Bluebonnet Learning
Secondary Mathematics
EDITION 1

Grade 6

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

These learning resources have been built for Texas students, aligned to the Texas Essential Knowledge and Skills, and are made available pursuant to Chapter 31, Subchapter B-1 of the Texas Education Code.

If you have further product questions or to report an error, please email openeducationresources@tea.texas.gov.

Bluebonnet Learning

Secondary Mathematics

EDITION 1

Grade 6

Skills Practice Guide

GRADE 6

MODULE 1

Composing and Decomposing

TOPIC 1: Factors and Multiples

I. Writing Equivalent Expressions Using the Distributive Property 3
II. Identifying Common Factors and Common Multiples 7
III. Dividing a Whole into Fractional Parts 13
IV. Benchmark Fractions 17
V. Multiplying Fractions 22
VI. Fraction by Fraction Division 27

TOPIC 2: Shapes and Solids

I. Constructing Triangles Given Sides 33
II. Triangle Sum Theorem 36
III. Areas of Triangles and Quadrilaterals 40
IV. Volume of Rectangular Prisms 48

TOPIC 3: Decimals

I. Plotting, Comparing, and Ordering Rational Numbers 53
II. Multiplying Decimals 57
III. Dividing Decimals 64

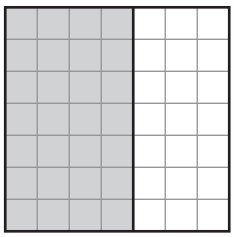
CC BY NC

Name _____ Date _____

I. Writing Equivalent Expressions Using the Distributive Property

Topic Practice

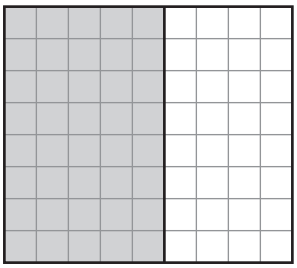
A. Complete each equation to represent the model.

1. 

$7 \cdot (4 + 3) = 7 \cdot ____ + 7 \cdot ____$

$= ____ + 21$

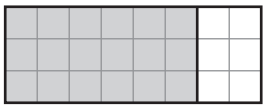
$= ____$

2. 

$8 \cdot (5 + 4) = 8 \cdot ____ + 8 \cdot ____$

$= 40 + ____$

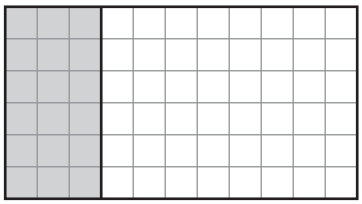
$= ____$

3. 

$3 \cdot (____ + 2) = 3 \cdot 6 + ____ \cdot 2$

$= ____ + 6$

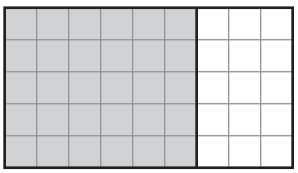
$= ____$

4. 

$____ \cdot (3 + 8) = 6 \cdot 3 + ____ \cdot 8$

$= ____ + 48$

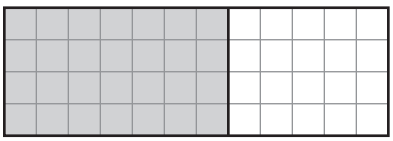
$= ____$

5. 

$5 \cdot (6 + 3) = 5 \cdot ____ + 5 \cdot ____$

$= 30 + ____$

$= ____$

6. 

$____ \cdot (7 + 5) = 4 \cdot ____ + 4 \cdot 5$

$= 28 + ____$

$= ____$

B. Complete each equation.

1. $8 \cdot 12 = 8 \cdot (____ + 10)$
2. $5 \cdot 14 = 5 \cdot (10 + ____)$
3. $7 \cdot 13 = 7 \cdot (____ + 10)$
4. $9 \cdot 11 = 9 \cdot (____ + 1)$
5. $11 \cdot 15 = 11 \cdot (____ + 10)$
6. $12 \cdot 12 = 12 \cdot (10 + ____)$

C. Identify the expression that shows a correct way to decompose each.

1. $10 \cdot 8$
2. $9 \cdot 12$
3. $13 \cdot 7$
4. $9 \cdot 8$
5. $12 \cdot 6$
6. $13 \cdot 11$

a. $9(8 + 4)$

b. $13(7 + 4)$

c. $9(6 + 2)$

d. $10(7 + 1)$

e. $12(3 \cdot 3)$

f. $10(4 \cdot 4)$

g. $13(3 + 4)$

h. $12(4 + 2)$

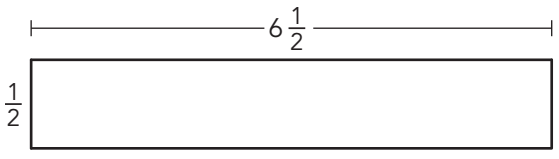
D. Match each expression to the equivalent addition expression.

1. $35 + 28$	a. $7 \cdot (8 + 6)$
2. $18 + 36$	b. $7 \cdot (2 + 11)$
3. $121 + 22$	c. $11 \cdot (11 + 2)$
4. $14 + 77$	d. $6 \cdot (3 + 6)$
5. $27 + 12$	e. $3 \cdot (9 + 4)$
6. $56 + 42$	f. $7 \cdot (5 + 4)$

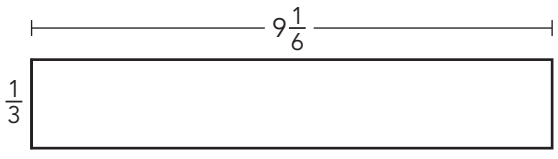
Extension

Decompose each rectangle into smaller rectangles to demonstrate the distributive property. Write each area in the form $a(b + c) = ab + ac$ and then determine the total area.

1.



2.



Spaced Practice

Calculate the area of each rectangle.

