of 7 games. The table shows the number of games that were played to win each series during the first 100 World Series.

Number of Games	Number of Series Won in Given Number of Games
4 games	17 series
5 games	24 series
6 games	21 series
7 games	33 series
8 games	5 series

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a. What is the probability that the next World Series will take 7 games to determine a winner?

b. What is the probability that the next World Series will take 4 games?

c. Is this theoretical or experimental probability? Use a complete sentence to explain.

2. Nakota's music collection is 40% hip-hop and 60% rock. If his music player selects songs to play at random, what is the probability of it selecting 3 hip-hop songs in a row? Describe a simulation that could be used to estimate this probability.

3. Rewrite each expression with the fewest number of terms.

a. $\frac{3}{5}a + 7\frac{2}{3} - 11 - \frac{9}{10}a$

b. $9 - 0.4(1.1s - 9)$

II. Using Tree Diagrams

Topic Practice

A. Suppose a 6-sided number cube is rolled 3 times.

1. What is the theoretical probability of rolling a 6-sided number cube 1 time and landing on an even number? An odd number?

2. Choose an appropriate model to simulate the probability of rolling the number cube three times and landing on an even each time. Explain how you will represent odd and even numbers in your model.

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3. Conduct 10 trials of the simulation. Record the results in the table shown.

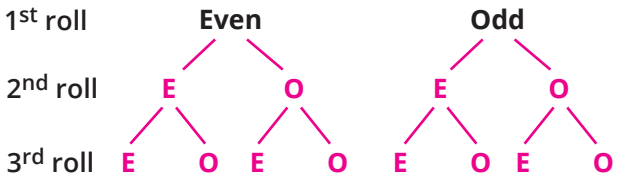
Trial	Result
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

4. Use the results of your simulation to construct a probability model.

Outcome	0 even	1 even	2 even	3 even
Probability				

5. What is the experimental probability that when rolling a 6-sided number cube three times it will land on an even number each time according to your probability model?

6. Construct a tree diagram to show all of the possible outcomes for rolling a 6-sided number cube 3 times.



7. Complete the probability model shown with the information from the tree diagram.

Outcome	0 even	1 even	2 even	3 even
Probability				

8. What is the theoretical probability of rolling a 6-sided number cube three times and rolling an even number each time?

9. Calculate P(1 even number).

10. Calculate *P*(1 or 2 even numbers).

11. Calculate *P*(3 odd numbers).

12. What event would be the complementary event for rolling 1 odd number?

B. Complete the tree diagram to determine the possible outcomes for each problem situation. Complete the probability model.

1. The probability of a student having pierced ears is 50%. What is the probability that the first 4 students that enter a classroom have pierced ears? Complete the tree diagram to determine all of the possible outcomes for the first 4 students entering the classroom. Complete the probability model.

1st **Unpierced** **Pierced**

2nd

3rd

4th

Outcome	0 pierced	1 pierced	2 pierced	3 pierced	4 pierced
Probability					

2. You toss a coin 4 times. What is the probability that all 4 tosses result in heads? Complete the tree diagram to determine all of the possible outcomes for the 4 coin tosses. Complete the probability model.

1st H T

2nd

3rd

4th

Outcome	0 heads	1 heads	2 heads	3 heads	4 heads
Probability					

3. A spinner has 3 equal parts. One part is green, one part is orange, and one part is yellow. What is the probability that spinning the spinner 3 times will result in 0 orange results? Complete the tree diagram to determine all of the possible outcomes of the 3 spins. Complete the probability model.

1st Green Orange Yellow

2nd

3rd

Outcome	0 orange	1 orange	2 orange	3 orange
Probability				

4. A six-sided number cube has two faces with a 1, two faces with a 2, and two faces with a 3. It is tossed 3 times. What is the probability that all 3 tosses result in a 1? Complete the tree diagram to determine all of the possible outcomes of tossing the number cube 3 times. Complete the probability model.

1st 1 2 3

2nd

3rd

Outcome	Zero 1s	One 1	Two 1s	Three 1s
Probability				

5. A bag contains a red stone, a yellow stone, and a blue stone. A stone is chosen from the bag at random, the stone's color is recorded, and the stone is replaced in the bag. If you choose a stone from the bag 2 times, what is the probability that only 1 of the chosen stones is blue? Complete the tree diagram to determine all of the possible outcomes of choosing 2 stones. Complete the probability model.

1st Red Yellow Blue

2nd

Outcome	0 blue	1 blue	2 blue
Probability			

6. A spinner has 4 equal parts. One part is black, one part is white, one part is red, and one part is yellow. What is the probability that spinning the spinner 2 times will result in 2 red results? Complete the tree diagram to determine all of the possible outcomes of the 2 spins. Complete the probability model.

1st Black White Red Yellow

2nd

Outcome	0 red	1 red	2 red
Probability			

Extension

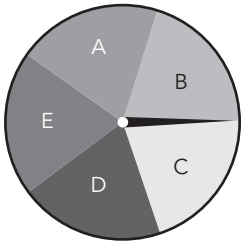
Different colored beads are placed in two tin cups. The first cup contains 1 bead of each color: blue, purple, and green. The second cup contains 1 bead of each color: yellow, garnet, blue, and green.

1. What is the probability of choosing the same color from each cup?

2. What is the probability of choosing blue from the first cup or blue from the second cup?

Spaced Practice

1. The spinner shown has 5 equal sections. Use the spinner to determine each probability.



   a. $P(C) =$

   b. $P(\text{vowel}) =$

   c. Suppose you spin twice.

      i. What is the probability of spinning two *A*s?

      ii. What is the probability of spinning an *A* and a *B* in any order?

2. In each table, x varies directly with y. Determine the constant of proportionality and express your answer as $y = kx$.

   a.

x	3	6	11	15
y	57	114	209	285

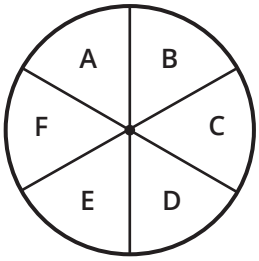
   b.

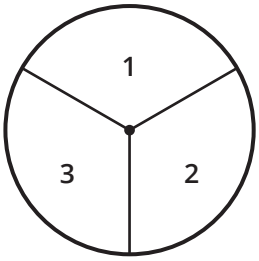
x	5	9	13	15
y	13	23.4	33.8	39

III. Determining Compound Probability

Topic Practice

A. One spinner has *6* equal parts labeled with the letters *A* through *F*. Another spinner has 3 equal parts labeled with the numbers 1, 2, and 3.





1. List all of the possible outcomes for spinning each spinner one time using an organized list.

2. What is the probability of spinning a *B* and a 3?

3. What is the probability of spinning a *B* or a 3?

4. What is the probability of spinning a vowel and a 1?

5. What is the probability of spinning a vowel or a 1?

6. What is the probability of spinning a letter that is not a vowel and a 2?

7. What is the probability of spinning a letter that is not a vowel or a 2?

8. What is the probability of spinning a *D* and an odd number?

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9. What is the probability of spinning a *D* or an odd number?

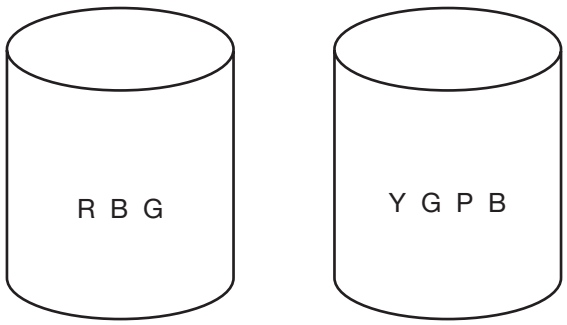
10. What is the probability of spinning a *B* and an even number?

11. What is the probability of spinning a *B* or an even number?

12. What is the probability of spinning a *G* and a 1?

B. Determine each compound probability. Show your work.

Marbles were placed in two buckets. The first bucket contains 1 marble of each of the following colors: red, blue, green. The second bucket contains 1 marble of each of the following colors: yellow, green, purple, blue. For the experiment you will choose marbles from the buckets without looking.



1. List all of the possible outcomes for choosing 1 marble from each bucket.

2. What is the probability of choosing blue from the first bucket and blue from the second bucket?

3. What is the probability of choosing blue from the first bucket or blue from the second bucket?

4. What is the probability of choosing red from the first bucket and yellow from the second bucket?

5. What is the probability of choosing red from the first bucket or yellow from the second bucket?

6. What is the probability of choosing two colors that are not blue?

7. What is the probability of choosing two unique colors?

8. What is the probability of choosing two of the same color?

9. What is the probability of choosing two different primary colors?

10. What is the probability of choosing two different colors that are not primary colors?

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Extension

1. In a popular board game, if you roll doubles on two 6-sided number cubes, you roll again. However, if you roll doubles three times in a row, you lose your turn and are further penalized. Determine the probability of rolling three doubles in a row.

Spaced Practice

1. Catalina has 3 shirts and 2 pairs of pants in her drawer. She has 2 red shirts and a blue shirt. The pants are a pair of jeans and a pair of khakis.

   a. What is the probability that she picks a red shirt with khakis at random?

   b. What is the probability that she picks the blue shirt and jeans at random?

2. Construct a probability model for rolling a 8-sided polyhedron.

   Is the probability model a uniform probability model? Explain your reasoning.

3. Determine each difference. Show your work.

   a. $-9\frac{3}{4} - 10\frac{7}{10}$

   b. $-34.9 - (-71.2)$

Use the Family Budge Estimator to answer Questions 4 and 5.

4. Suppose the Jackson family is a family of three. Use the Family Budget Estimator to determine the minimum household budget needed for a family of three to meet its basic needs in your region of the state.

5. Use the Family Budget Estimator to determine the average hourly wage necessary to earn enough money to support a family of three in your region of the state.

IV. Simulating Probability of Compound Events

Topic Practice

A. The probability that a Chihuahua puppy is born with brindle fur is $\frac{1}{6}$. Suppose you want to determine the probability that at least 1 out of 2 Chihuahua puppies has brindle fur.

1. What might be a good simulation tool to determine the probability that a Chihuahua puppy is born with brindle fur?

2. Describe how you would assign outcomes in the simulation.

3. Describe one trial of the simulation.

4. Conduct 20 trials of the simulation and record the results in the table.

Trial Number	Outcome	Number of Times the Cube Showed Number 1

Trial Number	Outcome	Number of Times the Cube Showed Number 1

5. According to your simulation, what is the probability that at least 1 out of 2 Chihuahua puppies has brindle fur?

6. Suppose you collected data on 100 litters of Chihuahua puppies. Predict the number of litters that would have more than 1 Chihuahua puppy with brindle fur.

B. The table displays data collected over the last month showing the percent of days each bus was late to school.

Bus 1	Bus 2	Bus 3	Bus 4
22%	28%	31%	19%

1. Use the data to predict the likelihood that bus 2 will be late to school tomorrow.

2. Use the data to predict the likelihood that bus 2 or 4 are late to school tomorrow.

3. Suppose you want to determine the probability that bus 3 will be late in the next 5 school days. Use a random number to run a simulation. Assign the numbers 00–21 to represent bus 1, 22–49 for bus 2, 50–80 for bus 3, and 81-99 for bus 4. One trial of the simulation consists of choosing five 2-digit numbers. Run 5 trials of the simulation. Record the data from your simulation in the table shown.

Random Number Table										
Line 1	65285	97198	12138	53010	94601	15838	16805	61404	43516	17020
Line 2	17264	57327	38224	29301	18164	38109	34976	65692	98566	29550
Line 3	95639	99754	31199	92558	68368	04985	51092	37780	40261	14479
Line 4	61555	76404	86214	11808	12840	55147	97438	60222	12645	62090
Line 5	78137	98768	04689	87130	79225	08153	84967	64539	79493	74917

Trials	Two-digit Numbers Selected	Number of Times Bus 3 Occurred

4. According to your simulation, what is the probability that bus 3 will be late in the next 5 school days? Interpret your results for this situation.

5. What would happen if you repeated the simulation using different lines of the random number table?

6. What do you think would happen if you ran the simulation 100 more times?

Extension

1. In this lesson, you have simulated the probabilities from what is known as binomial distributions or geometric distributions. Research each type of probability distribution. Explain the relationship between your research and the concepts learned in this lesson.

Spaced Practice

1. Lauren has a set of alphabet tiles. She puts the tiles representing the six letters of her name into a bag. Suppose Lauren selects a tile without looking, puts it back, and then selects a second tile without looking.

   a. What is the probability that she selects an *A* and an *N*?

   b. What is the probability that she selects an *A* or an *N*?

2. A local eatery noticed that there were anywhere from 0 to 4 double yolk eggs in each carton.

   Today the eatery opened and used 12 cartons of eggs.

   - 8 cartons contained no double yolk eggs.
   - 1 carton contained one double yolk egg.
   - 1 carton contained two double yolk eggs.
   - 1 carton contained three double yolk eggs.
   - 1 carton contained four double yolk eggs.

   Determine the probability that the next carton of eggs the eatery opens will contain 4 double yolk eggs.

   a. Design a probability model by creating a table.

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b. What could be a good model for using simulation to estimate the probability that a carton of eggs contains an egg with double yolks?

c. Describe one trial of the simulation.

b. How many trials do you think you would need to conduct for the experimental probability to approach the theoretical probability?

3. Determine each quotient.

a. $-4\frac{5}{8} \div 5\frac{1}{2}$

b. $-102.9 \div -3.3$

Name _____ Date _____

I. Collecting Random Samples

Topic Practice

A. Determine whether each survey result is a parameter or a statistic.

1. According to an online poll, 65% of Americans live in a single-family home.

2. According to Ms. Tanaka's survey of the students in her class, 50% of her students have at least one dog.

3. A local journal conducted a survey. Of the 1800 subscribers, 1354 responded. Based on the survey, the journal concludes that 75% of subscribers will renew their subscriptions next year.

4. According to a random telephone survey of 1000 residents of Jackson County, 43% of the residents of Jackson County eat out at a restaurant more than once per week.

5. Mr. Flores gives a survey to all of the students in his music classes. He concludes that 85% of music class students would like to attend a live musical in the city.

6. The state police set up a roadblock on Highway 31 to determine how many drivers wear their seatbelts. They conclude that eight out of every ten drivers in Georgia wear their seatbelts.

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B. Determine whether the data collected in each survey represent a census or a sample.

1. Ms. Lopez concludes that 76% of the students in the school have at least one sibling after she conducts a survey of her class.

2. Nakota reports that one out of every five players on the boys' varsity basketball team can dunk a basketball after he conducts a survey of the players on the team.

3. After examining 24 loaves of bread at a local grocery store, Lucia concludes that two loaves out of every 24 are multi-grain bread.

4. James surveys each of the teachers in his school. He concludes that 64% of the teachers in his school enjoy reading as a hobby.

5. After surveying each member of the Math Club, Catalina reports that four out of every five members has a graphing calculator.

6. Joey surveys each of the students in his seventh-grade class. He concludes that 50% of all seventh-graders have at least one sibling.

C. Determine if each given sample is random or not random. Explain your reasoning.

1. Ricardo chooses each player on his basketball team whose name has five letters to participate in a survey about school sports.

2. Mr. Tanaka chooses the first seven students to raise their hands in his math class to participate in a survey.

3. Ms. Brown, the Drama Club teacher, writes the names of each of the fifteen team members on separate slips of paper. She puts the slips of paper inside a bag, shakes it, and selects three slips of paper without looking. The three members whose names are selected will complete a survey about the Drama Club.

4. Ms. Patel has 36 students in her English class. The students are seated in 6 rows. The students in each row are assigned a different number 1 through 6. Ms. Patel rolls a 6-sided number cube to select a row. She rolls it again to select one of the students in that row. The selected student is given a survey about Ms. Patel's English class.

5. A local coffee shop is conducting a survey to gather information about the coffee consumption of the town's residents. They hand a survey to the first 50 customers of the day.

6. Customers at the local grocery store can win a $25 gift card for throwing a bull's-eye on the dart board after they check out. Winners are also given a survey about their shopping experience at the grocery store.

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D. Use Ms. Davis's Class List and the Random Number Table at the end of this Skills Practice to answer each question.

Ms. Davis's Class List of 6th- and 7th-Graders			
Student Name	Student Number	Student Name	Student Number
Michael (6)	11	Gabriela (6)	21
Olivia (6)	12	Hannah (7)	22
Javier (7)	13	Madison (6)	23
Fernando (7)	14	William (7)	24
Alexander (7)	15	Ana (7)	25
Jacob (6)	16	Maria (7)	26
Amir (6)	17	Abby (6)	27
Daniela (6)	18	Angel (7)	28
Koda (7)	19	Luis (7)	29
Destiny (6)	20	Malik (6)	30

1. The students in Ms. Davis's class are each given a student number (11 through 30) as shown in the class list. Use line 14 of the Random Number Table to determine the first four random student numbers.

2. Ms. Davis randomly selects 3 students in her class according to their student number. She uses line 18 of the Random Number Table. What are the students' names?

3. Ms. Davis randomly selects 3 sixth-graders in her class using line 8 of the Random Number Table. What are the students' names?

4. Ms. Davis randomly selects 3 seventh-graders in her class using line 10 of the Random Number Table. What are the students' names?

5. Ms. Davis randomly selects 2 seventh-graders in her class using line 20 of the Random Number Table. What are the students' names?

6. Ms. Davis randomly selects 2 sixth-graders in her class using line 15 of the Random Number Table. What are the students' names?

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Extension

1. Variations of random samples are often preferred to truly random samples. Two variations are called *stratified random samples* and *systematic random samples*. Research each type of random sampling. Define each type of sample and give an example, perhaps from the lesson, of when each might provide a more representative sample than a truly random sample.

Spaced Practice

1. A soccer player makes 4 out of every 5 penalty shots she attempts.

    a. What might be a good model for simulating the number of shots the soccer player makes in when attempting 4 penalty shots?

b. Describe how you would assign outcomes and then describe one trial of the simulation.

c. Conduct 20 trials of the simulation and record your results in a table.

d. According to your simulation, what is the probability that the soccer player makes exactly 3 out of the next 4 penalty shots?

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2. Linh spins 2 spinners. The first spinner is divided into 4 equal sections, and each is labeled with a perfect square (4, 9, 16, 25). The second spinner is divided into 5 equal sections, and each is labeled with an even number (2, 4, 6, 8, 10).

   a. Create an array to illustrate the possible products of the result of spinning both spinners.

   b. What is the probability that the product is a perfect square?

   c. What is the probability that the product is a perfect cube?

d. What is the probability that the product is a multiple of 10?

3. Solve each equation for the unknown.

a. $7 - 2(3t + 9) = -47$

b. $-2.5 = \frac{(5.5h - 7)}{1.5 + 4}$

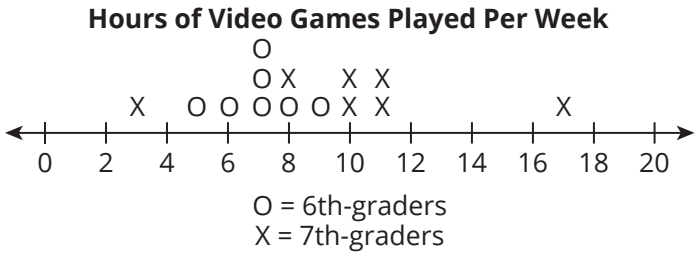
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II. Using Random Samples to Draw Inferences

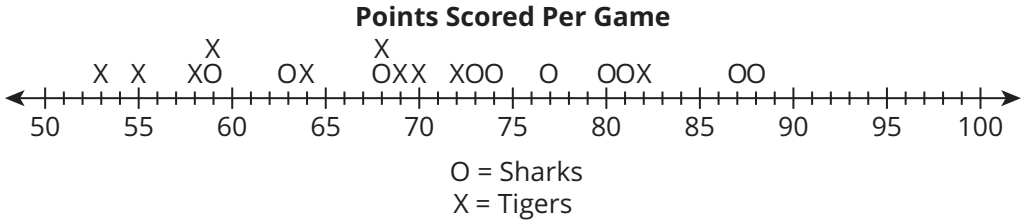
Topic Practice

A. Describe the distribution of each dot plot. Then, determine the mean for both data sets.

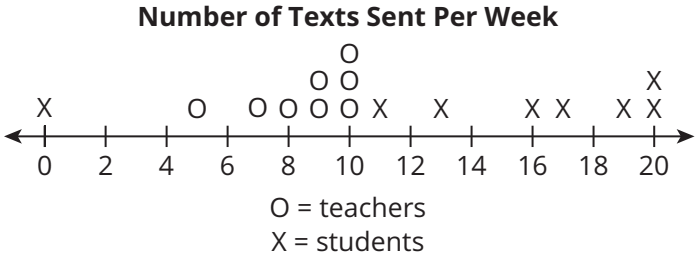
1. The dot plot shows the number of hours of video games per week played by 6th-graders and 7th-graders.



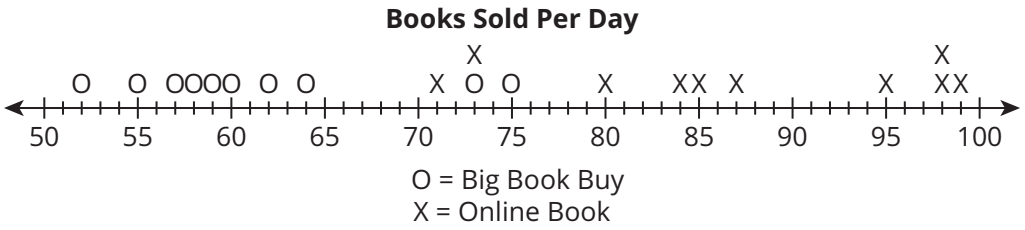
2. The dot plot shows the total points earned per game by two different teams.



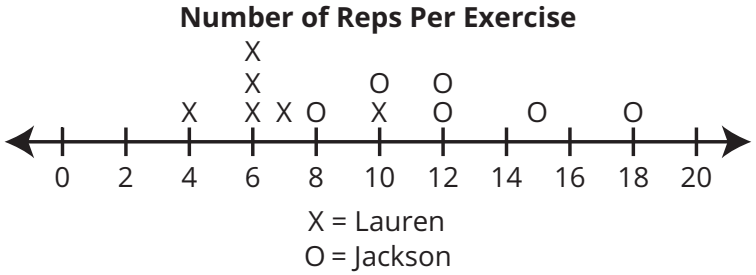
3. The dot plot shows the number of texts sent per week by teachers and students.



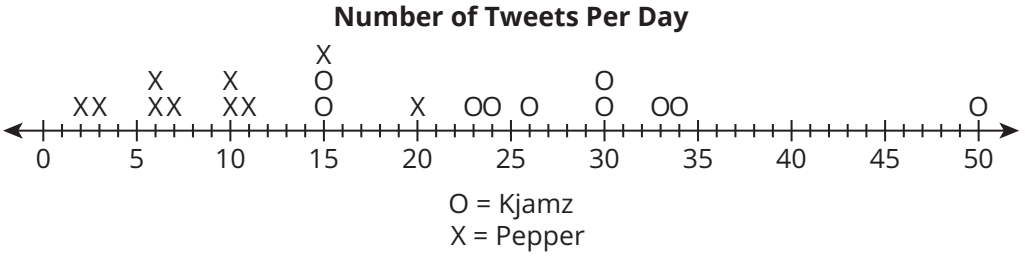
4. The dot plot shows the number of books sold per day by two different book sellers.



5. The dot plot shows the number of reps performed per exercise by Lauren and Jackson.



6. The dot plot shows the number of tweets sent per day by two celebrities.



B. Sample Class Data from Mr. Hernandez's Math class is shown. Use the data and the random number generator tool to answer each question.

Mr. Hernandez's Math Class			
Student Number	Student Name	Number of Siblings	Number of Pets
11	Isabella	1	3
12	Ethan	0	0
13	Samuel	1	1
14	Harper	0	4
15	Diego	0	0
16	Sofia	5	4
17	Daniel	0	1
18	Chloe	2	3
19	Juan	1	2
20	Mia	0	1
21	Jayden	1	3
22	Mateo	1	6
23	Minh	3	3
24	Victoria	1	6

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Mr. Hernandez's Math Class			
Student Number	Student Name	Number of Siblings	Number of Pets
25	Liam	2	3
26	Elijah	0	1
27	Aaliyah	0	2
28	Kai	1	0
29	Ava	3	4
30	Emma	2	7

1. Mr. Hernandez wants to know the mean number of siblings his students have. He chooses the students with student numbers 11 through 15 as his sample. Determine the mean number of siblings for the students in this sample.

2. Select a random sample of 5 students using a random number generator tool. Determine the mean number of siblings for the students in your sample.

3. Determine the actual mean number of siblings for the 20 students in Mr. Hernandez's class.

4. Mr. Hernandez wants to know the mean number of pets his students have. He chooses the first 5 students to voluntarily raise their hands as his sample. The students selected are Sofia, Chloe, Mateo, Victoria, and Liam. Determine the mean number of pets for the students in this sample.

5. Select a random sample of 5 students using a random number generator tool. Determine the mean number of pets for the students in your sample.

6. Determine the actual mean number of pets for the 20 students in Mr. Hernandez's class.

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C. Use the data provided to answer each set of questions.

Two students are volunteering at their local hospital. The table shows the data collected for each of their volunteer hours over ten weeks.

Miguel	Alejandra
5	5
9	6
8	3
9	4
7	6
8	5
9	8
9	9
6	6
8	7

1. Create a dot plot to show the number of volunteer hours worked for each student over ten weeks. Be sure to provide a title and a key.

2. Describe the distribution of each data set.

3. Determine the mean number of volunteer hours worked per week for each student.

4. Predict the number of volunteer hours worked for each student at 24 weeks.

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5. Predict the number of volunteer hours worked for each student over one year (52 weeks).

Students are participating in a fundraiser to raise money for the school. The table shows the data collected from ten students for sales in the month of October.

Raffle Tickets Sold	Candy Bars Sold
24	9
15	8
35	0
28	12
30	15
11	5
30	3
32	26
8	20
27	12

6. Create a dot plot to show the items sold in the month of October. Be sure to provide a title and a key.

7. Describe the distribution of each data set.

8. Determine the mean number of each item sold in the month of October.

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9. Predict the number of each item sold in the month of October by 150 students.

10. Predict the number of each item sold by one student over the course of 6 months.

Extension

Design a simulation that takes 100 samples of size 25 from a population in which 42% of the members of the population have a particular characteristic (e.g., blood group). Formulate a question and collect the data. For each sample, compute the percentage of observations with the given characteristic. Then, analyze your results: summarize your sample percentages in a table and on a dot plot. Interpret the results: What are some predictions or generalizations about the population parameter based on your sample?

Spaced Practice

1. Ms. Patel, the sponsor of the spirit team, wants to survey the team about upcoming events. Which sampling methods would result in representative samples? Explain your reasoning.

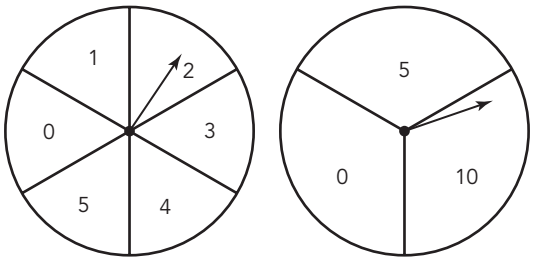
   a. Surveying the first 5 members who arrive at the volleyball game.

   b. Drawing 5 names from a box that contains the names of all the members and surveying those 5 members.

   c. Surveying the 5 members who have been members the longest.

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2. Nicky spins each spinner one time. He determines the product of the two numbers.



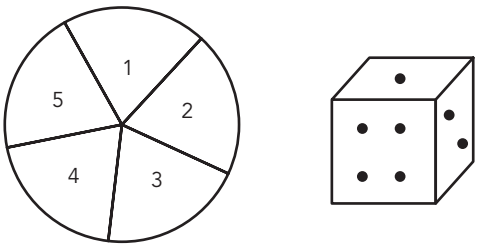
a. Create an array to illustrate the possible products.

b. What is the sample space?

c. Determine *P*(multiple of 10).

d. Determine *P*(0).

3. A game requires spinning a spinner numbered 1 through 5 and rolling a six-sided number cube.



a. Determine the possible outcomes for playing the game.

b. What is the probability of spinning an even number and rolling an even number?

c. What is the probability of spinning a 5 or rolling a 5?

4. Evaluate the expression $1.2(x + 0.9) - 10.8$ for each unknown.

a. $x = -5.5$

b. $x = 8.9$

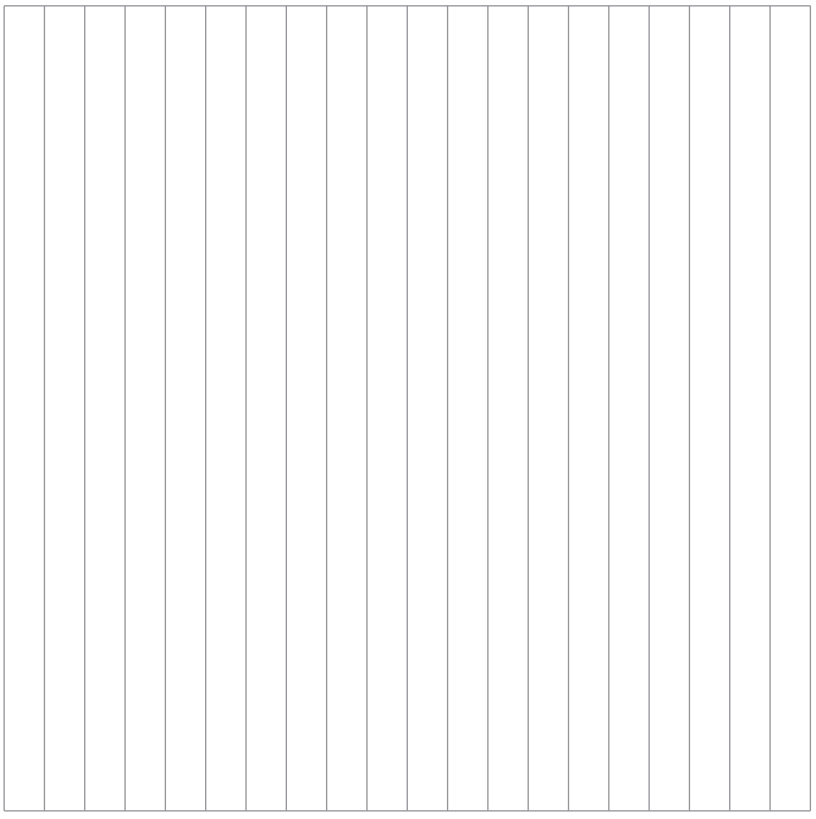
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III. Bar Graphs

Topic Practice

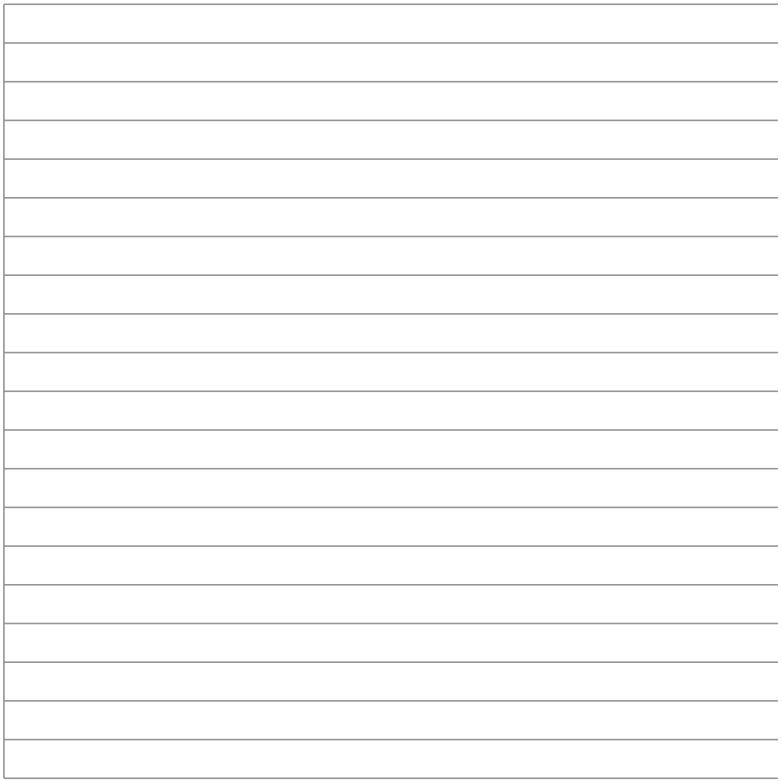
A. Use the given information to create each graph.

1. a. Create a single bar graph to display the scores of five students on a recent math quiz. Xavier scored 18; Ben scored 14; Antonio scored 16; Hailey scored 20; and Brianna scored 15.



b. Which student scored an 80% on their math quiz?

2. a. Create a single bar graph to display the number of pets owned by each of the following students. Gracie has 4 pets, Nia has 7 pets, Juliana has 3 pets, and Omar has 5 pets.



b. How many more pets does Nia have than Juliana?

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3. The table displays the number of hours spent watching television during the weekdays and during the weekend for five students last week.

Name	Number of Hours Watching TV During the Weekdays	Number of Hours Watching TV During the Weekend
Catalina	12	6
James	14	4
Ricardo	6	0
Linh	8	3
Jackson	10	5

a. Create a double bar graph that displays the number of hours spent watching television during the weekdays and during the weekend for five students last week.

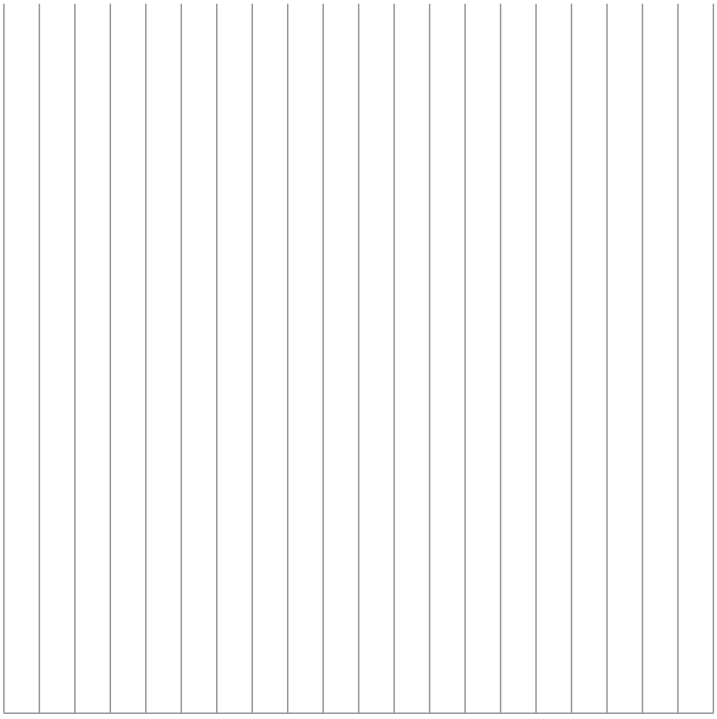
b. Which student(s) has an amount of weekend TV watching hours that is 50% of their amount of weekday TV watching hours?

4. The table displays the number of hours spent watching television during the weekdays and during the weekend for five students last week.

Name	Number of Hours Watching TV During the Weekdays	Number of Hours Watching TV During the Weekend
Catalina	12	6
James	14	4
Ricardo	6	0
Linh	8	3
Jackson	10	5

a. Create a stacked bar graph that displays the number of hours spent watching television during the weekdays and during the weekend for five students last week.

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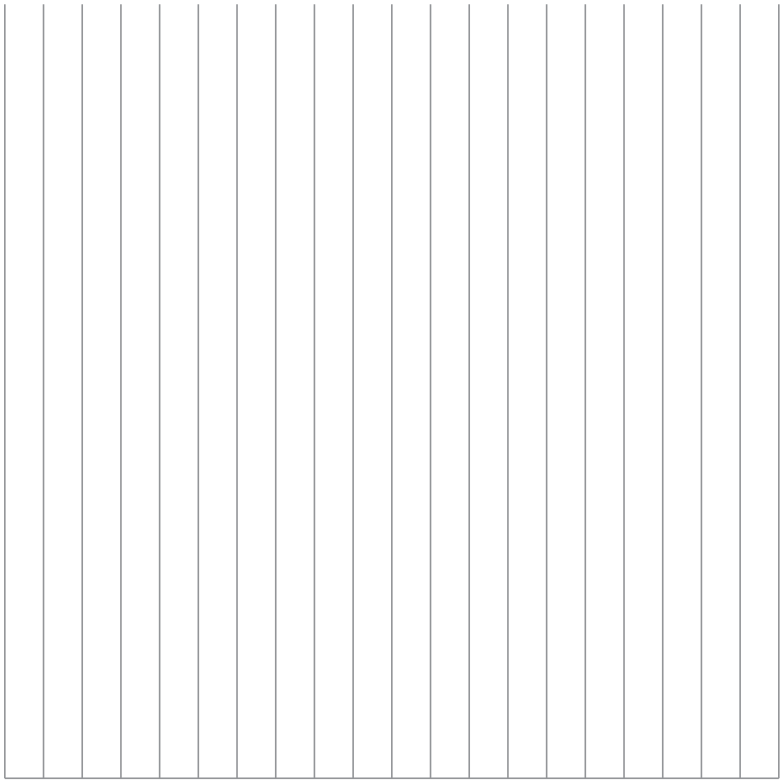


b. What percentage of students watch less than 9 hours of TV on weekdays?

5. The table shows the votes for this years prom theme.

Prom Theme	Number of Junior Votes	Number of Senior Votes
On Cloud Nine	20	25
Texas Rodeo	30	35
Enchanted Ball	10	20
A Night in the 60s	15	25

a. Create a double bar graph to display the results of the prom theme vote.



b. Write a comparative statement about Juniors and Seniors that would be supported by your double bar graph.

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6. The table shows the votes for this year's prom theme.

Prom Theme	Number of Junior Votes	Number of Senior Votes
On Cloud Nine	20	25
Texas Rodeo	30	35
Enchanted Ball	10	20
A Night in the 60s	15	25

a. Create a stacked bar graph to display the results of the prom theme vote.

b. Write a comparative statement about Juniors and Seniors that would be supported by your stacked bar graph.

7. A softball coach wanted to order new softball jerseys. He asked students to vote on their preferred jersey color. The results are shown in the table.