1. Width = 5 feet
   Length = $\frac{2}{3}$ foot

2. Width = 10 feet
   Length = $\frac{2}{3}$ foot

3. Width = 15 inches
   Length = $\frac{2}{3}$ inch

4. Width = 20 inches
   Length = $\frac{2}{3}$ inch

II. Identifying Common Factors and Common Multiples

Topic Practice

A. Construct a factor tree and write the prime factorization for each number.

1. 18

2. 56

3. 54

4. 108

5. 72

6. 60

CC BY NC

B. Write the prime factorization for each number in Part B using powers.

1. 18
2. 56
3. 54
4. 108
5. 72
6. 60

C. List the factors of each number. Then, determine the common factor(s).

1. 25, 45
2. 48, 20
3. 32, 56
4. 15, 16
5. 32, 80
6. 25, 36

D. Rewrite each numeric expression using the distributive property and the greatest common factor (GCF).

1. 56 + 35

2. 90 + 27

3. 54 + 72

4. 36 + 60

5. 32 + 28

6. 88 + 66

E. List the multiples of each number. Then, determine the least common multiple.

1. 6, 9

2. 12, 30

3. 4, 7

4. 42, 70

CC BY NC

5. 8, 11

6. 24, 40

F. Write the prime factorization for each number. Then, determine the greatest common factor (GCF) and the least common multiple (LCM).

1. 28, 32

2. 40, 100

3. 18, 45

4. 30, 70

5. 50, 105

6. 126, 84

CC BY NC

Extension

Determine the LCM or GCF for each.

1. LCM(4, 8, 14)

2. LCM(9, 15, 18)

3. GCF(8, 27, 35)

4. GCF(20, 90, 50)

Spaced Practice

Use the distributive property to write an equivalent addition expression for each.

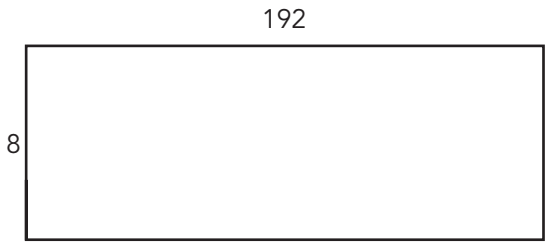
1. $6(9 + 1)$

2. $(14 + 3)7$

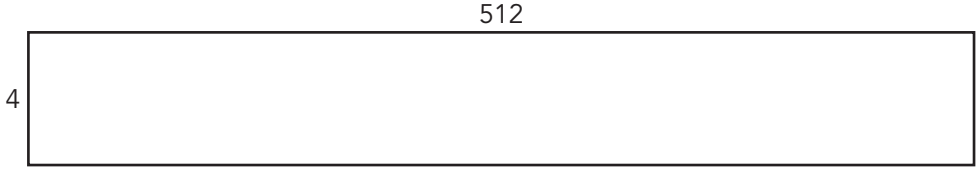
3. $\frac{1}{2}(7 + 10)$

Decompose each rectangle into two smaller rectangles to demonstrate the distributive property. Then, write each in the form $a(b + c) = ab + ac$.

4.



5.



III. Dividing a Whole into Fractional Parts

Topic Practice

A. The Math Glossary is like a dictionary, where you can look up the definitions of math terms. The pages of a glossary or dictionary are organized into columns of equal width.

1. When a dictionary page has 3 columns, what fraction of the page is represented by 1 column?

2. When a dictionary page has 5 columns, what fraction of the page is represented by 1 column?

3. When a dictionary page has 4 columns, what fraction of the page is represented by 1 column?

4. Consider the dictionary page layouts above. If the pages are all the same size, which column is the widest?

5. When a dictionary page has 4 columns, what fraction of the page is represented by 2 columns?

6. Write an equivalent fraction to represent how much space the 2 columns take up on the page.

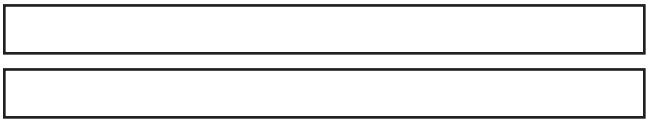
7. When a dictionary page has 6 columns, what fraction of the page is represented by 2 columns?

8. Write an equivalent fraction to represent how much space the 2 columns take up on the page.

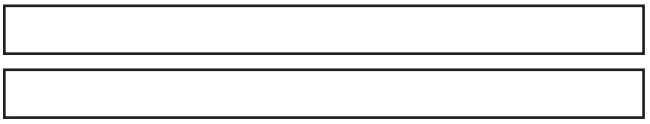
CC BY NC

B. Divide the strips into equal parts and shade to determine the equivalent fraction.

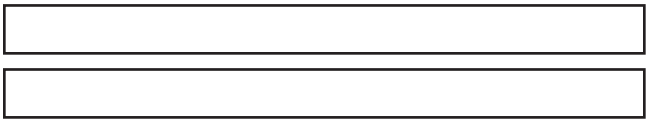
1. Show that $\frac{2}{3}$ is equivalent to $\frac{\ }{9}$.



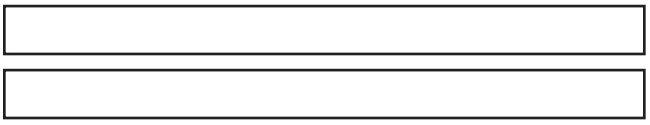
2. Show that $\frac{1}{4}$ is equivalent to $\frac{\ }{8}$.



3. Show that $\frac{1}{3}$ is equivalent to $\frac{\ }{6}$.



4. Show that $\frac{1}{3}$ is equivalent to $\frac{\ }{9}$.



5. Show that $\frac{3}{5}$ is equivalent to $\frac{\quad}{10}$.

6. Show that $\frac{2}{3}$ is equivalent to $\frac{\quad}{6}$.

Extension

Suppose you were on one side of the classroom with your back to the wall and you took one giant step toward the opposite wall. The second step you take has to be $\frac{1}{2}$ the distance of the first step. The third step you take has to be $\frac{1}{2}$ the distance of the second step. The fourth step you take has to be $\frac{1}{2}$ the distance of the third step. (And so on, and so on.)

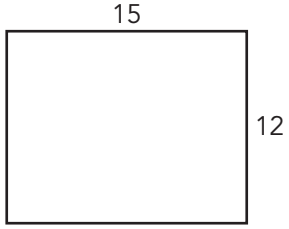
1. Will you ever reach the opposite wall of the classroom? Explain your reasoning.

2. What does this situation have to do with the paper folding activity?

Spaced Practice

1. Determine the area of each rectangle with the given dimensions.

a.



b.