Preferred Color	Number of Votes
Navy Blue	16
Maroon	29
Gold	21
Black	34

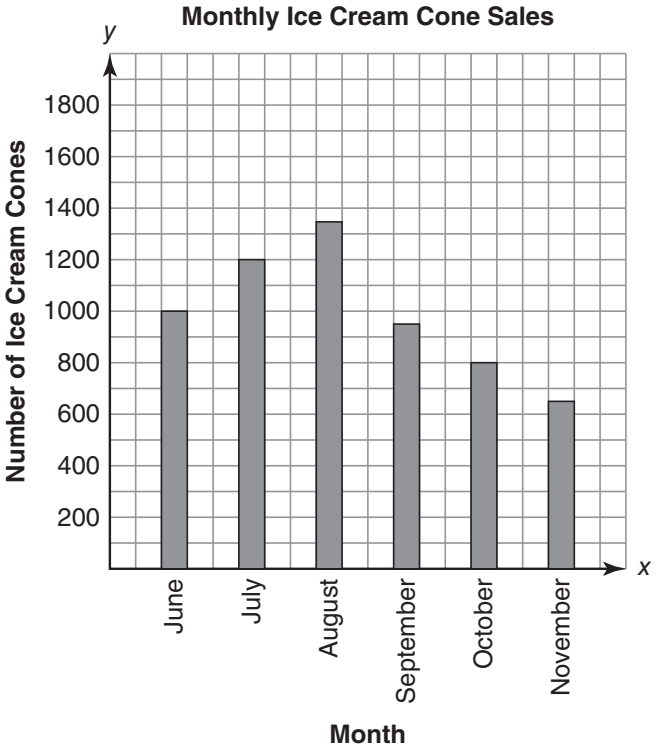
a. Create a circle graph to represent the data. Be sure to include a title and labels.

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b. What fraction of students prefer black or gold jerseys?

B. Analyze the given graph to answer each problem.

1. The bar graph shows the number of ice cream cones sold each month at an ice cream parlor.

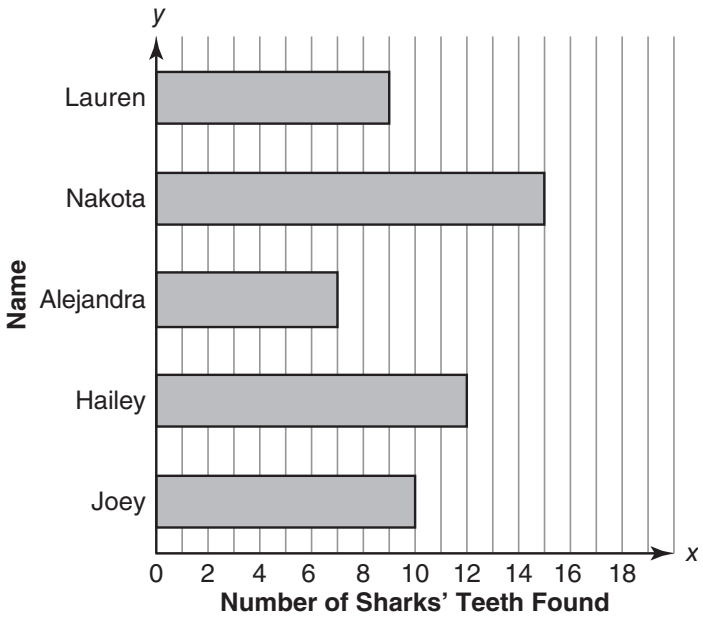


a. In which of the six months did the ice cream parlor sell the fewest ice cream cones? How many did they sell in that month?

b. In which of the six months did the ice cream parlor sell the most ice cream cones? How many did they sell in that month?

c. How many total ice cream cones did the ice cream parlor sell during the six month period represented in the graph?

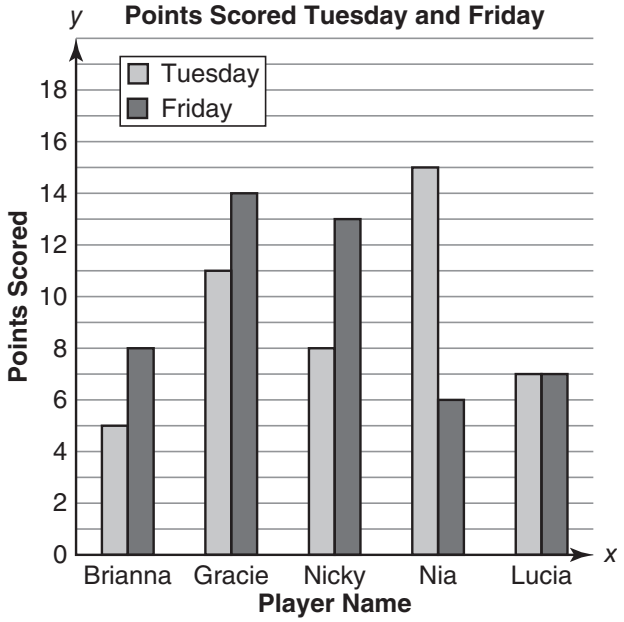
2. On a recent trip to a beach in southern Florida, five friends competed to see who could find the most sharks' teeth. Their results are displayed in the bar graph.



a. Who found the most sharks' teeth? How many teeth did that person find?

b. How many total sharks' teeth did the five friends find?

3. The double bar graph shows the scores of the five starters on the girls' basketball team for their Tuesday and Friday games.

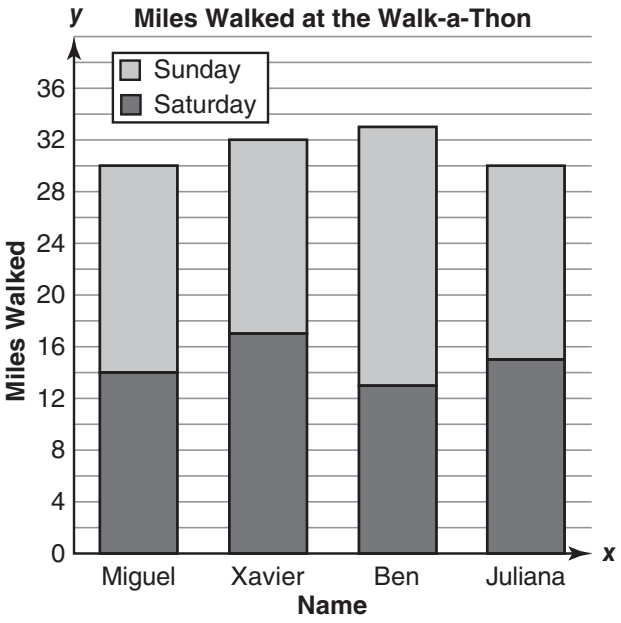


a. Which player scored fewer points during Friday's game than she did during Tuesday's game?

b. Which player scored the most total points during the two games? How many points did that player score?

c. Determine the average number of points scored by the five starters during Friday's game.

4. Four students participated in a Walk-a-Thon to raise money for a charity. The distances each student walked on Saturday and Sunday are displayed in the stacked bar graph.

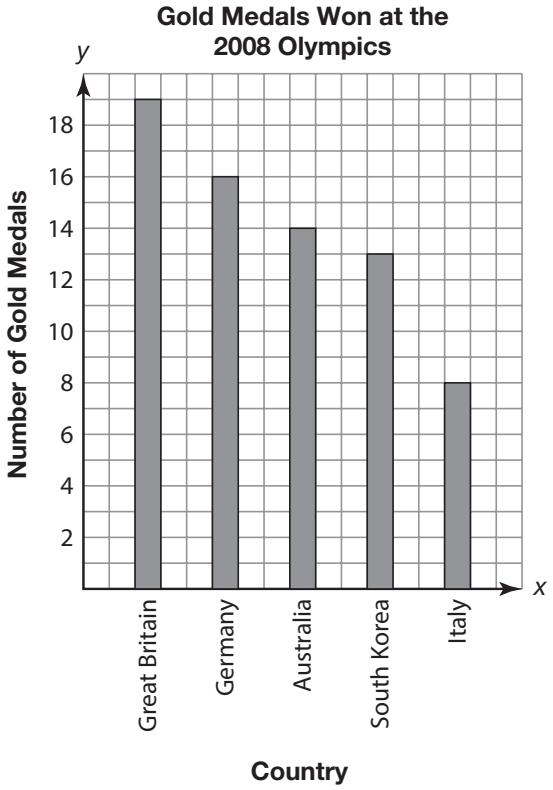


a. Who walked the most miles on Saturday? How many miles did that person walk on Saturday?

b. Who walked the most total miles during the Walk-a-Thon? How many total miles did that person walk?

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5. The bar graph represents the number of gold medals won by 5 countries at the 2008 Summer Olympics.

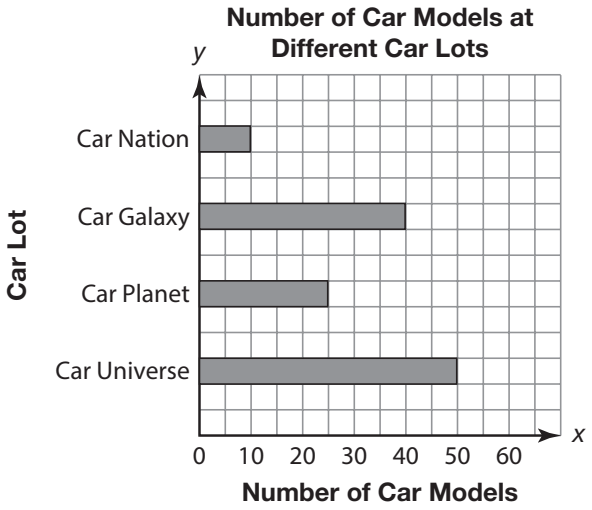


a. Which country won 13 gold medals at the 2008 Summer Olympics?

b. How many more gold medals did Germany win than Italy at the 2008 Summer Olympics?

c. How many gold medals did Great Britain win at the 2008 Summer Olympics?

6. The bar graph represents the number of different car models available at each car lot.

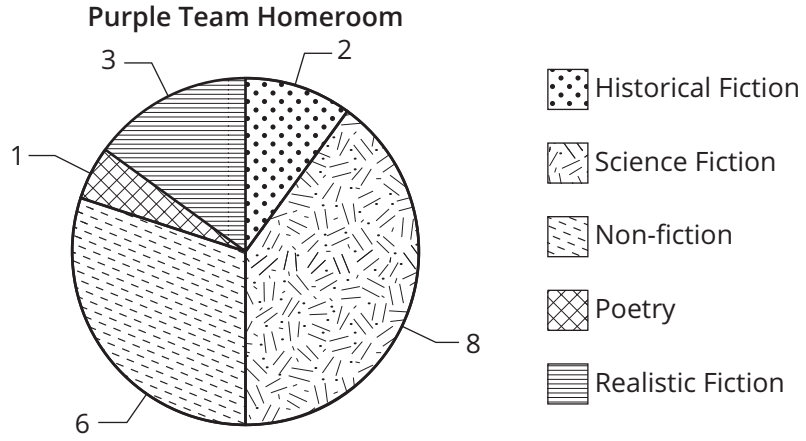


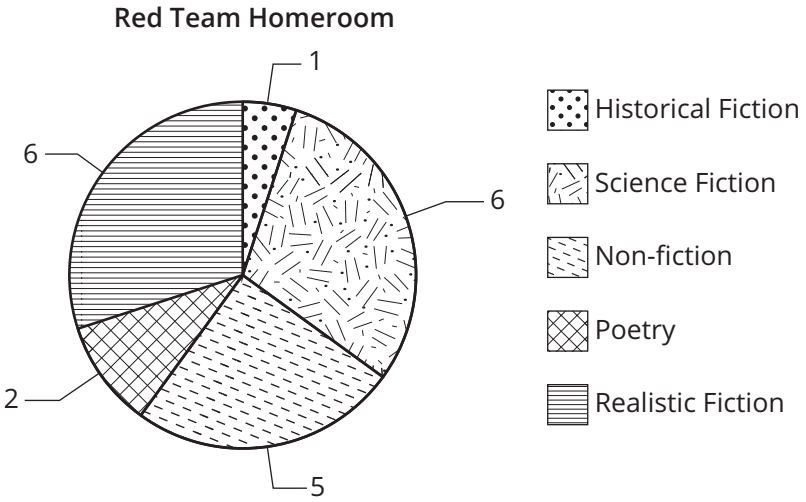
a. Which car lot has 25 different car models?

b. What is the difference between the car lot with the most car models and the car lot with the least car models?

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7. A middle school surveyed students in seventh-grade about their favorite book genre. The data collected for two homerooms is shown in the circle graphs.





a. Compare the data in both circle graphs. What is the most popular book genre in each classroom? What is the least popular book genre in each classroom?

b. If the Purple Team's homeroom has 28 students, how many prefer either science fiction or historical fiction?

c. About 30% of the students in the Red Team homeroom prefer realistic fiction. If there are 27 students in the Red Team homeroom, how many prefer realistic fiction?

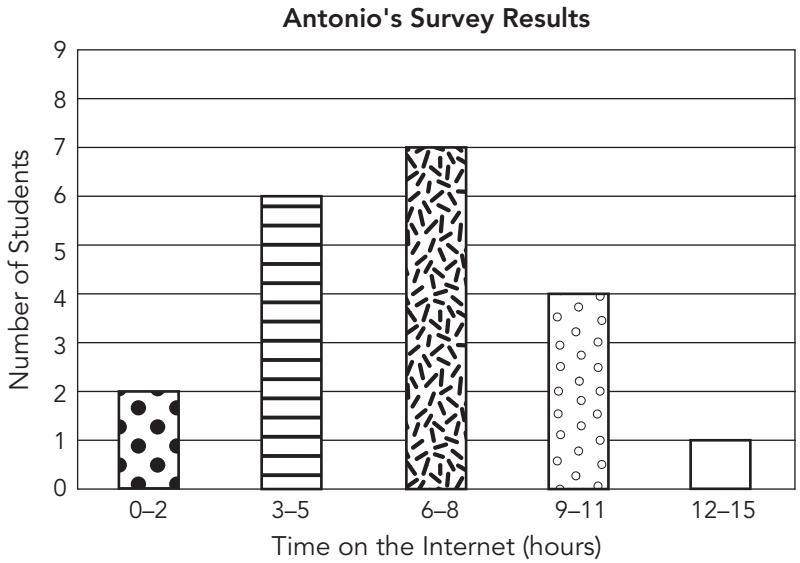
Extension

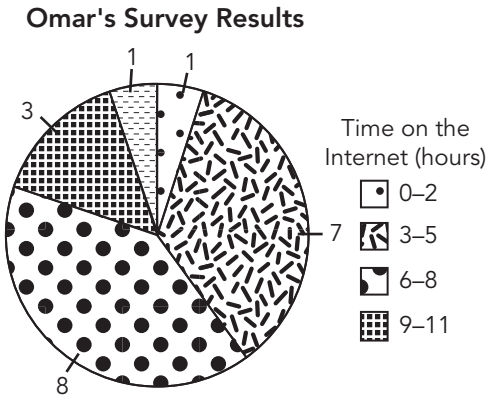
Construct a bar graph to represent each data set shown in the table.

Antonio and Omar want to determine the number of hours 7th-grade students spend on the Internet each week. They decide to collect data from a sample of the 7th-grade population at school.

- Antonio surveys twenty 7th-grade students whose student ID number ends with 2.
- Omar surveys twenty 7th-grade students whose student ID number ends with 5.

Antonio and Omar's survey results are represented in the graphs shown.





1. Which sample is a better representation of the 7th-grade population? Explain your reasoning.

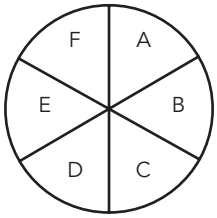
2. Which student's graph is a better visual representation of the number of hours 7th-grade students spend on the Internet each week?

3. Identify and explain the advantages and disadvantages of each visual representation.

Spaced Practice

Determine each compound probability. Show your work.

A spinner has 6 equal parts labeled with the letters A through F.



1. What is the probability that the next spin is an *A* or *B*?

2. What is the probability that the next spin is a vowel?

3. What is the probability that the next spin is not C?

4. What is the probability that the next spin is a consonant?

5. What is the probability that the next spin is a *D*, *E*, or *F*?

6. What is the probability that the next spin is not an *A* or *B*?

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IV. Comparing Two Populations

Topic Practice

A. Use the data provided to answer each set of questions.

Michael claims that he spends less money than his sister Olivia, so the siblings decide to track their spending. The table shows the amount of money each sibling spent per week for a total of ten weeks.

Michael	Olivia
10	18
6	15
15	16
9	17
12	10
5	13
10	17
11	18
10	17
7	9

1. Create a dot plot to show the weekly spending for each sibling. Be sure to provide a title and a key.

2. Describe the distribution of each data set.

3. Determine the median of each data set.

4. Determine the mean of each data set.

5. Which measure of center is most useful in this situation?

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6. Compare the difference in the means. Interpret the difference in terms of this problem situation.

7. What can you conclude about the data based on your observations?

A car dealership is trying to gather information to determine when cars are most likely to be sold. Salesperson A works evenings, and Salesperson B works during the day. The table shows the number of cars each salesperson sold during their shift each month for ten months.

Salesperson A	Salesperson B
18	5
10	6
9	4
12	10
17	9
18	7
20	6
14	6
18	2
17	5

8. Create a dot plot to show the monthly car sales for each salesperson. Be sure to provide a title and a key.

9. Describe the distribution of each data set.

10. Determine the median of each data set.

11. Determine the mean of each data set.

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12. Which measure of center is most useful in this situation?

13. Compare the difference in the means. Interpret the difference in terms of this problem situation.

14. What can you conclude about the data based on your observations?

B. Use the data provided to answer each set of questions.

Two 7th-grade teachers wanted to compare math test scores for students in their classes. Each teacher used a random sample of 10 students in their first period class. The data is shown in the table.

Ms. Ramirez	Mr. Davis
85	88
78	90
77	93
90	84
91	85
93	92
76	95
91	90
79	79
86	89

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1. Create a stem-and-leaf plot to show the math test scores for the sample of students from each teacher's classroom. Be sure to provide a title and a key.

2. Describe the distribution of each data set.

3. Determine the five-number summary for each data set.

	Ms. Ramirez	Mr. Davis
Minimum		
Q1		
Median		
Q3		
Maximum		
Interquartile Range (IQR)		

4. Use the five-number summary to interpret and compare the math test scores from each classroom.

5. What can you conclude about the data based on your observations?

The Patel family was trying to decide between two cities for their next vacation. They looked up the daily temperature highs for each city over the course of ten days. The table shows the temperature highs, in degrees Fahrenheit, for each city.

Sunnyville	Cooltown
68	72
70	69
75	63
80	58
76	70
75	50
77	63
69	52
75	54
81	53

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6. Create a stem-and-leaf plot to show the daily high temperatures for each city. Be sure to provide a title and a key.

7. Describe the distribution of each data set.

8. Determine the five-number summary for each data set.

	Sunnyville	Cooltown
Minimum		
Q1		
Median		
Q3		
Maximum		
Interquartile Range (IQR)		

9. Use the five-number summary to interpret and compare the math test scores from each classroom.

10. What can you conclude about the data based on your observations?

Extension

1. Write at least two different data sets for which the following five-number summary is accurate. Minimum: 3, Quartile 1: 14, Median: 20, Quartile 3: 35, Maximum: 82

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Spaced Practice

1. Joey is using a computer program to randomly generate a digit from 1 to 6. Which statement most accurately describes how many times Joey's program will generate a 3 if he runs it 300 times? Explain your choice.

   a. exactly 50 times

   b. approximately 50 times

   c. exactly 100 times

   d. approximately 100 times

2. The school cafeteria has a hot food line and a cold food line for both breakfast and lunch. The cafeteria manager wants to estimate the percentage of students who select their meals from the hot food line. The manager collected data from the first 50 students who arrive for lunch and determined that 42% of students select their meals from the hot food line. Which statement is true about the cafeteria manager's sample? Explain your choice.

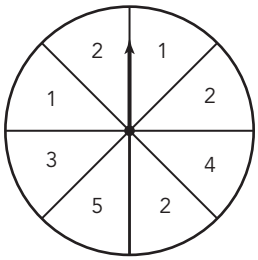
   a. The sample is the percent of students who select foods from the hot food line.

   b. The sample shows that exactly 42% of the student body selects food from the hot food line.

   c. The sample might not be representative of the population because it only included the first group of lunch students.

   d. The sample size is too small to make any generalizations.

3. The spinner is divided into 8 equal sections. Determine each probability.



   a. *P*(greater than 3)

   b. *P*(not greater than 3)

4. Determine each difference.

   a. $-7.7 - (-77.7)$

   b. $4\frac{1}{5} - 10\frac{3}{4}$

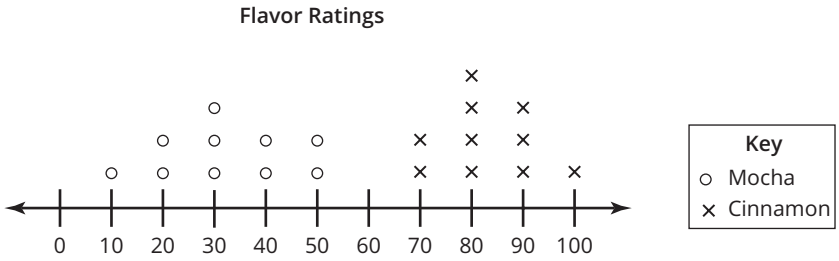
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V. Using Random Samples from Two Populations to Draw Conclusions

Topic Practice

A. Use the data provided to answer each set of questions.

A local bakery recently added two new flavors of cupcake to their selection—mocha and cinnamon. The store randomly selected 20 customers and asked them to rate the flavors on a scale of 0 to 100. The results of the survey are shown in the dot plot.

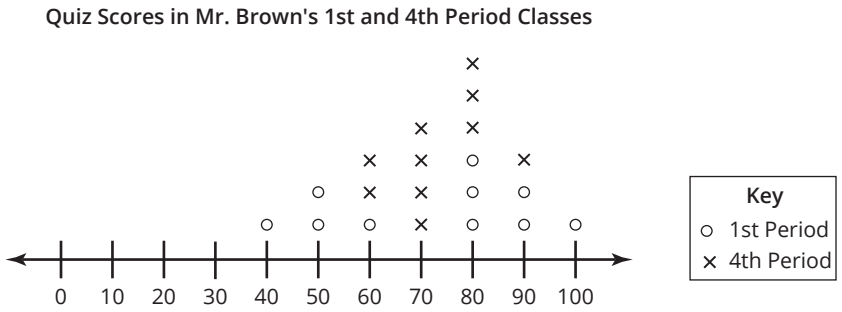


1. Describe the distribution of each data set.

2. Determine the mean for each data set.

3. Compare the shapes, spreads, and measures of center for each flavor. What can you conclude about the two new cupcake flavors?

Mr. Brown randomly selected ten students each from his first and fourth period math classes and used their quiz scores to create the dot plot shown.



4. Describe the distribution of each data set.

5. Determine the mean for each data set.

6. Compare the shapes, spreads, and measures of center for each class. What can you conclude about the math scores of the students in each class period?

B. Use the five-number summaries to create box plots for both given data sets on the same number line.

1.

Minimum	4	1
Q1	6	3
Median	8	4
Q3	10	7
Maximum	12	15
IQR	4	4

2.

Minimum	0	3
Q1	10	8
Median	15	10
Q3	17	11
Maximum	20	17
IQR	7	3

3.

Minimum	25	10
Q1	35	20
Median	40	25
Q3	45	45
Maximum	50	50
IQR	10	25

4.

Minimum	1	5
Q1	2	7
Median	3	10
Q3	4	13
Maximum	11	18
IQR	2	6

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5.

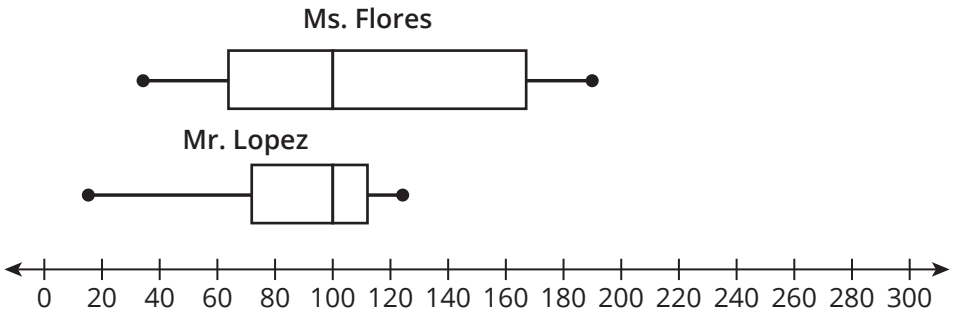
Minimum	0	0
Q1	15	5
Median	35	10
Q3	37	12
Maximum	40	25
IQR	22	7

6.

Minimum	40	10
Q1	60	40
Median	70	70
Q3	80	80
Maximum	100	100
IQR	20	40

C. Use the data provided to answer each set of questions.

Ms. Flores and Mr. Lopez randomly survey 20 students in each of their classes to determine the number of minutes that students spend watching television each day. The data is shown on the box plots.

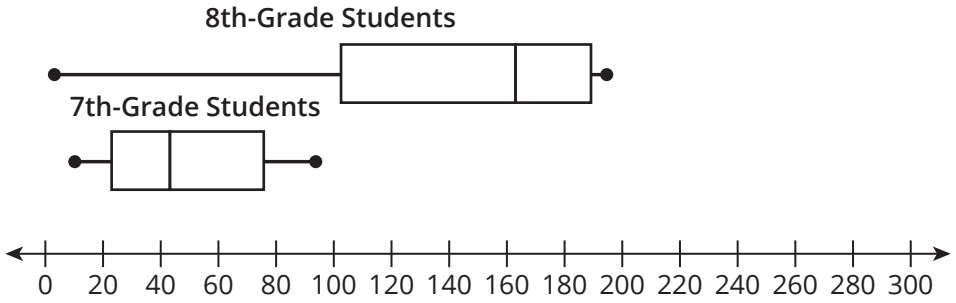


1. Describe the distribution of each data set.

2. Determine the median for each data set.

3. Compare the shapes, spreads, and measures of center for each class. What can you conclude about the television watched by students in each class?

A local journal surveyed middle school students to determine the number of texts each student sends per day. The journal selected a random sample of 20 seventh- and 20 eighth-graders. The data is shown on the box plots.



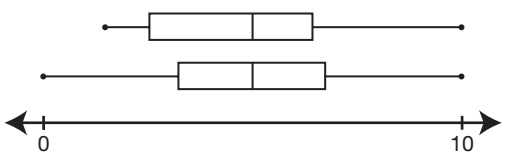
4. Describe the distribution of each data set.

5. Determine the median for each data set.

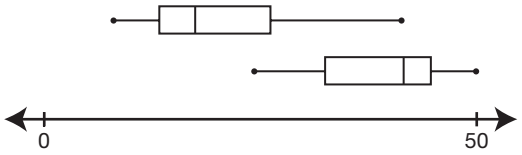
6. Compare the shapes, spreads, and measures of center for each grade. What can you conclude about the texts messages sent per day by students in each grade?

D. Compare the box plots in each data display and describe the variation.

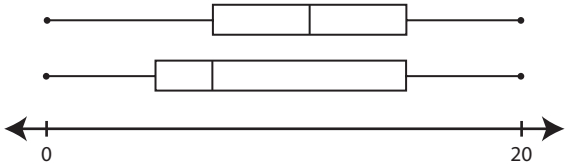
1.



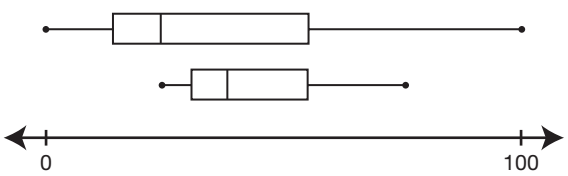
2.



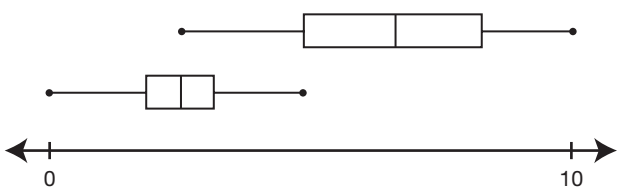
3.



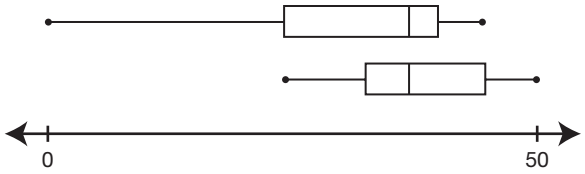
4.



5.



6.



Extension

1. Conduct your own experiment! Collect data from samples drawn from two populations. Then, analyze the data and report on your findings.

Spaced Practice

A spinner has 6 equal sections, labeled 1 through 6. Determine each compound probability.

1. What is the probability that the next spin is a 2 or a 5?

2. What is the probability that the next spin is a 1, 2, or 3?

Evaluate each expression for $x = -0.5$.

3. $x^4 + x^3$

4. $-x^4 - x^3$

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5. Huyen is purchasing a new sweater. She has two coupons for a local clothing store, but she can only use one of the coupons. One coupon is for 25% off the list price of any article of clothing. The other is for $10 off. The list price of the sweater Huyen wants is $34.95. Which coupon should Huyen use to get the best deal?

6. Malik needs a new bookshelf for his room. The one he likes is available at two different stores. Store A sells the bookshelf for $137.99 but is having a sale for 15% off that price. Store B sells the bookshelf for $159.99 and Malik has a coupon for 25% off that price.

Random Number Table										
Line 1	65285	97198	12138	53010	94601	15838	16805	61404	43516	17020
Line 2	17264	57327	38224	29301	18164	38109	34976	65692	98566	29550
Line 3	95639	99754	31199	92558	68368	04985	51092	37780	40261	14479
Line 4	61555	76404	86214	11808	12840	55147	97438	60222	12645	62090
Line 5	78137	98768	04689	87130	79225	08153	84967	64539	79493	74917
Line 6	62490	99215	84987	28759	19107	14733	24550	28067	68894	38490
Line 7	24216	63444	21283	07044	92729	37284	13211	37485	11415	36457
Line 8	18975	95428	33226	55901	31605	43816	22259	00317	46999	98571
Line 9	59138	39542	71168	57609	91510	27904	74244	50940	31553	62562
Line 10	29478	59652	50414	31966	87912	87154	12944	49862	96566	48825
Line 11	96155	95009	27429	72918	08457	78134	48407	26061	58754	05326
Line 12	29621	66583	62966	12468	20245	14015	04014	35713	03980	03024
Line 13	12639	75291	71020	17265	41598	64074	64629	63293	53307	48766
Line 14	14544	37134	54714	02401	63228	26831	19386	15457	17999	18306
Line 15	83403	88827	09834	11333	68431	31706	26652	04711	34593	22561

Random Number Table										
Line 16	67642	05204	30697	44806	96989	68403	85621	45556	35434	09532
Line 17	64041	99011	14610	40273	09482	62864	01573	82274	81446	32477
Line 18	17048	94523	97444	59904	16936	39384	97551	09620	63932	03091
Line 19	93039	89416	52795	10631	09728	68202	20963	02477	55494	39563
Line 20	82244	34392	96607	17220	51984	10753	76272	50985	97593	34320

GRADE 7

MODULE 5

Constructing and Measuring

TOPIC 1: Angle Relationships

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TOPIC 2: Area, Surface Area, and Volume

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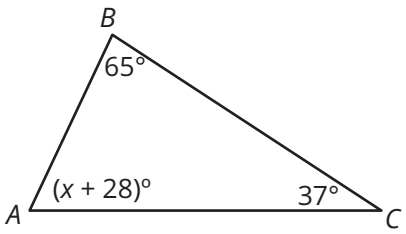
Name _____ Date _____

I. Solving Equations Using the Triangle Sum Theorem

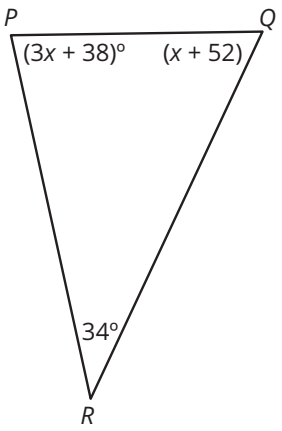
Topic Practice

A. Determine the measure of the unknown angle(s) in each triangle.

1.

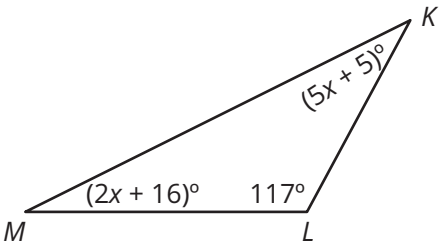


2.

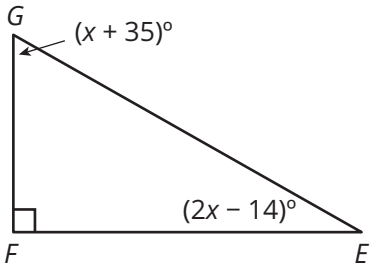


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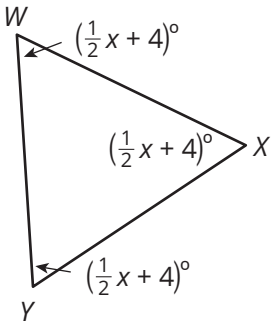
3.



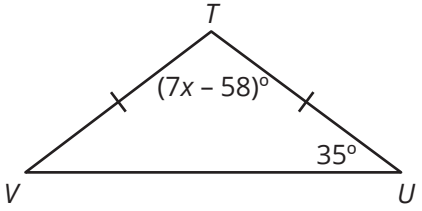
4.



5.



6.



B. Write and solve an equation to answer each question.

1. Determine the measure of the third angle when the base angle of an isosceles triangle is 63°.

2. Determine the measure of the base angles of an isosceles triangle when the non-base angle is 36°.

3. Determine the measure of the third angle when the base angle of an isosceles triangle is 12°.

4. Determine the measure of the base angles of an isosceles triangle when the non-base angle is 115°.

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5. Determine the measure of the third angle when the base angle of an isosceles triangle is 22.5°.

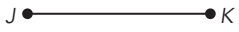
6. Determine the measure of the base angles of an isosceles triangle when the non-base angle is 13°.

Extension

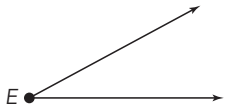
1. The base angle of an isosceles triangle is 16 degrees less than half the measure of the non-base angle. Determine the measures of all three angles of the isosceles triangle. Show your work.

Spaced Practice

1. Construct a line segment that is twice the length of $\overline{JK}$.



2. Construct an angle that is twice the measure of $\angle E$.



3. Consider the population of integers from -10 to 10.

   a. Select a sample of six numbers. Is this a random sample? Explain your reasoning.

   b. How can you assign random numbers to select a sample using a random number table?

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4. Estimate the likelihood of each event as 0, $\frac{1}{2}$, or 1.

   a. A dog greeting you with the words, "Good morning!"

   b. Rolling a prime number on a six-sided number cube.

5. Decide whether each statement is true or false. Explain your reasoning.

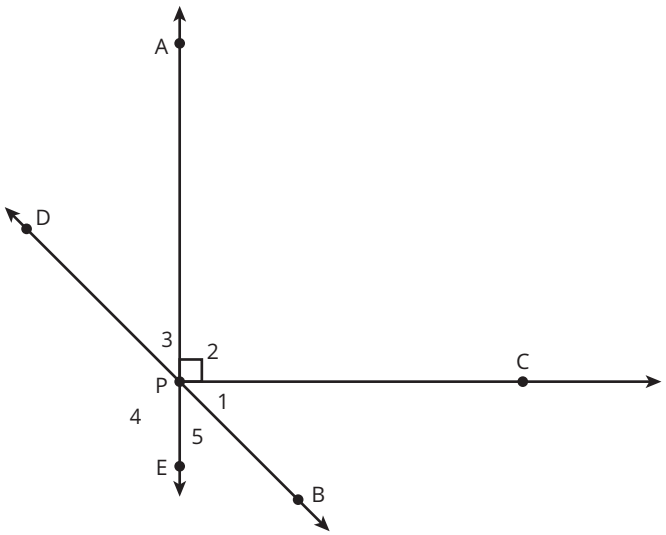
   a. $5\frac{2}{3}$ is included in the set of integers.

   b. -12 is included in the set of whole numbers.

II. Relationships Between 90° and 180° Angles

Topic Practice

A. Use the diagram to answer the given questions.



1. List all of the angle pairs that are supplementary.

2. List all of the angle pairs that are complementary.

3. Determine the measure of angle 2.

4. Describe the relationship between line *AE* and ray *PC*.

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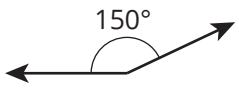
5. Suppose angle 4 has a measure of 132°. Determine the measure of angle 3.

6. Suppose angle 1 has a measure of 35°. Determine the measure of angle 5.

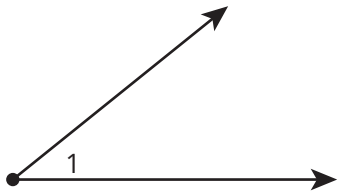
7. Suppose angle 3 has a measure of 60°. Determine the measure of angle 4.

B. Complete each sketch.

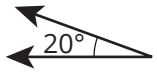
1. Draw $\angle 2$ such that it supplements $\angle 1$ and does not share a common side.



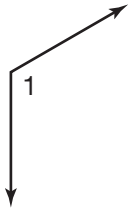
2. Draw $\angle 2$ such that it complements $\angle 1$ and shares a common side.



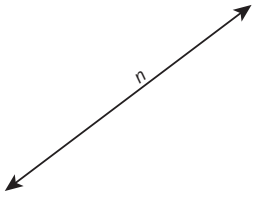
3. Draw $\angle 2$ such that it complements $\angle 1$ and does not share a common side.



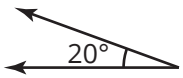
4. Draw $\angle 2$ such that it supplements $\angle 1$ and shares a common side.



5. Draw line *m* so that it is perpendicular to line *n*.



6. Draw $\angle 2$ such that it complements $\angle 1$ and draw $\angle 3$ such that it supplements $\angle 1$.



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C. Determine each unknown angle measure.

1. If $\angle 1$ and $\angle 2$ are complementary angles and $m\angle 1 = 43°$, what is $m\angle 2$?

2. If $\angle 1$ and $\angle 2$ are supplementary angles and $m\angle 1 = 106°$, what is $m\angle 2$?

3. If $\angle 1$ and $\angle 2$ are supplementary angles and $m\angle 1$ is one-fourth $m\angle 2$, what is the measure of each angle?

4. If $\angle 1$ and $\angle 2$ are complementary angles and $m\angle 1$ is $40°$ less than $m\angle 2$, what is the measure of each angle?

5. If $\angle 1$ and $\angle 2$ are complementary angles and $m\angle 1$ is five times $m\angle 2$, what is the measure of each angle?

6. If $\angle 1$ and $\angle 2$ are supplementary angles and $m\angle 1$ is 18° more than $m\angle 2$, what is the measure of each angle?

Extension

1. Suppose $\angle 1$ and $\angle 2$ are supplementary angles and $m\angle 1$ is three times 14° less than $m\angle 2$. Determine the measure of each angle. Show your work.