2. Use the distributive property to rewrite each numeric expression as a sum.

a. $5(9 + 11)$

b. $15(3 + 5)$

3. Determine the prime factorization of each number.

a. 28

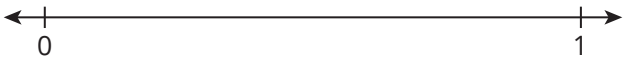
b. 52

IV. Benchmark Fractions

Topic Practice

A. Label the given number line to represent the fractional part provided and plot each fraction.

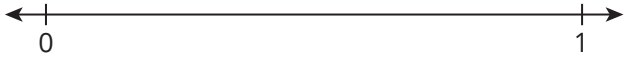
1. Divide the number line into halves. Plot $\frac{1}{2}$.



2. Divide the number line into sixths. Plot $\frac{2}{6}$ and $\frac{5}{6}$.



3. Divide the number line into thirds. Plot $\frac{1}{3}$ and $\frac{2}{3}$.



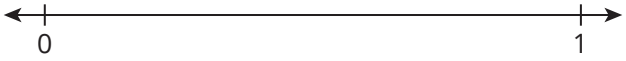
4. Divide the number line into fifths. Plot $\frac{1}{5}$ and $\frac{3}{5}$.



5. Divide the number line into ninths. Plot $\frac{3}{9}$, $\frac{6}{9}$, and $\frac{8}{9}$.



6. Divide the number line into tenths. Plot $\frac{2}{10}$, $\frac{3}{10}$, $\frac{5}{10}$, and $\frac{9}{10}$.



B. Name the closest benchmark fraction to each given fraction.

1. $\frac{1}{9}$
2. $\frac{5}{12}$
3. $\frac{16}{18}$
4. $\frac{3}{5}$
5. $\frac{13}{14}$
6. $\frac{3}{61}$

C. Fill in the missing numerator or denominator so that each fraction is close to but less than $\frac{1}{2}$.

1. $\frac{\quad}{17}$
2. $\frac{4}{\quad}$
3. $\frac{12}{\quad}$
4. $\frac{\quad}{7}$
5. $\frac{\quad}{5}$
6. $\frac{9}{\quad}$

D. Fill in the missing numerator or denominator so that each fraction is close to but less than 1.

1. $\frac{\quad}{15}$
2. $\frac{4}{\quad}$
3. $\frac{8}{\quad}$
4. $\frac{\quad}{11}$
5. $\frac{\quad}{13}$
6. $\frac{22}{\quad}$

E. Use benchmark fractions and estimation to order the fractions from least to greatest.

1. $\frac{1}{3}, 2\frac{3}{4}, \frac{47}{24}, \frac{16}{8}, \frac{1}{8}, 1\frac{1}{5}$

2. $\frac{5}{4}, \frac{2}{3}, \frac{8}{8}, \frac{5}{6}, \frac{7}{12}, \frac{8}{5}$

3. $\frac{5}{12}, \frac{3}{16}, \frac{1}{8}, \frac{7}{6}, \frac{3}{4}, 1\frac{1}{2}$

4. $\frac{1}{7}, \frac{3}{5}, \frac{3}{14}, \frac{11}{10}, \frac{7}{8}, \frac{3}{2}$

5. The amount of sugar in cups used in 6 different recipes is listed: $\frac{8}{16}, \frac{1}{4}, \frac{9}{8}, \frac{9}{12}, 1\frac{1}{4}, \frac{24}{24}$.
   Order the amount of sugar used in each recipe from least to greatest.

6. The time five students spent working on homework in hours is listed: $\frac{5}{18}, \frac{1}{20}, \frac{7}{9}, \frac{33}{32}, 1\frac{5}{6}, \frac{23}{24}$
   Order the times spent from least to greatest.

CC BY NC

E. Rewrite each expression using benchmark fractions. Then estimate the sum.

1. $\frac{7}{15} + \frac{21}{23}$

2. $\frac{9}{72} + \frac{23}{50}$

3. $\frac{2}{41} + \frac{12}{13}$

4. $\frac{6}{7} + \frac{11}{12} + \frac{4}{9}$

5. $\frac{7}{15} + \frac{8}{14} + \frac{3}{7}$

6. $\frac{11}{23} + \frac{13}{14} + \frac{9}{10} + \frac{2}{25}$

Extension

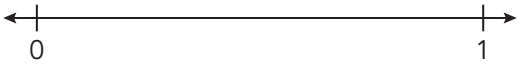
Use benchmark fractions to estimate each product or quotient.