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Spaced Practice

Xia tosses a coin 3 times. One side is heads and the other side is tails.

1. Represent the sample space as a tree diagram.

2. Represent the sample space as a list.

3. Determine the theoretical probability of Xia getting all tails.

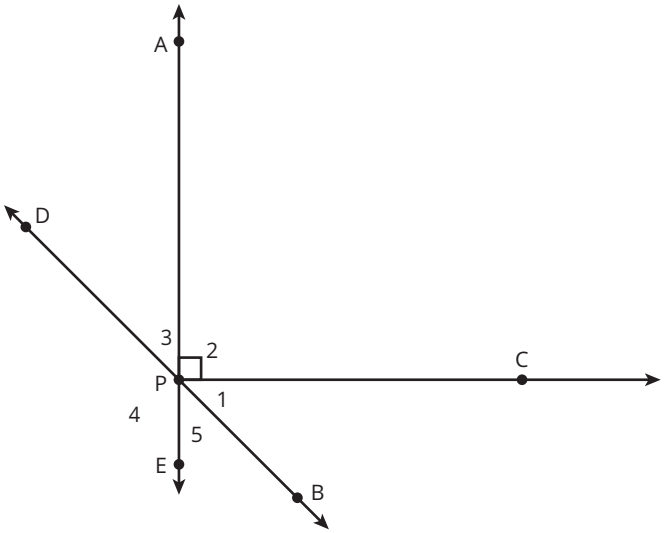
4. Determine the theoretical probability of Xia getting no tails.

5. What is the relationship between the events and probabilities in Questions 3 and 4?

III. Special Angle Relationships

Topic Practice

A. Use the diagram to answer the given questions.



1. List all of the angle pairs that are adjacent angles.

2. List all of the angles that are vertical angles.

3. List all of the linear pairs.

4. Suppose angle 3 has a measure of 40°. Determine the measure of angle 5.

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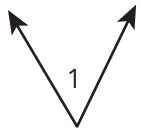
5. Suppose angle 5 has a measure of 52°. Determine the measure of angle 3.

6. Suppose angle 4 has a measure of 160°. Determine the measure of angle 1.

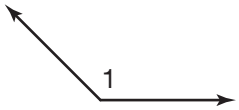
7. Suppose angle 4 has a measure of 135°. Determine the measure of each unknown angle.

B. Complete each sketch.

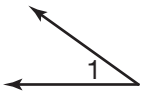
1. Draw ∠2 adjacent to ∠1.



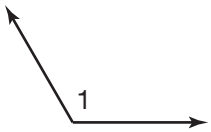
2. Draw ∠2 such that it forms a vertical angle with ∠1.



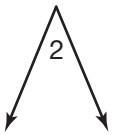
3. Draw ∠2 such that it forms a linear pair with ∠1.



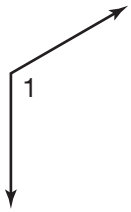
4. Draw ∠2 adjacent to ∠1.



5. Draw ∠1 such that it forms a vertical angle with ∠2.



6. Draw ∠2 such that it forms a linear pair with ∠1.



C. Determine each unknown angle measure.

1. If ∠1 and ∠2 form a linear pair and m∠1 = 72°, what is m∠2?

2. If ∠1 and ∠2 are vertical angles and m∠1 = 87°, what is m∠2?

3. If $\angle 1$ and $\angle 2$ form a linear pair and $m\angle 1$ is one-fifth $m\angle 2$, what is the measure of each angle?

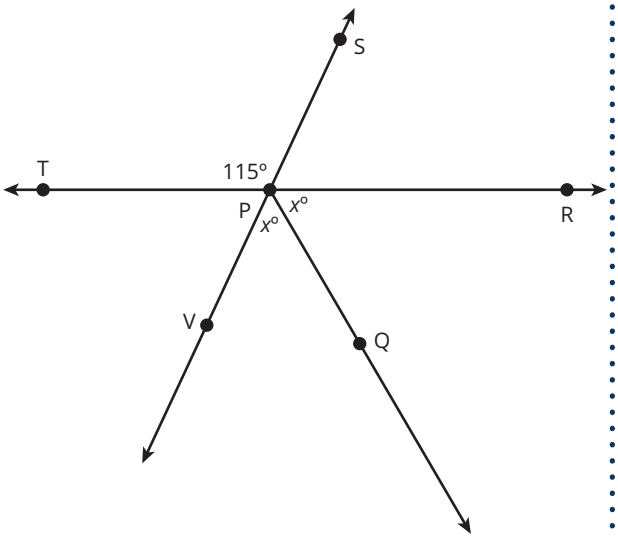
4. If $\angle 1$ and $\angle 2$ are vertical angles, $m\angle 1 = 2x°$, and $m\angle 2 = (x + 24)°$, what is the measure of each angle?

5. If $\angle 1$ and $\angle 2$ form a linear pair and $m\angle 1$ is 56° less than $m\angle 2$, what is the measure of each angle?

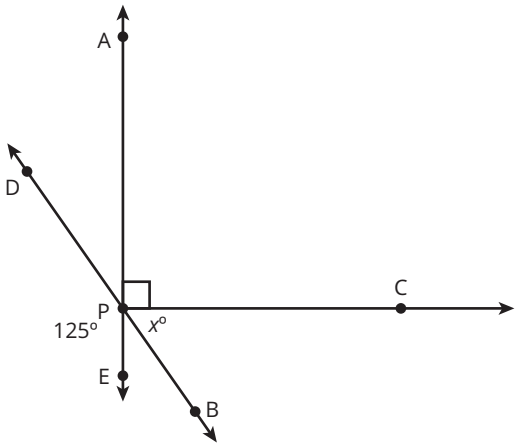
6. If $\angle 1$ and $\angle 2$ are vertical angles, $m\angle 1 = (3x + 58)°$, and $m\angle 2 = (5x - 12)°$, what is the measure of each angle?

D. Determine the value of *x*.

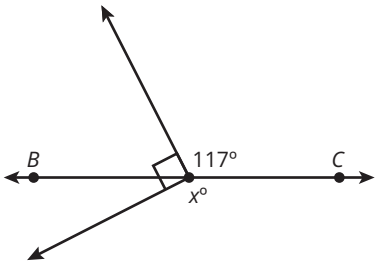
1. Consider the diagram. Points *T* and *R* lie on a straight line. Points *S* and *V* lie on a straight line.



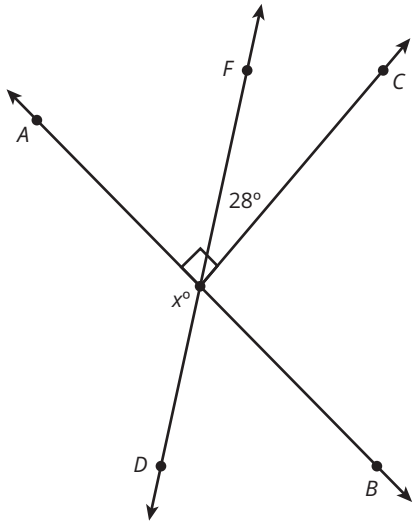
2. Consider the diagram. Points *A* and *E* lie on a straight line, points *P* and *C* lie on a straight line, and points *B* and *D* lie on a straight line.



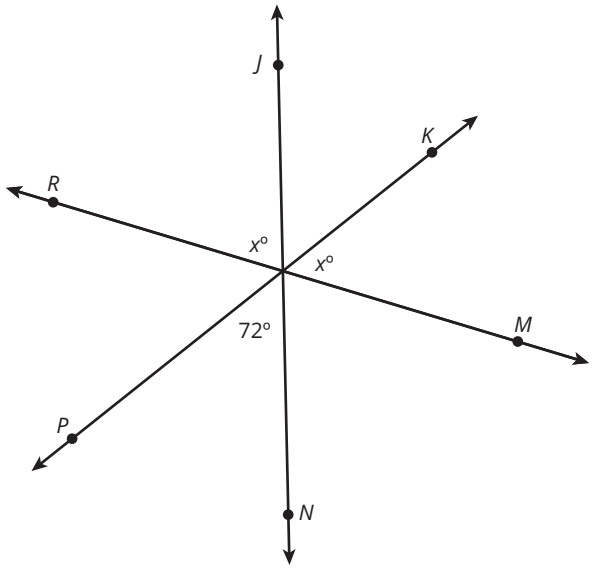
3. Consider the diagram. Points *B* and *C* lie on a straight line.



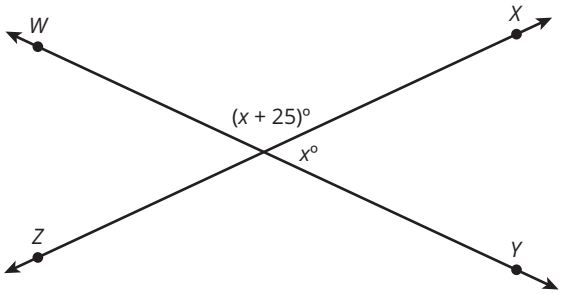
4. Consider the diagram. Points *A* and *B* lie on a straight line and points *D* and *F* lie on a straight line.



5. Consider the diagram. Points J and N lie on a straight line, points K and P lie on a straight line, and points M and R lie on a straight line.

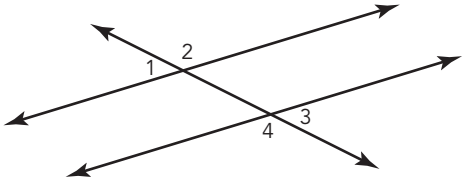


6. Consider the diagram. Points W and Y lie on a straight line and points X and Z lie on a straight line.



Extension

1. If $\angle 1$ is the supplement of $\angle 2$, $\angle 3$ is the supplement of $\angle 4$, and $\angle 1$ is congruent to $\angle 3$, what can you conclude about the measures of $\angle 2$ and $\angle 4$? Write this conclusion in a general form.



Spaced Practice

Consider the two accounts.

Account A: Earns 4% simple interest

Account B: Earns 3.5% compound interest

1. Calculate the amount of interest earned if you deposit $2,000 into Account A for 10 years. Show your work.

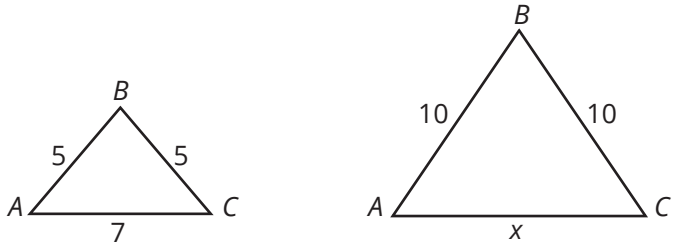
2. Calculate the amount of interest earned if you deposit $2,000 into Account B for 10 years. Show your work.

3. Which account would you deposit your money in? Explain.

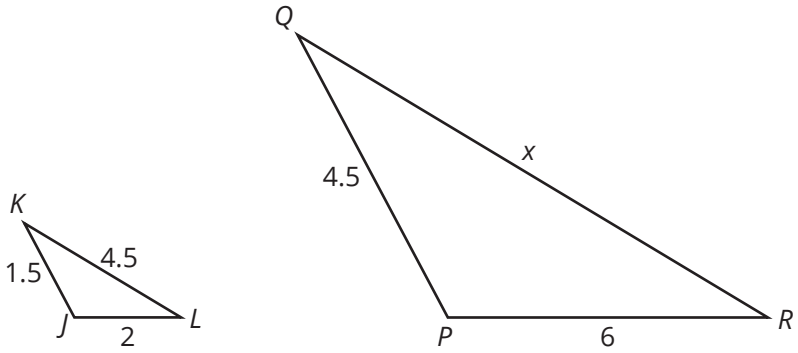
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4. For each pair of similar triangles, write a proportion that can be used to calculate the length of the missing side, x. Then, determine the value of x.

   a. $\triangle ABC$ is similar to $\triangle XYZ$.



   b. $\triangle JKL$ is similar to $\triangle PQR$.



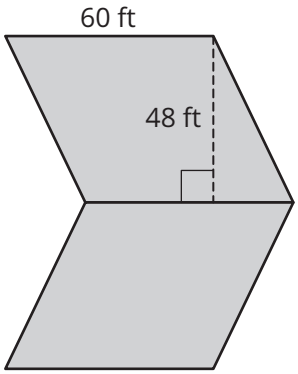
Name _____ Date _____

I. Composite Figures

Topic Practice

A. Calculate the area of each shaded region.

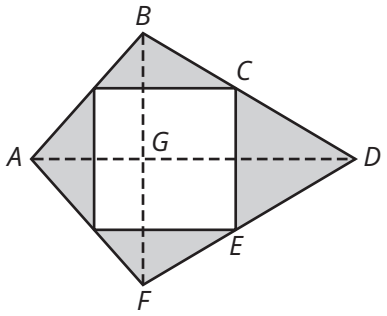
1. The figure is composed of 2 congruent rhombi.



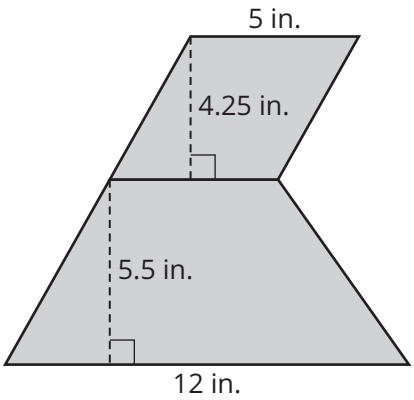
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2. The figure is composed of a kite and a square.

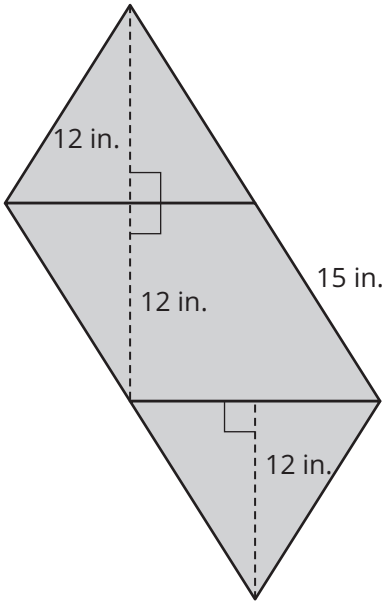
   Given: $AG = 14$ meters, $BG = FG = 16$ meters, $DG = 27$ meters, and $CE = 18$ meters



3. The figure is composed of a trapezoid and a rhombus.

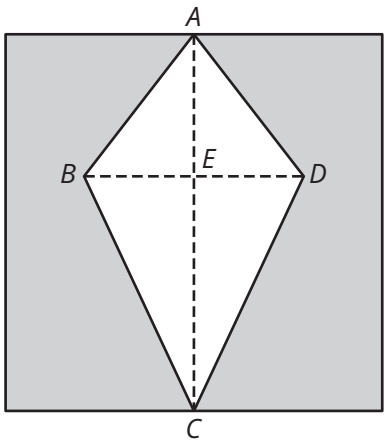


4. The figure is composed of 2 congruent triangles and a rhombus.



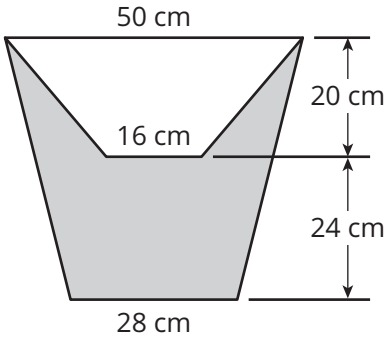
5. The figure is composed of a square and a kite.

   Given: $AE = 27$ inches, $BE = DE = 21$ inches, and $CE = 45$ inches.



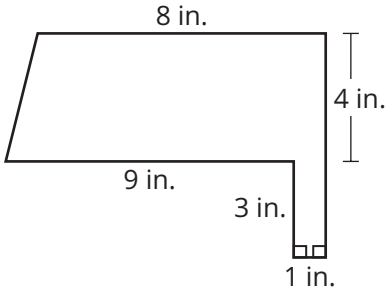
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6. The figure is composed of two trapezoids.

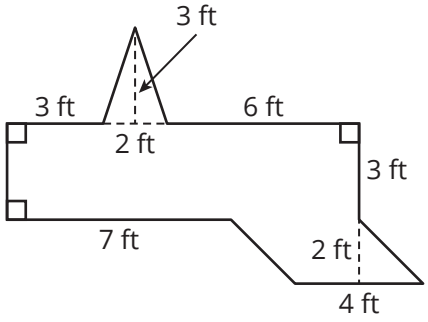


B. Calculate the area of each composite figure.

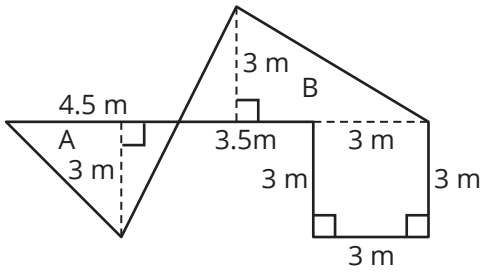
1.



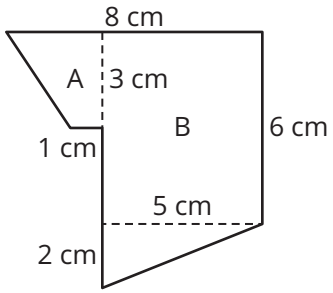
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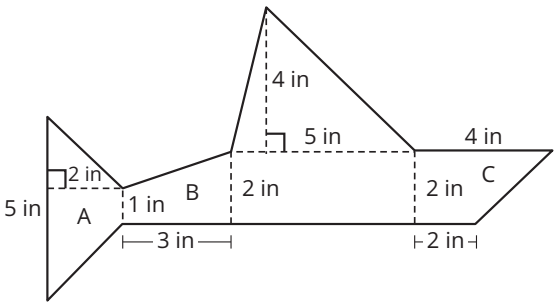
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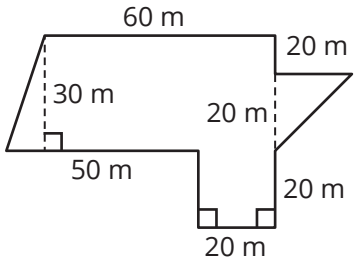
4.



5.


4 in
5 in
4 in
2 in
5 in
A
1 in
B
2 in
2 in
C
3 in
2 in

6.


60 m
20 m
30 m
20 m
50 m
20 m
20 m

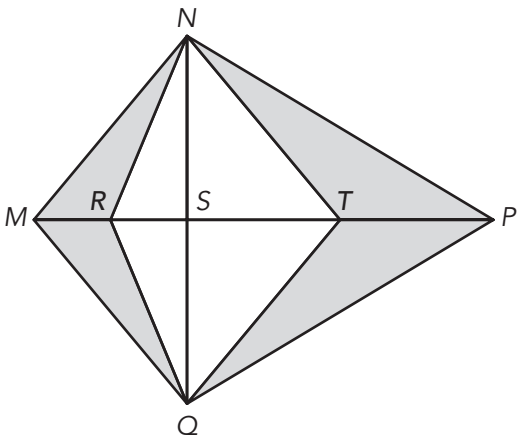
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Extension

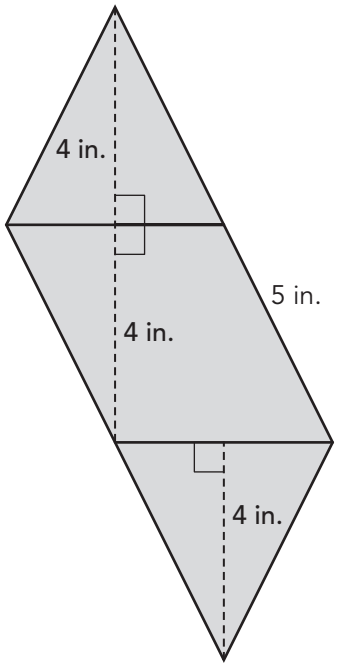
Calculate the area of each shaded region.

1. The figure is composed of two kites.

   Given: $MR = RS = 5$ feet, $ST = PT = 10$ feet, and $NS = QS = 12$ feet.

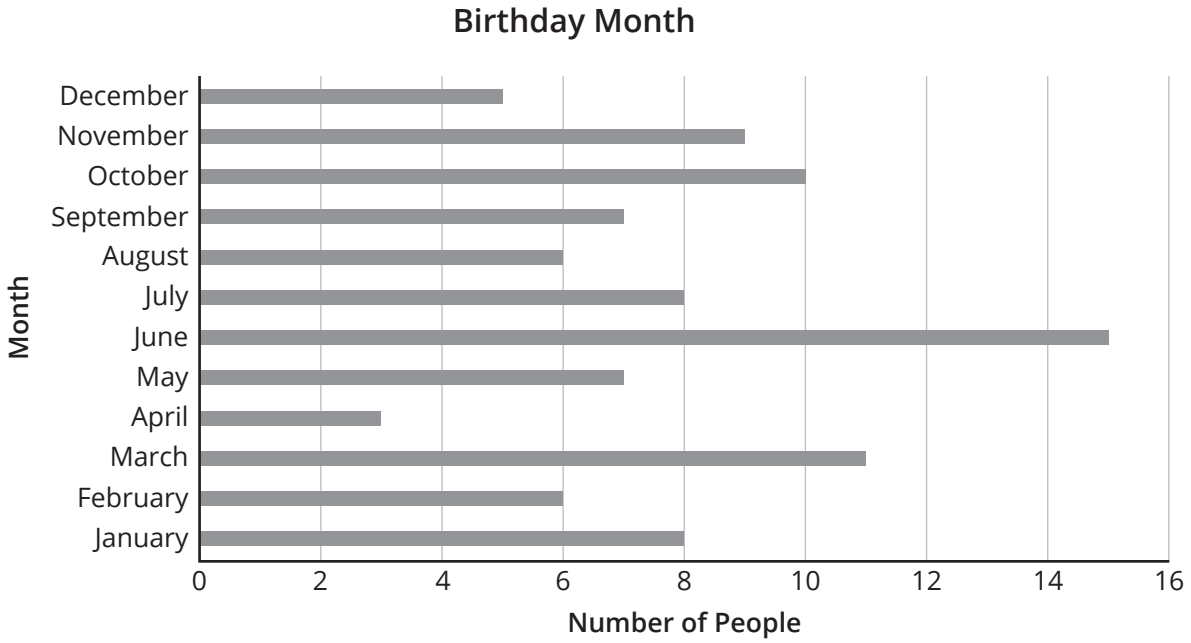


2. The figure is composed of two congruent triangles and a rhombus.



Spaced Practice

1. Analyze the given graph to answer each problem.



   a. In which of the twelve months do the most people have a birthday? How many people have a birthday in that month?

   b. How many people are represented on the graph?

2. A bag contains 4 red marbles, 11 blue marbles, 3 green marbles, and 12 white marbles. Predict each probability.

   a. *P*(green marble) =

   b. *P*(not a red marble) =

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3. Write a real-world problem for the equation or inequality.

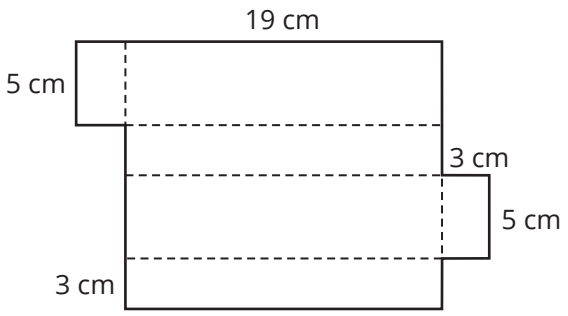
   a. $3x + 7 = 55$

   b. $18x - 20 < \$215$

4. Use the net of the prism to answer each problem.

   a. What is the lateral surface area?

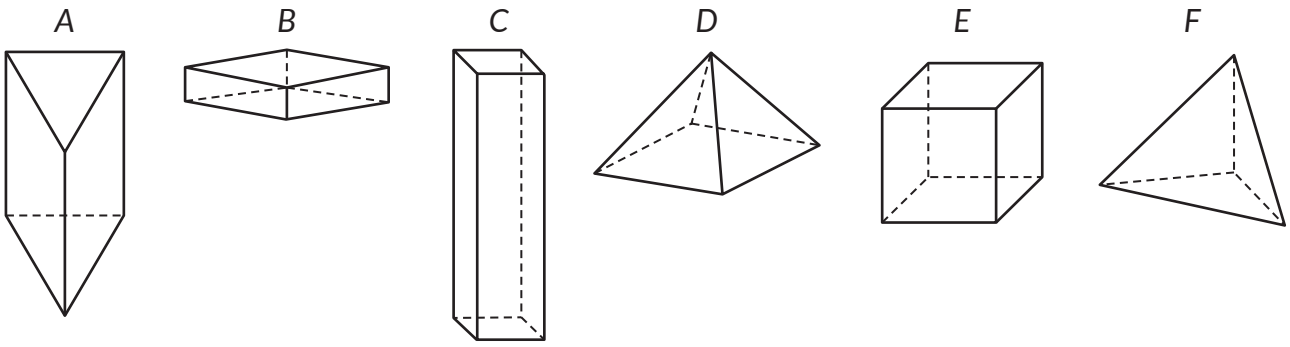
   b. What is the total surface area?



II. Total Surface Area of Prisms and Pyramids

Topic Practice

A. Sketch a net to represent each solid figure.



1. Figure *A*

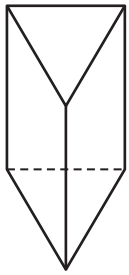
2. Figure *B*

3. Figure *C*

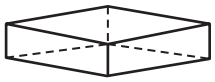
4. Figure *D*

B. Analyze the figures shown to complete the table.

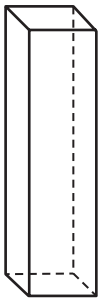
A



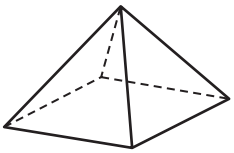
B



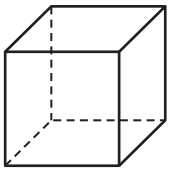
C



D



E



F

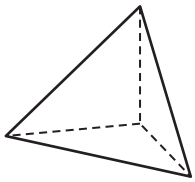


Figure	Number of Faces	Number of Vertices	Number of Edges	Name of Figure
A				
B				
C				
D				
E				
F				

5. Figure *E*

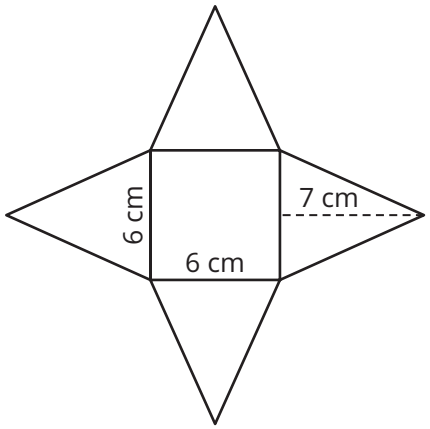
6. Figure *F*

7. Which figures are prisms? Which figures are pyramids? Explain your reasoning.

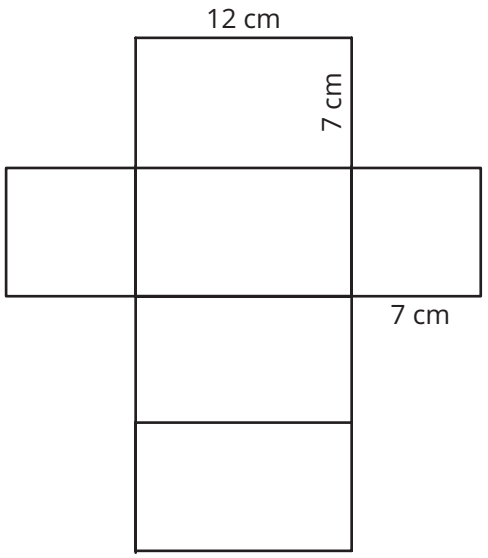
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C. Determine the surface area of each figure based on the measurements of its net.

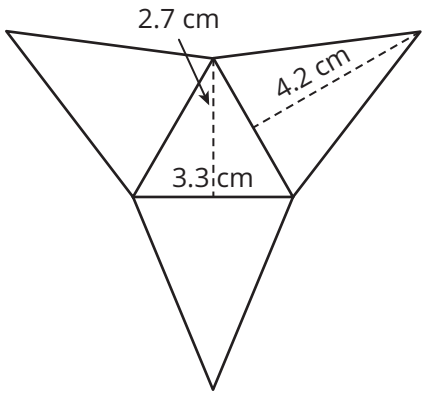
1.



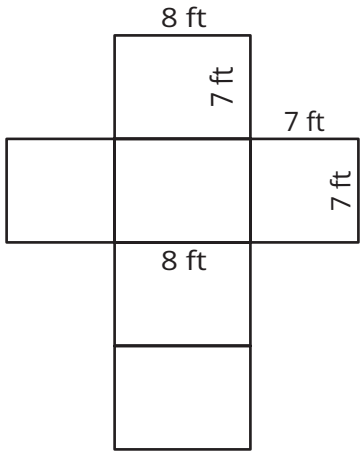
2.



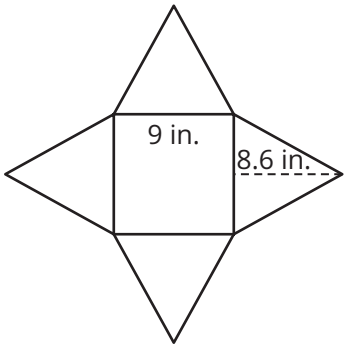
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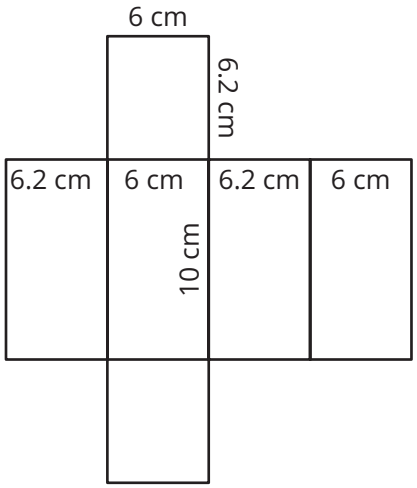
4.



5.

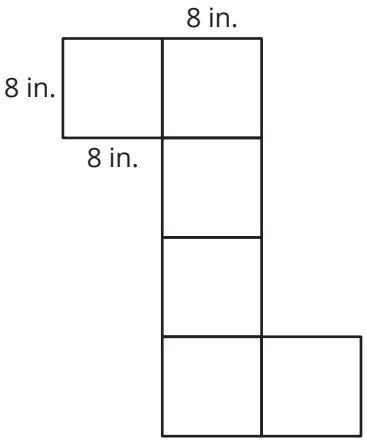


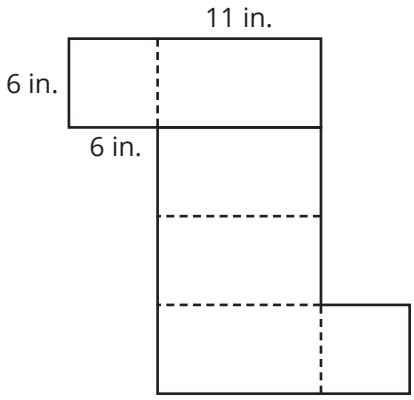
6.



D. Use the nets to determine the surface area of each figure. Then, use the surface area to answer each question.

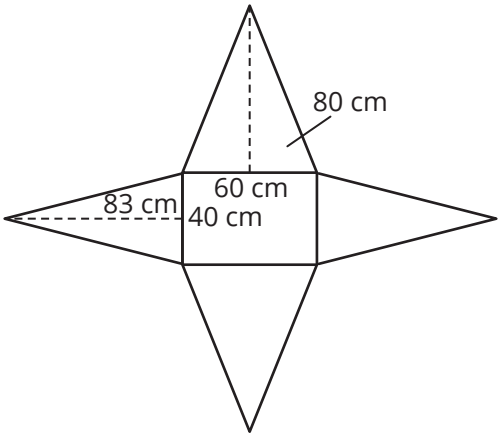
1. Mia is wrapping two gifts for her friends. The nets show the measurements for each gift. Determine which gift will require more wrapping paper.

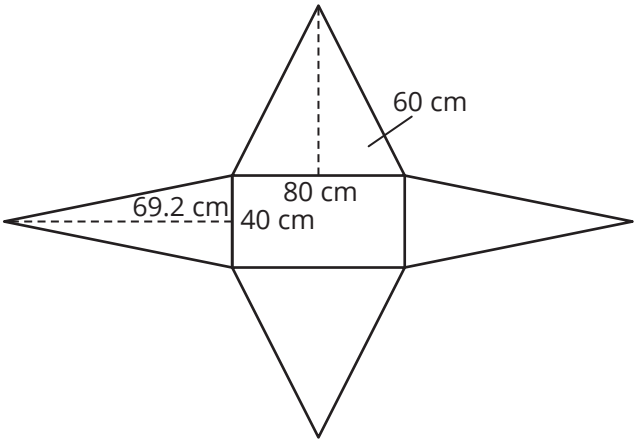




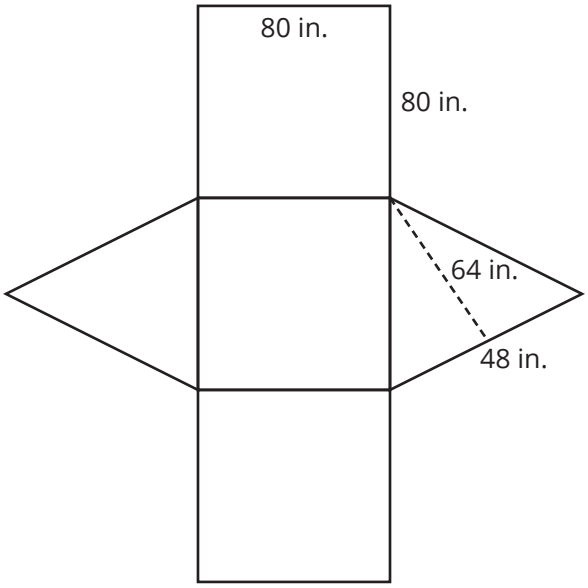
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2. Minh is building replicas out of Styrofoam of two pyramids for a social studies project. The nets with the measurements for her replicas are shown. She then needs to paint the pyramids brown. Determine which pyramid will require more paint.

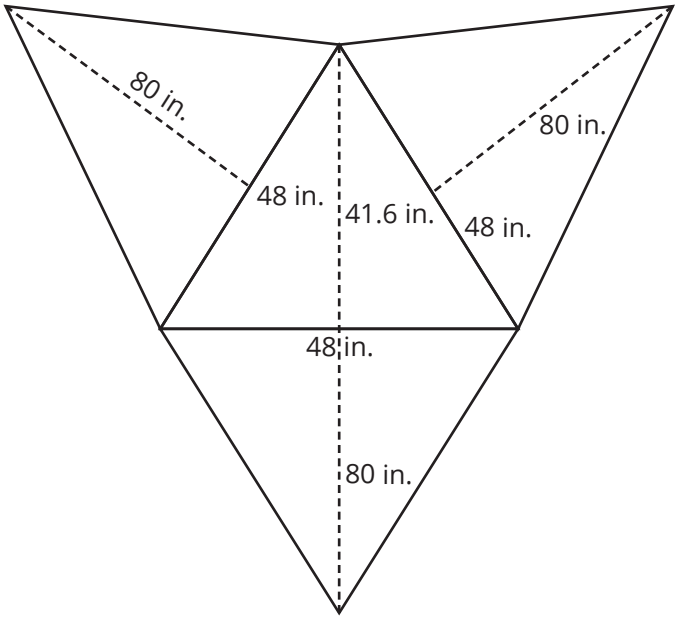




3. A local camping store is offering to spray camping tents with a water-repellant. The store will spray the entire outside of the tent and charges based on the number of square feet sprayed. Mateo family decides to take two tents to get sprayed. The measurements of their tents are shown. Determine which will cost more to be sprayed.



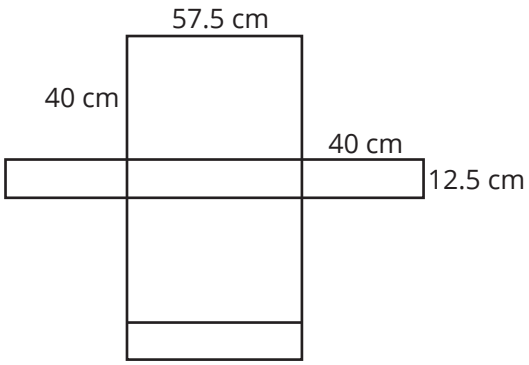
Mateo's Parents' Tent



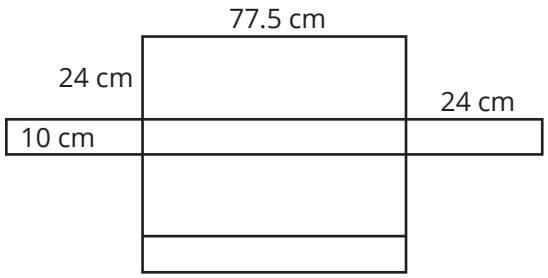
Mateo's Tent

4. An instant rice manufacturer is designing a new box to try and cut costs. They felt their old design used too much cardboard to build. They believe their new design, being taller and thinner, will use less cardboard to build. Determine which instant rice box design will use less cardboard to build.

Old Box Design

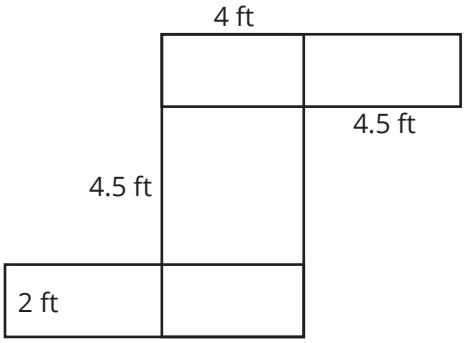


New Box Design

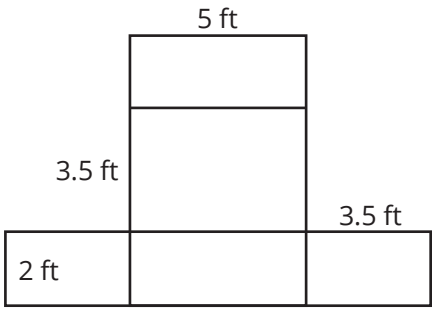


5. Liam is refinishing two bookshelves that he found at a yard sale. He has sanded each one down and is now going to repaint them. One bookshelf has a length of 4 feet, a depth of 2 feet, and a height of 4.5 feet. The second bookcase has a height of 3.5 feet, a depth of 2 feet, and a length of 5 feet. Determine which bookshelf will use more paint. (Remember, he cannot paint the front of a bookshelf.)