1. $\frac{5}{6} \cdot \frac{4}{3}$

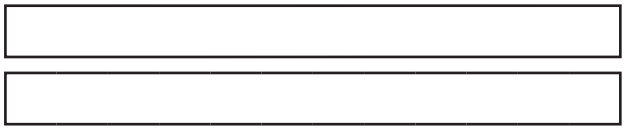
2. $\frac{7}{8} \div \frac{4}{9}$

Spaced Practice

1. Label the number line to represent fifths.



2. Use strip diagrams to show that $\frac{2}{3}$ is equivalent to $\frac{8}{12}$.



3. Determine the prime factorization of 42.

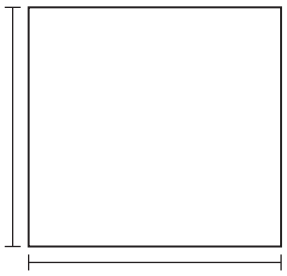
CC BY NC

V. Multiplying Fractions

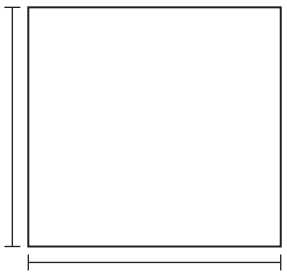
Topic Practice

A. Represent each product using an area model. Then calculate the product.

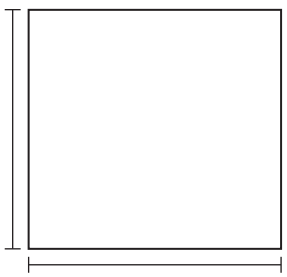
1. $\frac{3}{4} \cdot \frac{1}{3}$



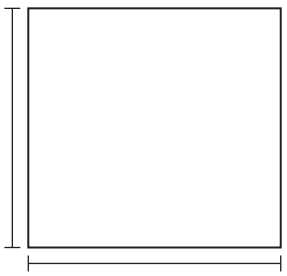
2. $\frac{1}{2} \cdot \frac{3}{5}$



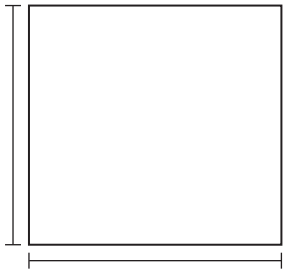
3. $\frac{1}{6} \cdot \frac{2}{3}$



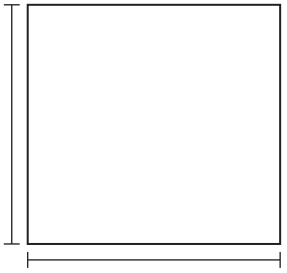
4. $\frac{1}{3} \cdot \frac{4}{5}$



5. $\frac{1}{4} \cdot \frac{1}{3}$



6. $\frac{1}{2} \cdot \frac{5}{6}$



B. Calculate each product. Simplify if necessary.

1. $\frac{3}{5} \cdot \frac{4}{7}$

2. $\frac{2}{9} \cdot \frac{1}{4}$

3. $\frac{2}{5} \cdot \frac{10}{13}$

4. $\frac{3}{7} \cdot \frac{4}{5}$

5. $\frac{3}{4} \cdot \frac{1}{12}$

6. $\frac{1}{6} \cdot \frac{12}{13}$

CC BY NC

C. Calculate each product. Write your answer in simplest form.

1. $3\frac{4}{5} \cdot 2\frac{1}{2}$

2. $1\frac{3}{8} \cdot 6\frac{1}{4}$

3. $5\frac{2}{3} \cdot 4\frac{1}{6}$

4. $2\frac{1}{3} \cdot 7\frac{1}{4}$

5. $6\frac{1}{2} \cdot 1\frac{3}{4}$

6. $3\frac{1}{8} \cdot 5\frac{1}{2}$

D. Determine whether the first factor will increase or decrease when multiplied by the second factor.

1. $7 \cdot \frac{1}{2}$

2. $\frac{4}{5} \cdot 8$

3. $7 \cdot 3$

4. $10 \cdot \frac{9}{10}$

5. $\frac{2}{3} \cdot \frac{1}{2}$

6. $\frac{3}{8} \cdot 9$

E. Determine whether the first factor will increase or decrease when multiplied by the second factor. Then, calculate each product and write your answer in simplest form.

1. $3 \cdot \frac{3}{4}$

2. $\frac{3}{8} \cdot \frac{2}{5}$

3. $\frac{6}{11} \cdot 33$

4. $15 \cdot \frac{7}{2}$

5. $8 \cdot \frac{9}{10}$

6. $\frac{2}{3} \cdot 1\frac{4}{5}$

CC BY NC

Extension

Write a rule for when the product of two mixed numbers is a whole number. Give an example that follows your rule.

Spaced Practice

Identify the expression that shows a correct way to decompose each multiplication statement.

1. $10 \cdot 8$
2. $9 \cdot 12$
3. $13 \cdot 7$
4. $9 \cdot 8$
5. $12 \cdot 6$
6. $13 \cdot 11$

a. $9(8 + 4)$
b. $13(7 + 4)$
c. $9(6 + 2)$
d. $10(7 + 1)$
e. $12(3 \times 3)$
f. $10(4 \times 4)$
g. $13(3 + 4)$
h. $12(4 + 2)$

7. Estimate and then calculate each product.

   a. $625 \cdot 34$

   b. $1014 \cdot 59$

VI. Fraction by Fraction Division

Topic Practice

A. Solve each problem. Show your work.

1. Daniel has 6 cups of popcorn. How many friends can he share the popcorn with if each is given $\frac{2}{3}$ cup?

2. Juan has 3 cups of grapes. He likes to pack $\frac{3}{4}$ cup of fruit in his lunch each day. How many days can Juan pack grapes in his lunch?

CC BY NC

3. Emma has $\frac{3}{4}$ cup of laundry detergent left in the detergent bottle. Each load of laundry requires $\frac{1}{6}$ cup of detergent. How many loads of laundry can Emma wash?

4. Jayden has $\frac{4}{5}$ cup of blueberries. A batch of blueberry muffins requires $\frac{1}{3}$ cup of blueberries. How many batches of blueberry muffins can Jayden make?

5. Isabella has $\frac{2}{3}$ cup of shampoo left in the shampoo bottle. She uses $\frac{1}{8}$ cup of shampoo to wash her hair. If Isabella washes her hair every day, how many days can she wait before opening a new bottle of shampoo?

6. Harper has 5 pints of strawberries. She needs $\frac{3}{2}$ pints to make a batch of strawberry ice cream. How many batches of strawberry ice cream can Harper make?

CC BY NC

B. Calculate each quotient and show your work. Then, simplify your answer.

1. $\frac{7}{4} \div \frac{11}{7} = ?$

2. $\frac{8}{3} \div \frac{2}{5} = ?$

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

4. $9 \div 5 = ?$

5. $\frac{15}{8} \div \frac{4}{3} = ?$

6. $10 \div 3 = ?$

C. Calculate each quotient. Simplify your answer.

1. $9\frac{1}{3} \div 2\frac{1}{3}$

2. $10\frac{1}{5} \div 3\frac{2}{5}$

3. $19 \div 6\frac{1}{4}$

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

5. $15\frac{2}{3} \div 4\frac{5}{6}$

6. $5\frac{1}{2} \div 1\frac{1}{4}$

Extension

Write a word problem that could be modeled by the quotient $2\frac{1}{2} \div \frac{3}{4}$.

Spaced Practice

1. Invented in the 1970s by the San Diego Track Club, a triathlon consists of swimming, cycling, and running. The triathlon was added to the Olympics at the Sydney 2020 Games and includes an approximate $\frac{9}{10}$–mile swim, a $24\frac{4}{5}$–mile cycle, and a $6\frac{1}{5}$–mile run. One training coach requires his clients to swim $2\frac{2}{3}$ times farther than they will swim in the triathlon to ensure they are prepared and less tired on the day of competition.

   a. Use benchmark fractions to estimate how far the coach requires his clients to swim. Show your work.

   b. Calculate the exact distance the coach requires his clients to swim. Show your work.

CC BY NC

2. Sofia is a camp counselor at a local summer camp. She is in charge of the weekly craft activity for 40 campers. She plans to make fabric-covered frames that each require $\frac{1}{6}$ yard of fabric. The camp director gave her $6\frac{2}{3}$ yards of fabric remnants for this project. Does Sofia have enough fabric for her craft activity? Show your work.

3. Write the prime factorization for each number. Then, determine the greatest common factor.

   a. 28, 32

   b. 40, 100

Name _____ Date _____

I. Constructing Triangles Given Sides

Topic Practice

A. Determine whether it is possible to form a triangle using segments with the given measurements.

1. 3 in., 2.9 in., 5 in.
2. 4 m, 5.1 m, 12.5 m
3. 7.4 cm, 8.1 cm, 9.8 cm
4. 13.8 km, 6.3 km, 7.5 km
5. 20.2 in., 11 in., 8.2 in.
6. 6 cm, 3.1 cm, 9 cm

B. Determine whether the given information forms a unique triangle, many different triangles, or no triangles. Explain your reasoning.

1. 7.2 cm, 3.8 cm, 10.4 cm
2. 2.25 ft, 2.7 ft
3. 9 m, 1.4 m, 6.7 m
4. 6.5 in., 8.9 in., 3.2 in.

CC BY NC

5. 3.15 yd, 6.34 yd

6. 22.4 mm, 7.8 mm, 13.8 mm

Extension

1. Use your compass and straightedge to construct an equilateral triangle.

Spaced Practice

1. List the factors of each number. Then, determine the greatest common factor: 25, 36.

2. Rewrite each numeric expression using the distributive property and the GCF.

   a. $56 + 35$

   b. $90 + 27$

3. At the middle school, the bell rings every 40 minutes to tell the students to change classes. Across the street, the clock above city hall chimes every 30 minutes. Both the school bell and the clock ring at noon. When will both bells ring at the same time again?

4. Mateo babysits his neighbor's children in the evening every 14 days. Mateo goes to visit his grandmother in the afternoon every 21 days. Mateo has both activities planned for today. Will Mateo have both activities again on the same day within 30 days? Explain your reasoning.

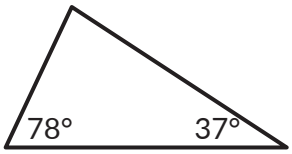
CC BY NC

II. Triangle Sum Theorem

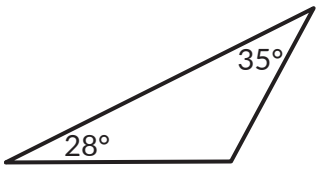
Topic Practice

A. You are helping set up for swimming races at camp. Each course is in the shape of a triangle with a buoy at each vertex. There are rope floats to connect each buoy in order to help swimmers stay on course. The scale drawings of each swim course are shown.

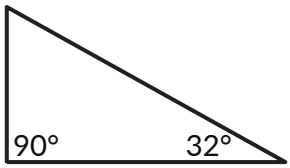
Course 1



Course 2



Course 3



1. You will label each circuit with the measures of each angle and the lengths of each side. Work with one triangle at a time.

   a. Use the Triangle Sum theorem to determine the measure of the third angle for Course 1. Label the unknown angle measure. Then, use the table to list the angle measures for Course 1 from least to greatest.

   b. Use the Triangle Sum theorem to determine the measure of the third angle for Course 2. Label the unknown angle measure. Then, use the table to list the angle measures for Course 2 from least to greatest.

   e. Use the Triangle Sum theorem to determine the measure of the third angle for Course 3. Label the unknown angle measure. Then, use the table to list the angle measures for Course 3 from least to greatest.

   b. Measure the length of each side of Course 1. Then, use the table to list the side lengths for Course 1 from least to greatest.

   d. Measure the length of each side of Course 2. Then, use the table to list the side lengths for Course 2 from least to greatest.

   f. Measure the length of each side of Course 3. Then, use the table to list the side lengths for Course 3 from least to greatest.

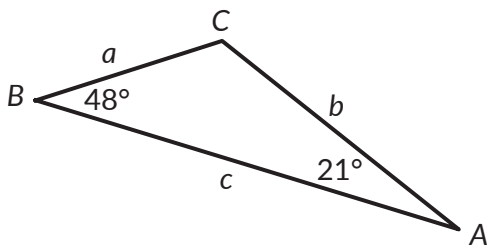
	Course 1	Course 2	Course 3
Angle Measures			
Side Lengths			

2. The longest side of each course is across from the _____ angle.

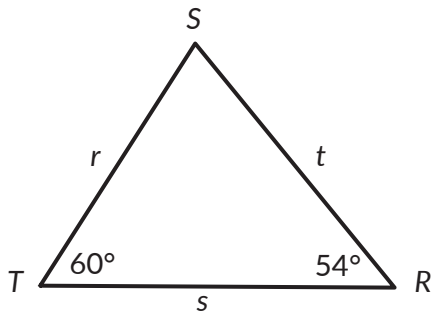
3. The smallest angle of each course is across from the _____ side.

B. Determine the unknown angle measure. Then, list the sides in order from shortest to longest.

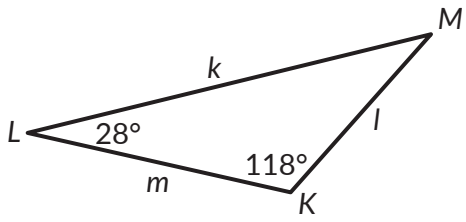
1.



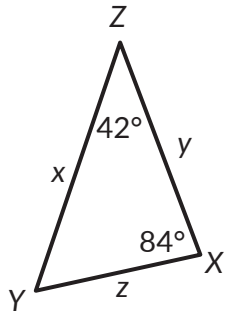
2.



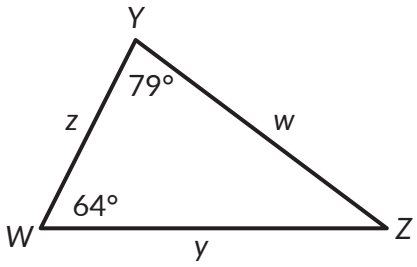
3.



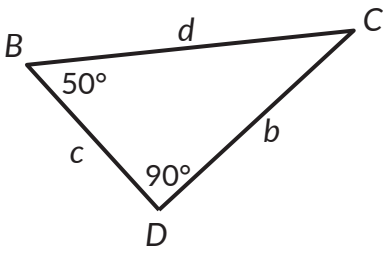
4.



5.



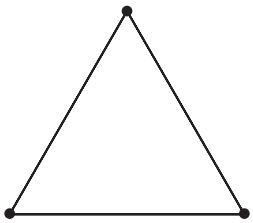
6.