Bookshelf 1

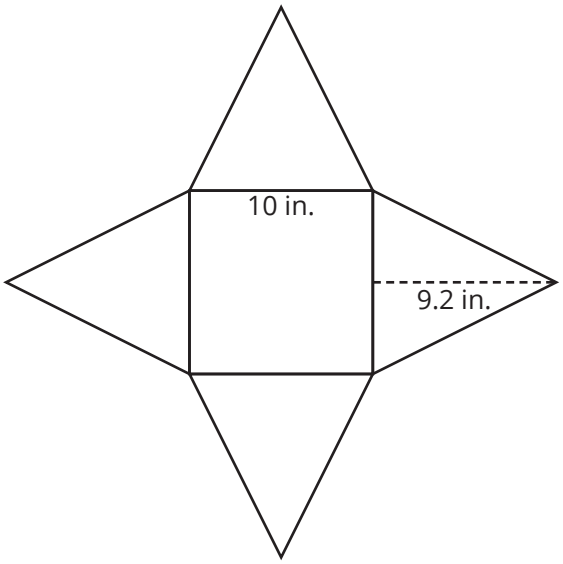


Bookshelf 2

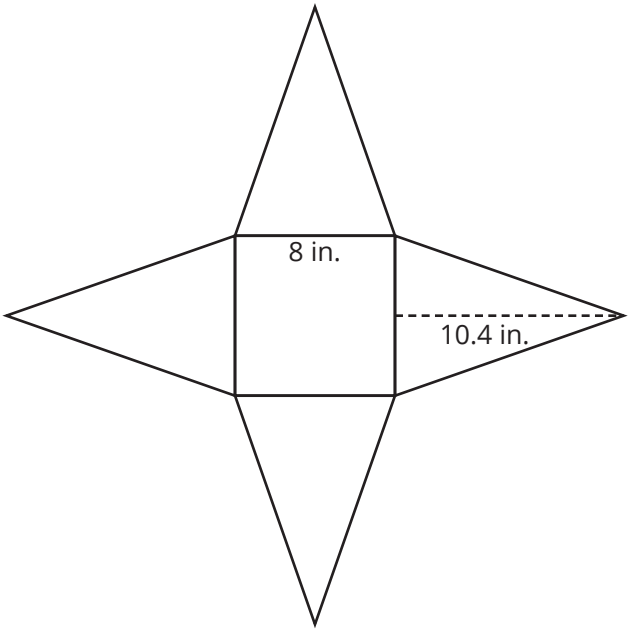


6. A local basketball league is giving out awards to its top two teams. The awards are shaped like square pyramids. The base of the first place award has a length of 10 inches and a slant height of 9.2 inches. The base of the second place award has a length of 8 inches and a slant height of 10.4 inches. Determine how much greater the surface area of the first place award is than the second place award.

First Place Award

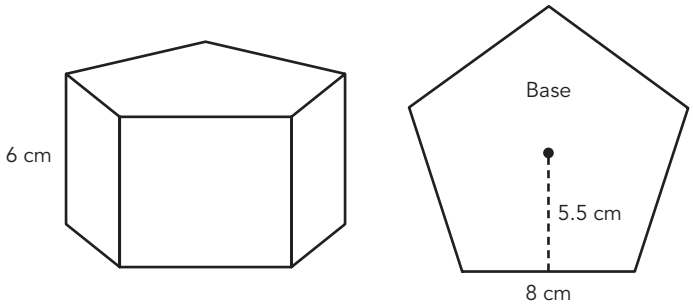


Second Place Award



Extension

1. A pentagonal prism has pentagons as bases. Each base can be divided into five congruent triangles. Determine the surface area of this pentagonal prism.



Spaced Practice

1. Victoria is a huge fan of Broadway musicals. She wants to record some of her favorite shows. The table shows the musicals she has chosen and how much space they each take up in megabytes.

Musical	Disc Space (megabytes)
Annie	109.785
Beauty and the Beast	131.642
Into the Woods	79.4
Les Miserables	192.27
Shrek the Musical	117.005

a. Calculate the total amount of memory the musicals will take up. Show your work.

b. How much out of 700 megabytes will Victoria have left after she records her musicals? First estimate, then calculate the answer. Show your work.

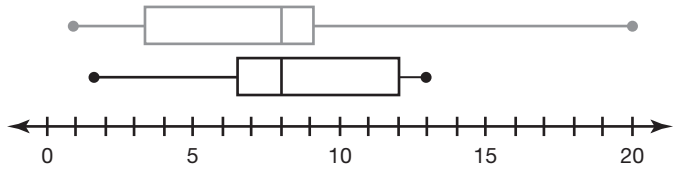
2. Determine each sum.

a. $1.009 + 6.965$

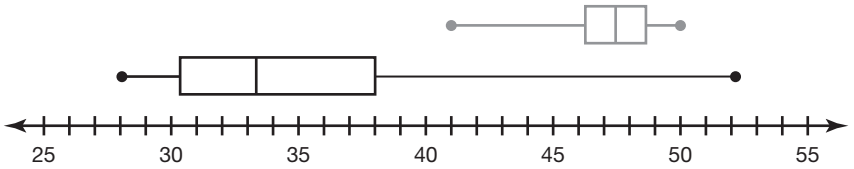
b. $3.25 + 0.003$

3. Compare the box plots in each data display and describe the variation.

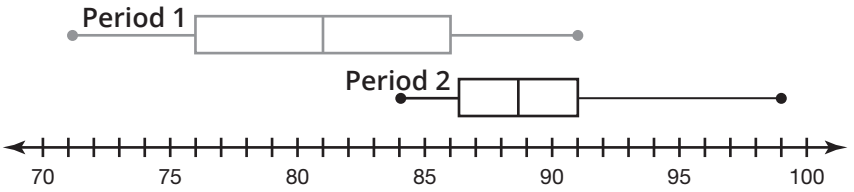
a.



b.



4. Mr. Nguyen randomly surveyed 10 students in each of his classes to determine the number of minutes that students spend doing homework each week. The data is shown on the box plots.



Compare the shapes, spreads, and measures of center for each class. What can you conclude about the amount of time spent doing homework by students in each class?

III. Volume of Prisms and Pyramids

Topic Practice

A. Consider each set of figures. Use the given information to answer the questions. Round to the nearest hundredth, if necessary.

	Rectangular Prism *A*	Rectangular Pyramid *B*
Length of Base	5.5 cm	5.5 cm
Width of Base	6.2 cm	6.2 cm
Height	12 cm	12 cm

1. What is the relationship between the dimensions of each figure?

2. What is the area of the base of each figure?

3. What is the volume of each figure?

4. What is the relationship between the volume of each figure?

	Triangular Prism *A*	Triangular Pyramid *B*
Length of Base	7.4 in.	7.4 in.
Height of Base	3.6 in.	3.6 in.
Height of Figure	9.5 in.	9.5 in.

5. What is the relationship between the dimensions of each figure?

6. What is the area of the base of each figure?

7. What is the volume of each figure?

8. What is the relationship between the volume of each figure?

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B. Consider each set of figures. Use the given information to answer the questions. Round to the nearest hundredth, if necessary.

	Rectangular Prism *A*	Rectangular Prism *B*
Length of Base	8.5 cm	8.5 cm
Width of Base	4.24 cm	4.24 cm
Height	2.5 cm	7.5 cm

1. What is the relationship between the dimensions of each figure?

2. What is the area of the base of each figure?

3. What is the volume of each figure?

4. What is the relationship between the volume of each figure?

	Triangular Prism *A*	Triangular Prism *B*
Length of Base	2.6 in.	2.6 in.
Height of Base	13.7 in.	13.7 in.
Height of Figure	21 in.	7 in.

5. What is the relationship between the dimensions of each figure?

6. What is the area of the base of each figure?

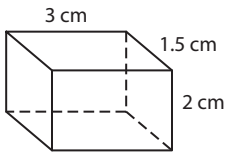
7. What is the volume of each figure?

8. What is the relationship between the volume of each figure?

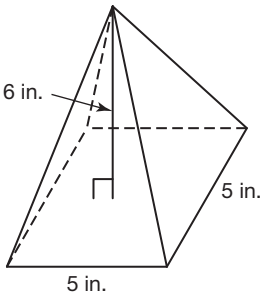
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C. Determine the volume of each figure.

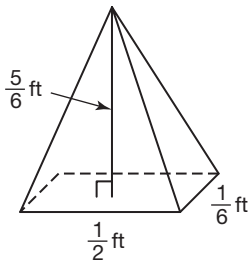
1.



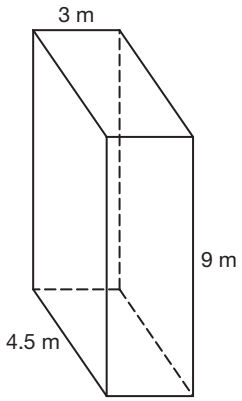
2.



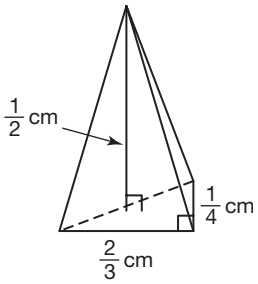
3.



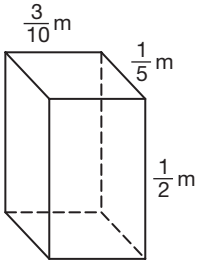
4.



5.

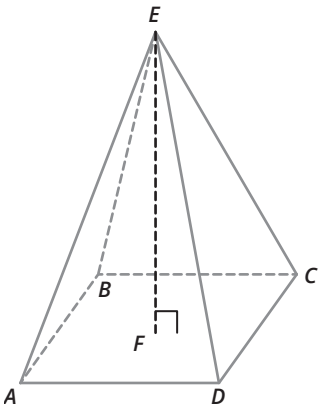


6.

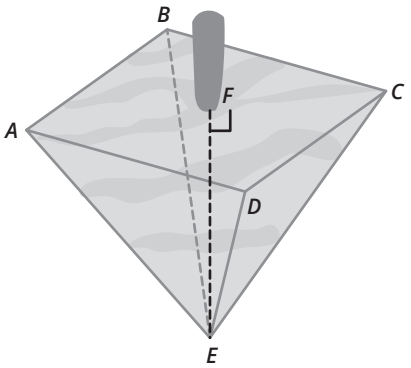


D. Determine each volume. Show your work. Round to the nearest hundredth, if necessary.

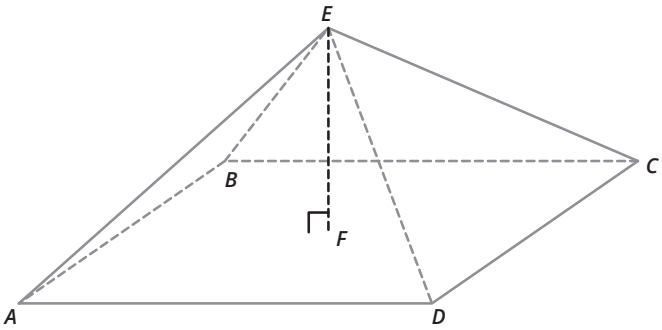
1. The given figure is a square pyramid. The side length of the base of the pyramid is 5 inches. The height of the pyramid is 3.3 inches. What is the volume of the pyramid?



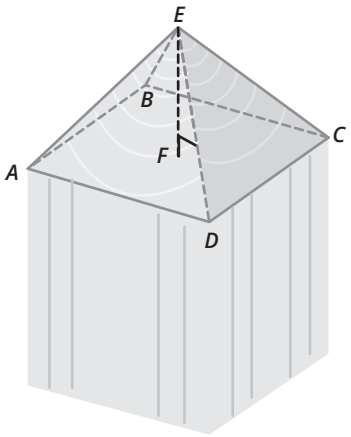
2. You buy a spinning top for your younger cousin. The spinning top is a square pyramid. The side length of the base of the spinning top is 32 millimeters. The height of the spinning top is 32 millimeters. What is the volume of the spinning top?



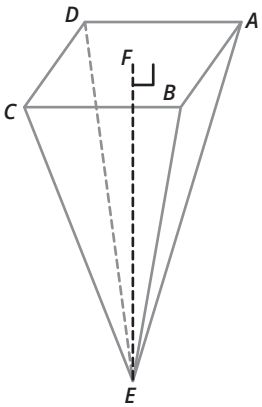
3. The given figure is a square pyramid. The side length of the base of the pyramid is 6.6 feet. The height of the pyramid is 12.672 feet. What is the volume of the pyramid?



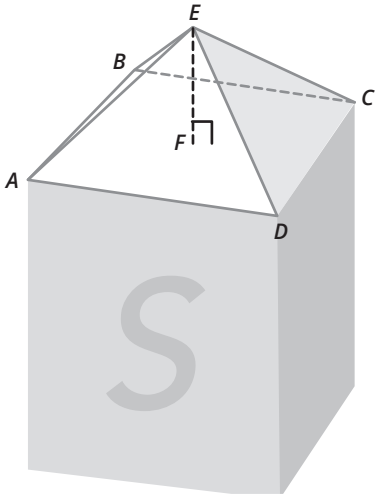
4. Your aunt is building a new fence around her front yard. On top of each fence post is a square pyramid. The side length of the base of the fence post top is 10.1 centimeters. The height of the fence post top is 6.868 centimeters. What is the volume of the fence post top?



5. The given figure is a square pyramid. The side length of the base of the pyramid is 28 millimeters. The height of the pyramid is 14 millimeters. What is the volume of the pyramid?



6. You see a salt shaker at a local restaurant. The top of the salt shaker is a square pyramid. The side length of the base of the salt shaker top is 15 millimeters. The height of the salt shaker top is 7.5 millimeters. What is the volume of the salt shaker top?



Extension

1. A rectangular pyramid has one half the volume of a rectangular prism with the same base area. What do you know about the height of the pyramid compared with the height of the prism?

Spaced Review

Solve each inequality.

1. $7 > -0.8y + 27$

2. $22\frac{1}{2} \leq -\frac{1}{4}g + 3$

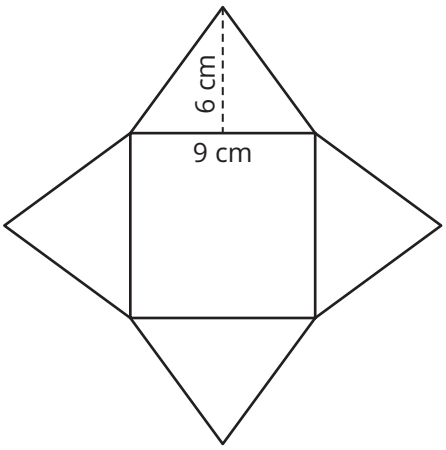
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IV. Volume and Surface Area Problems with Prisms and Pyramids

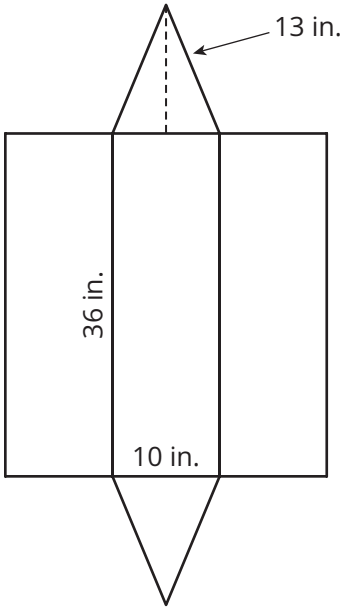
Topic Practice

A. Calculate the lateral surface area and total surface area of each polyhedron. Round to the nearest hundredth, if necessary.

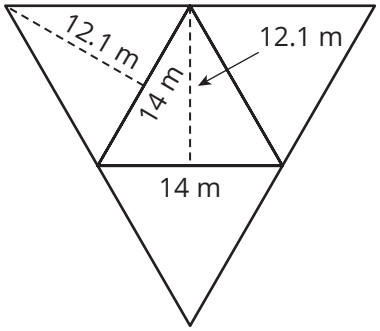
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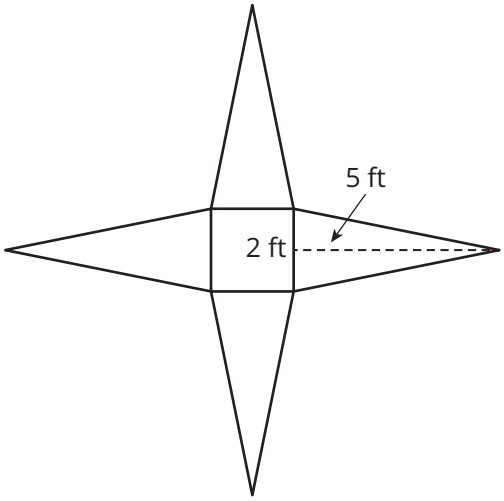
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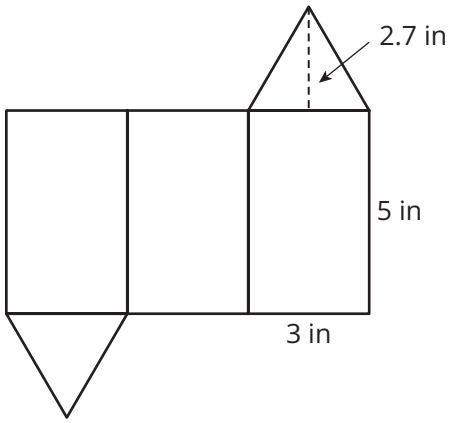
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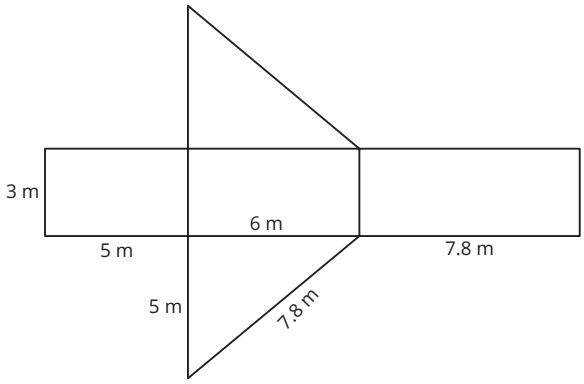
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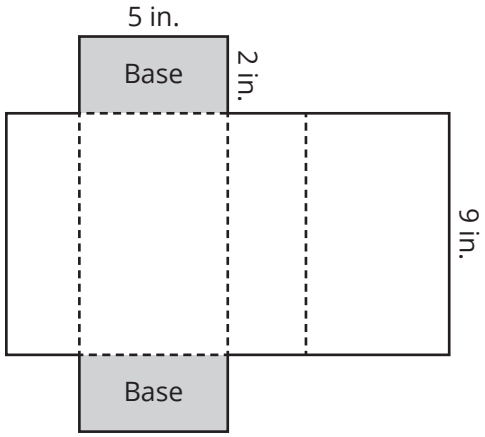
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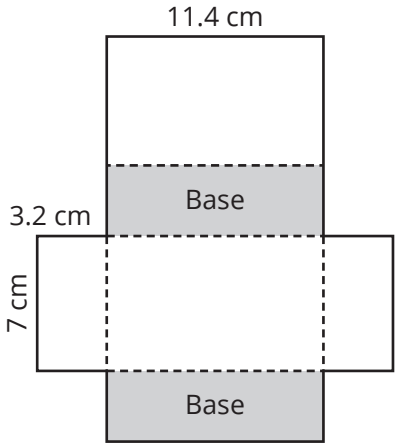
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7.