Extension

1. To tessellate a plane means *to cover a surface by repeated use of a single shape or design without gaps or overlaps.* M.C. Escher was a Dutch graphic artist who is famous for his tessellations, perspective drawings, and impossible spaces.

   You cannot tessellate all shapes or patterns. Use what you know about the interior angles of equilateral triangles to explain why you can tessellate equilateral triangles and to determine the number of triangles around each vertex in a tessellation.



Spaced Practice

1. Write the prime factorization for each number. Then, determine the greatest common factor: 18, 42.

2. List the multiples of each number. Then, determine the least common multiple: 24, 40.

3. Victoria's family volunteers at the local soup kitchen every 30 days. Victoria has swimming lessons every 9 days. She has both activities this Saturday. When will she have both activities again on the same day?

4. Determine whether it is possible to form a triangle using segments with the given measurements.

   a. 8 ft, 9 ft, 11 ft

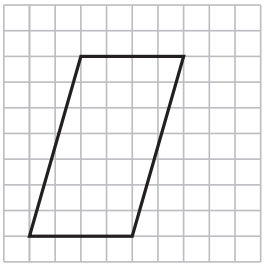
   b. 4 m, 5.1 m, 12.5 m

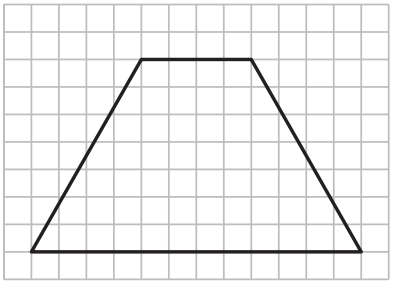
CC BY NC

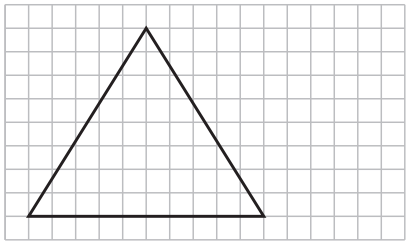
III. Area of Triangles and Quadrilaterals

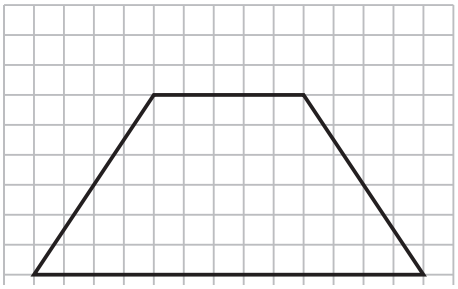
Topic Practice

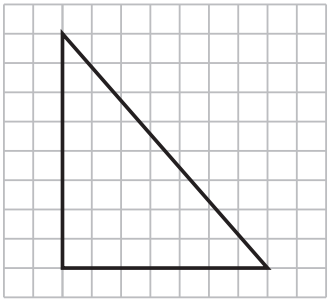
A. Compose or decompose each figure and rearrange to determine the total area.

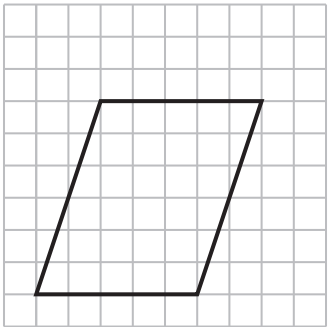
1. 

2. 

3. 

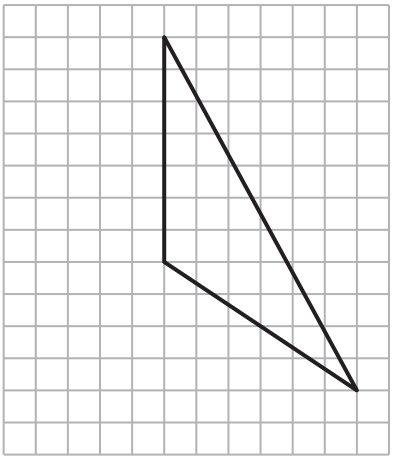
4. 

5. 

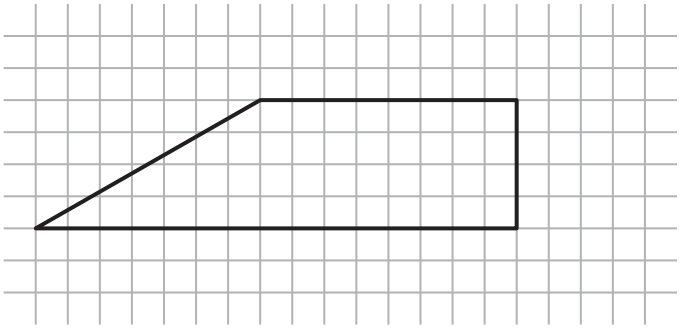
6. 

B. Identify a base or bases and corresponding height for each figure. Then, determine the area of the figure.

1.

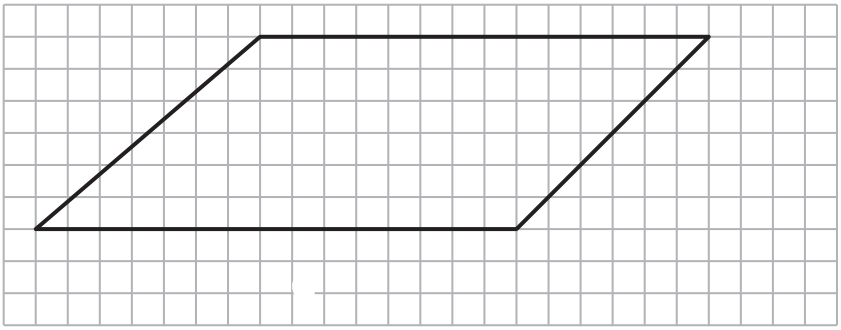


2.

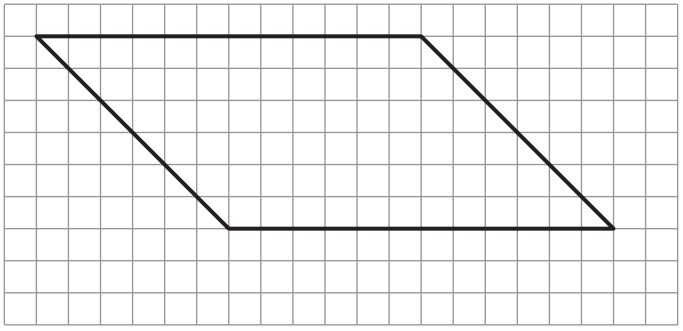


CC BY NC

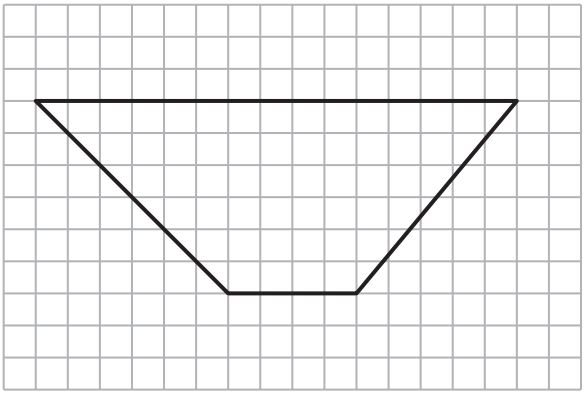
3.



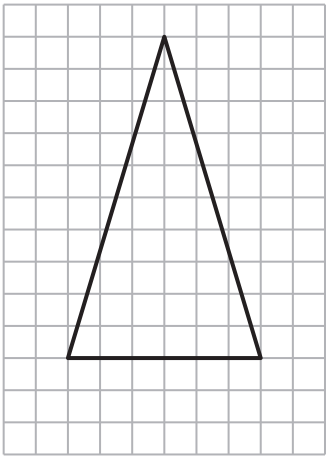
4.



5.



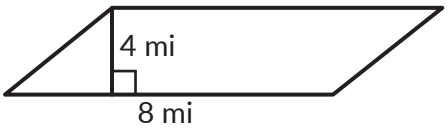
6.



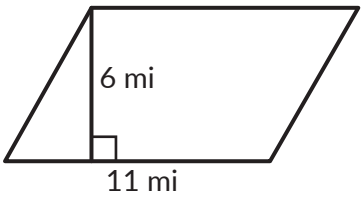
CC BY NC

C. Write an equation and calculate the area of each figure.

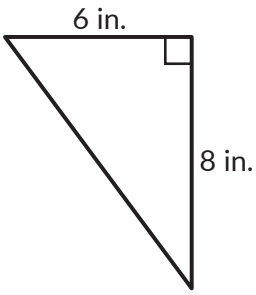
1.



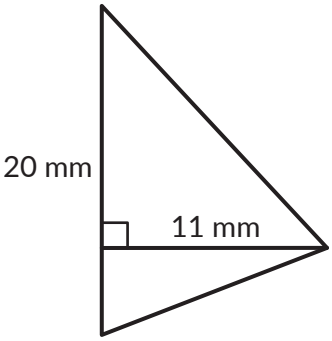
2.



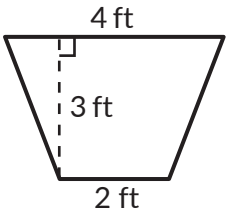
3.



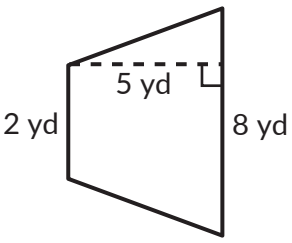
4.



5.

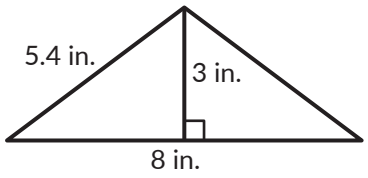


6.

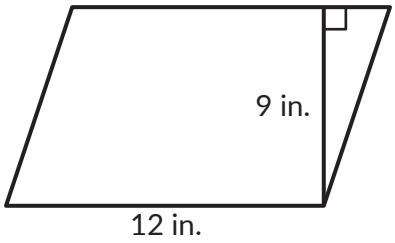


D. Use the given information to write an equation and answer each question.

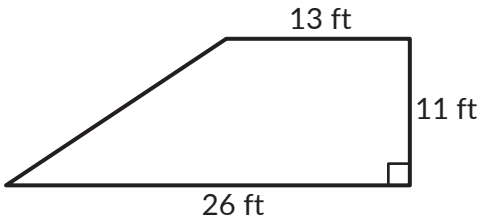
1. A fabric napkin is folded into a triangle and put onto a placemat. The dimensions of the folded napkin are shown in the diagram. How many square inches of fabric are showing on the placemat?



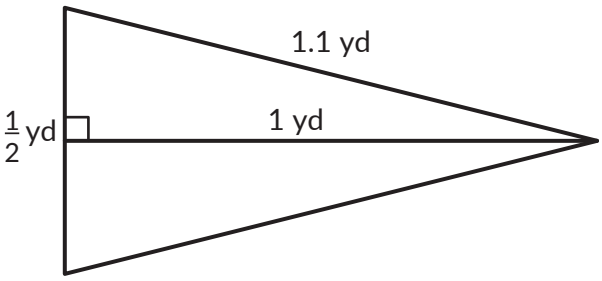
2. Liam cut a tile into the shape of a parallelogram to place on his floor. The dimensions of the tile are shown. What is the area of the tile?



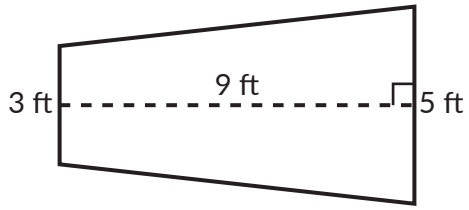
3. The side of a staircase has the shape of a trapezoid with the dimensions shown in the diagram. You want to paint this side of the staircase. How many square feet will you need to cover with paint?



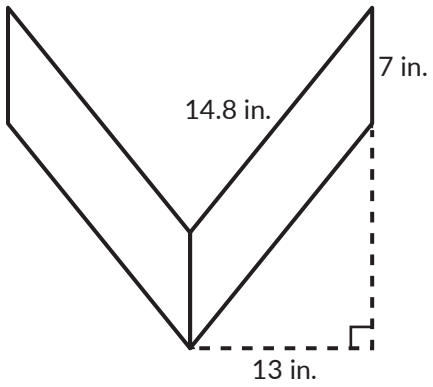
4. Elijah wants to make a pennant for his school's football team. The pennant will be a triangle with the dimensions shown in the diagram. How many square yards of felt will the pennant be made of?