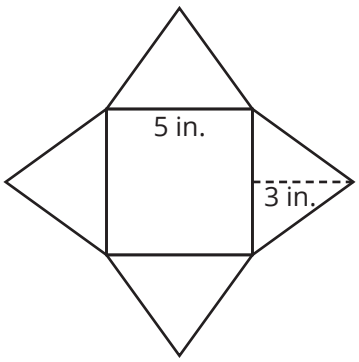


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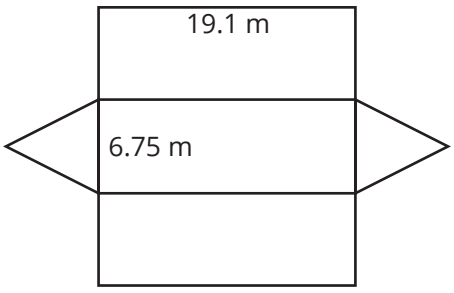


B. Calculate the lateral surface area of each polyhedron. Round to the nearest hundredth, if necessary.

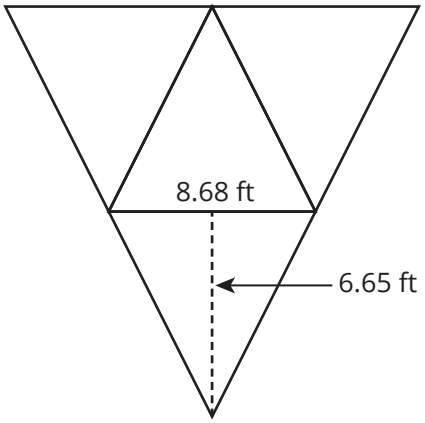
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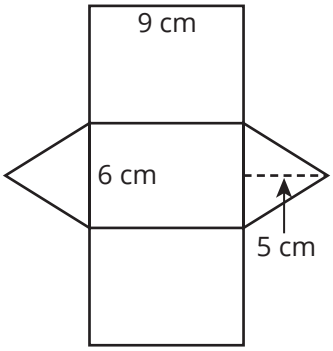
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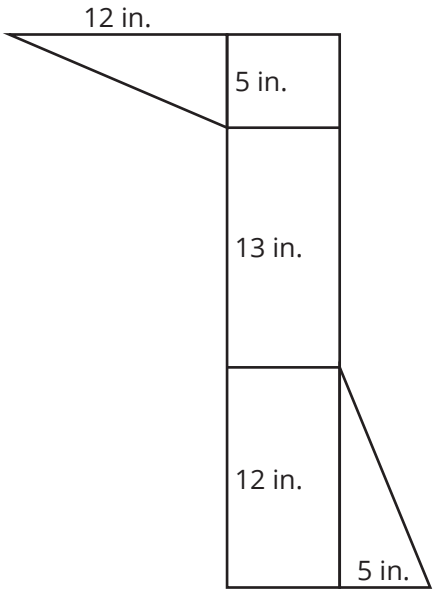
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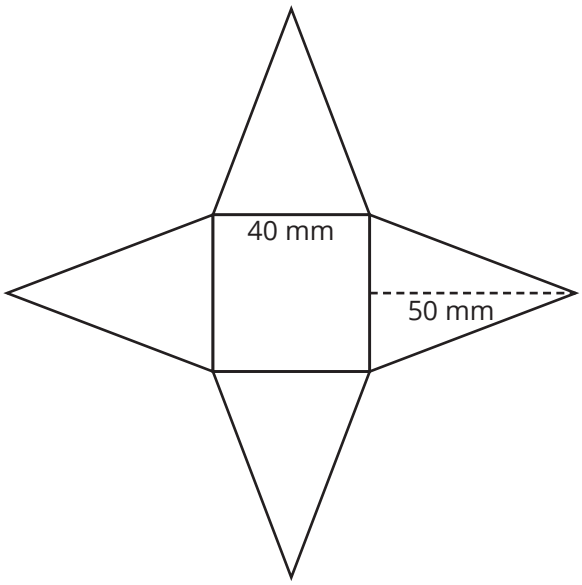
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5.

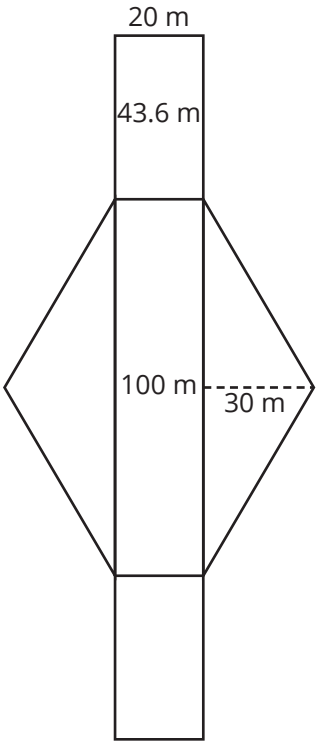


6.

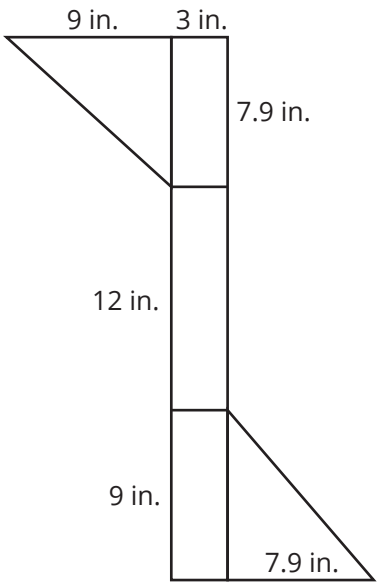


C. Calculate the total surface area of each polyhedron. Round to the nearest hundredth, if necessary.

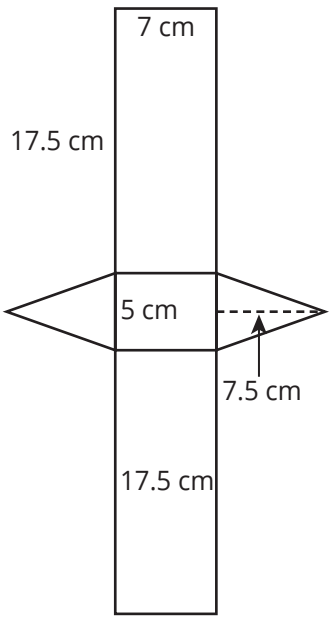
1.



2.

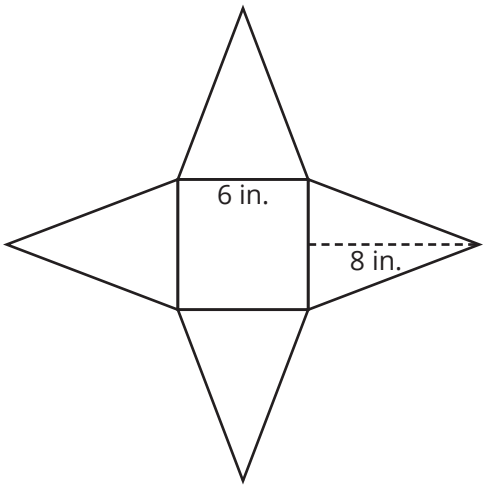


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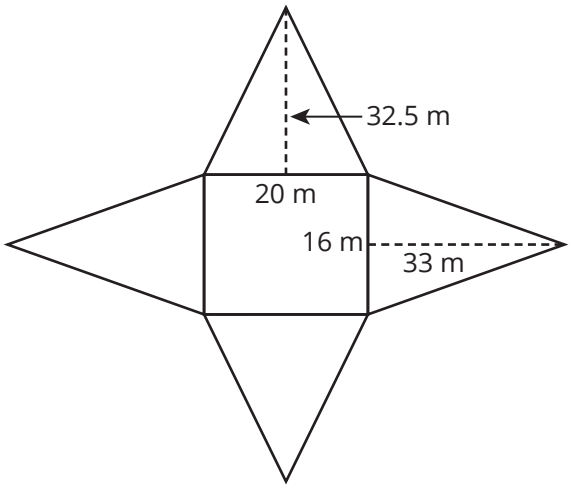


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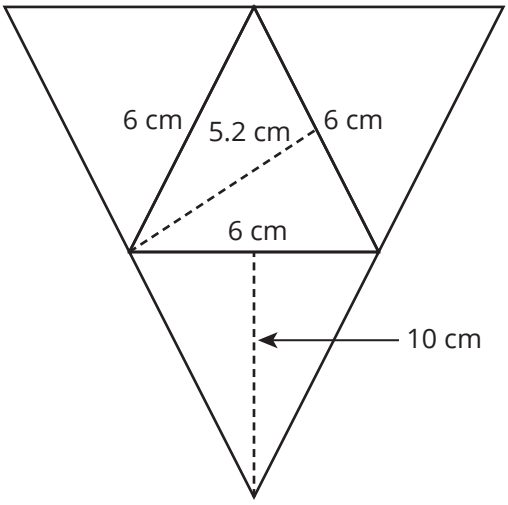


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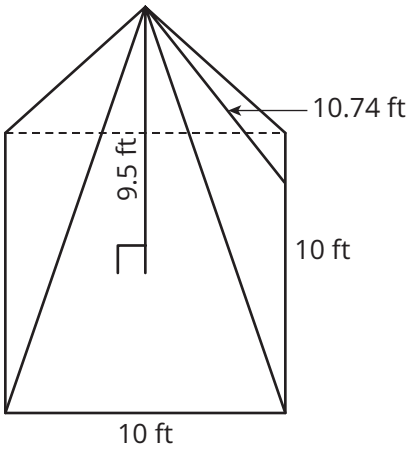
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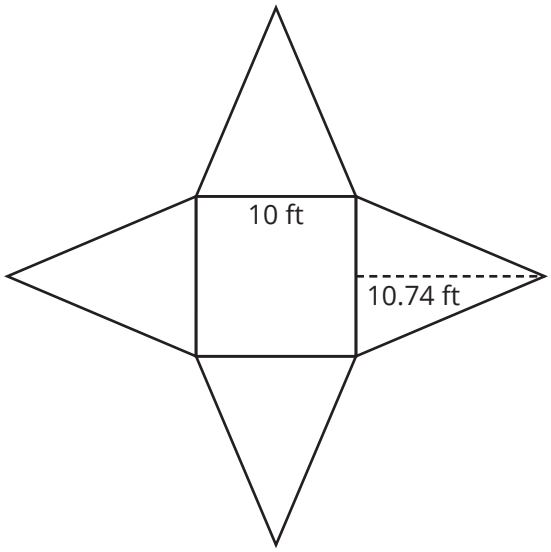
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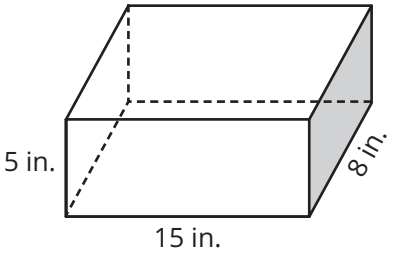
D. Determine the surface area, volume, or lateral surface area of each polyhedron. Explain how you determined which value to calculate based on the problem situation.

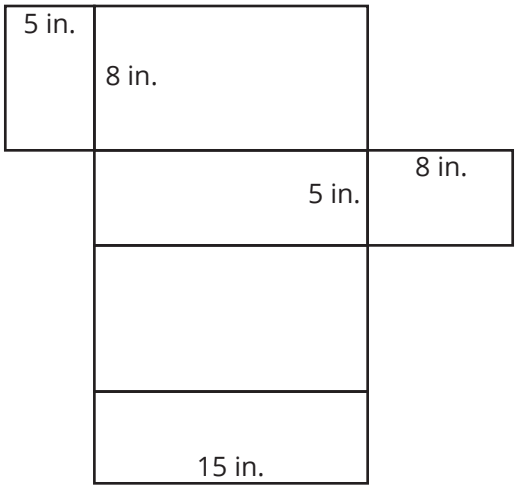
1. Elijah needs to recover the sides of his tent in nylon. How much nylon will he need?



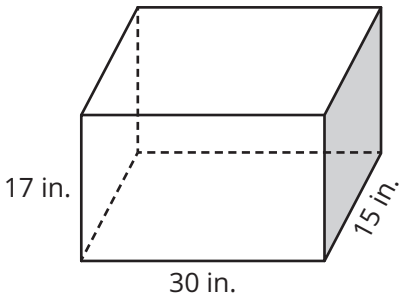


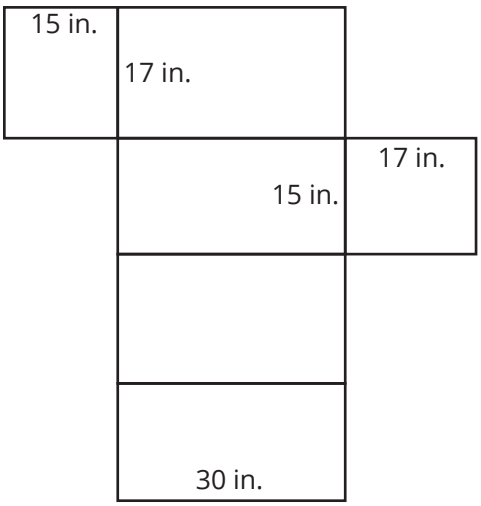
2. Kai places a gift in a gift box and wraps it for his cousin. How much wrapping paper does he use to cover the box?





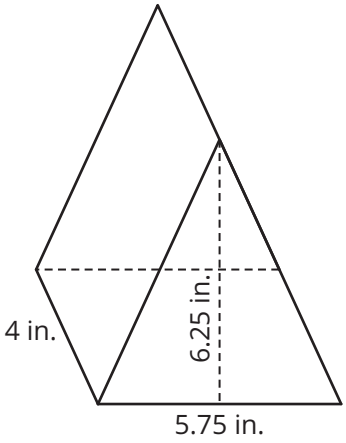
3. A pet store sells a number of fish tanks. One of their tanks has the dimensions shown. How much water could this tank hold?

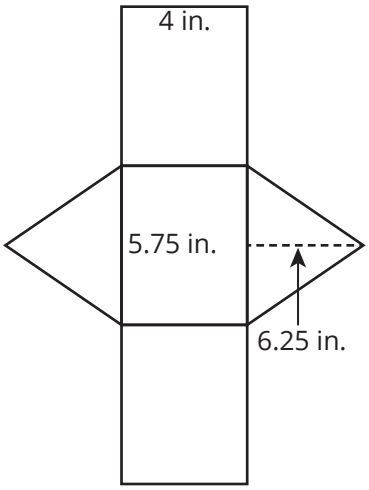




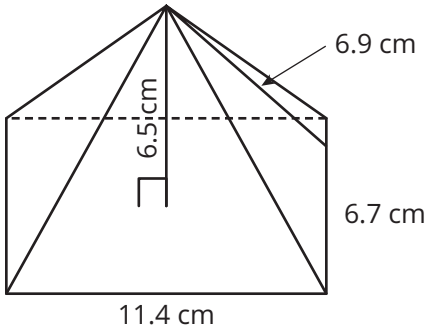
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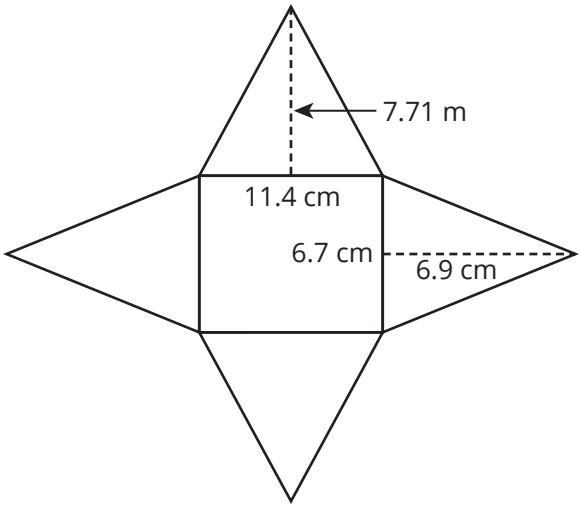
4. Aaliyah is making blocks for her nephew. She carves the blocks out of wood then paints them blue. How much paint will she need to paint this block?



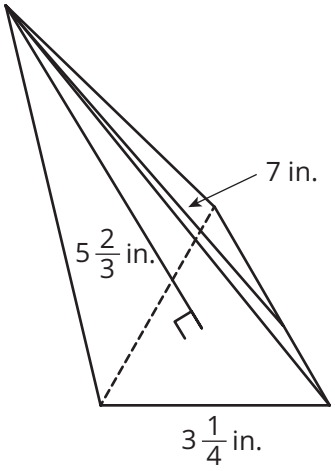


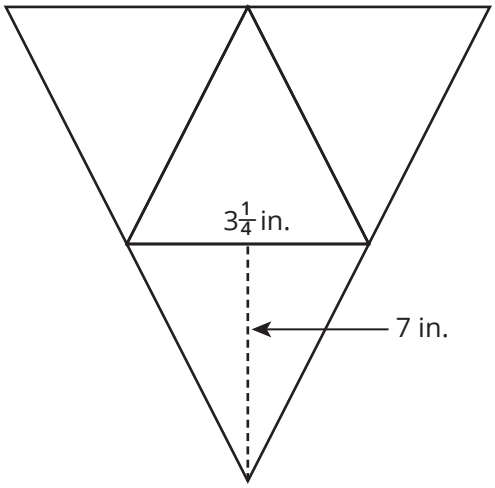
5. Noah is building a model of a pyramid. He builds the pyramid out of cardstock. He then fills the pyramid with sand to weigh it down. How much sand will he need to fill this pyramid?





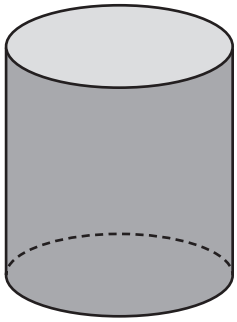
6. Ava is decorating hanging glass sun catchers. She paints every face of a sun catcher except the base. How much paint does she need to paint one sun catcher?





Extension

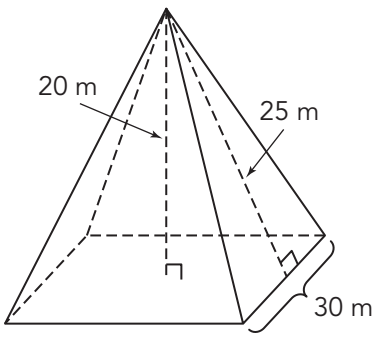
1. You have learned about the diameter, radius, and circumference of circles. How could you determine the surface area of a cylinder, like the one shown?



Spaced Practice

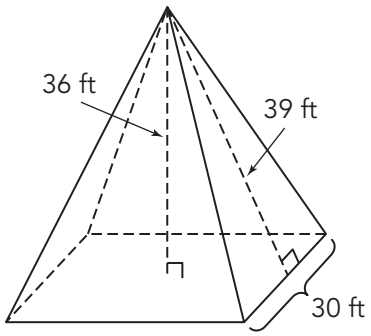
Calculate the volume of each square pyramid.

1.



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2.



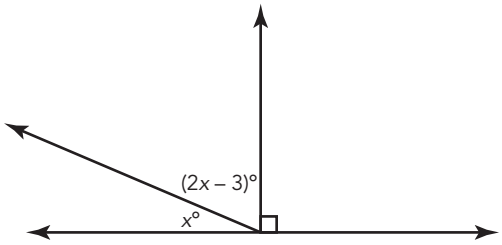
Draw each pair of special angles.

3. Draw a pair of supplementary angles. Explain why the angles are supplementary.

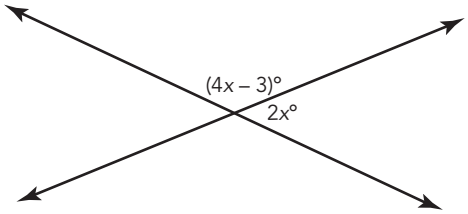
4. Draw a pair of complementary angles. Explain why the angles are complementary.

Write an equation and solve for the unknown angle measures in each figure.

5.



6.



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