5. A gymnastics safety mat for the vault is in the shape of a trapezoid. The base of the trapezoid and its dimensions are shown. What is the area of the mat?



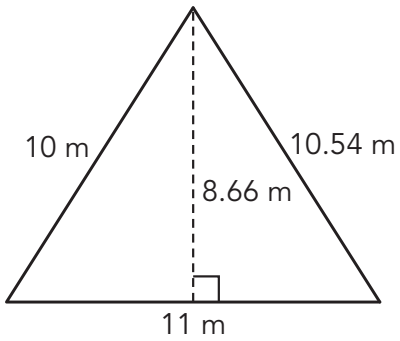
6. A piece of art is created from two congruent parallelograms that share a side. The artwork is shown below. Half of the artwork will be covered in blue paint. How many square inches of blue paint will be used?



Extension

1. What is the area of a parallelogram that has a base of $4\frac{3}{4}$ ft and a height of $1\frac{1}{3}$ ft?

2. Calculate the area of the triangle.



Spaced Practice

Use the distributive property to write an equivalent addition expression for each.

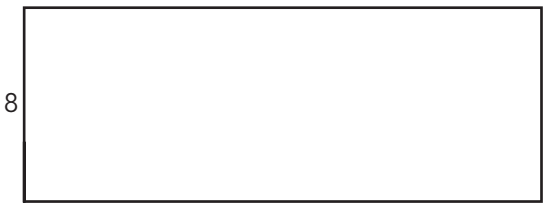
1. $6(9 + 1)$

2. $(14 + 3)7$

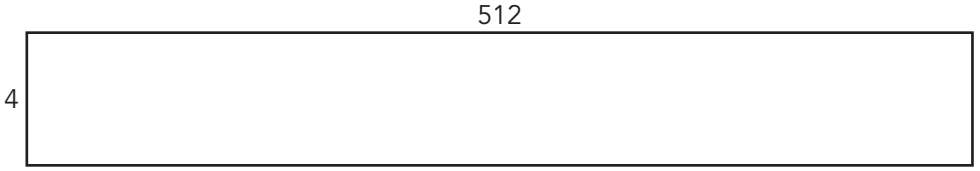
3. $\frac{1}{2}(7 + 10)$

Decompose each rectangle into two or three smaller rectangles to demonstrate the distributive property. Then, write each in the form $a(b + c) = ab + ac$.

4.



5.

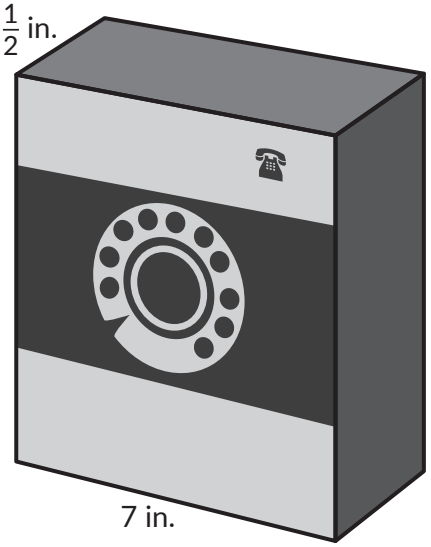


IV. Volume of Rectangular Prisms

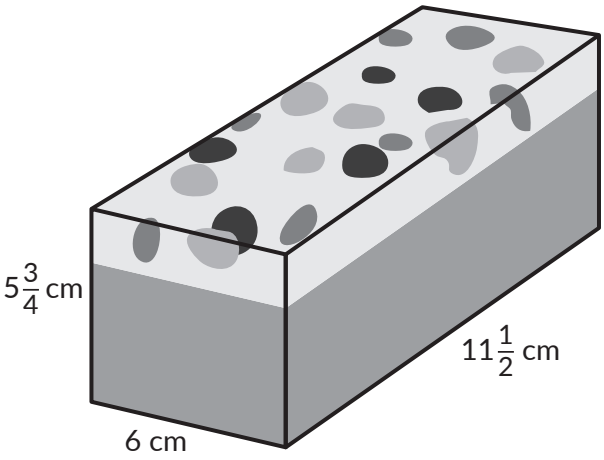
Topic Practice

A. Write an equation and calculate the volume of each figure.

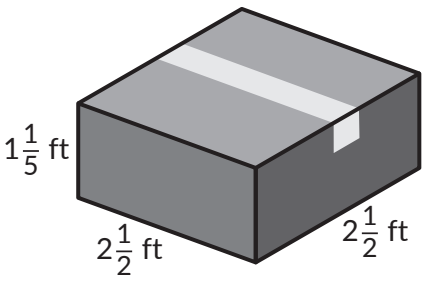
1.



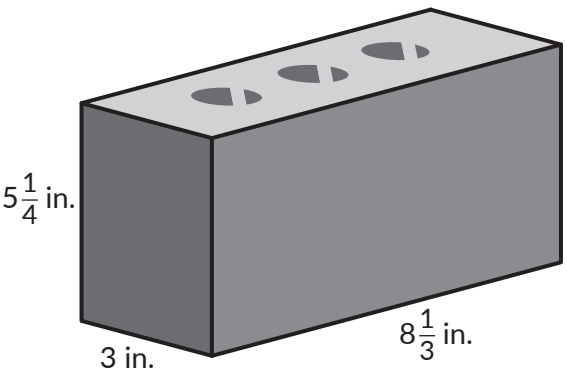
2.



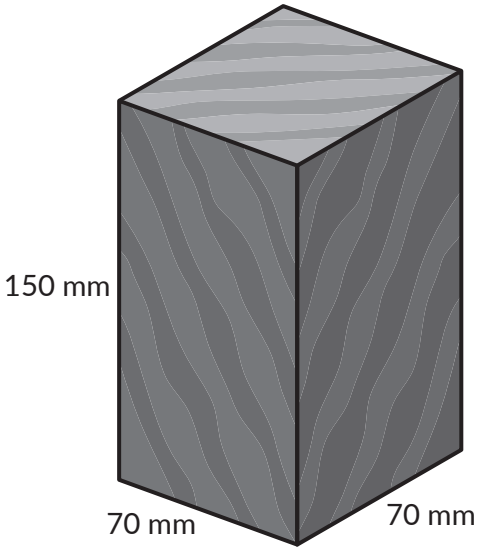
3.



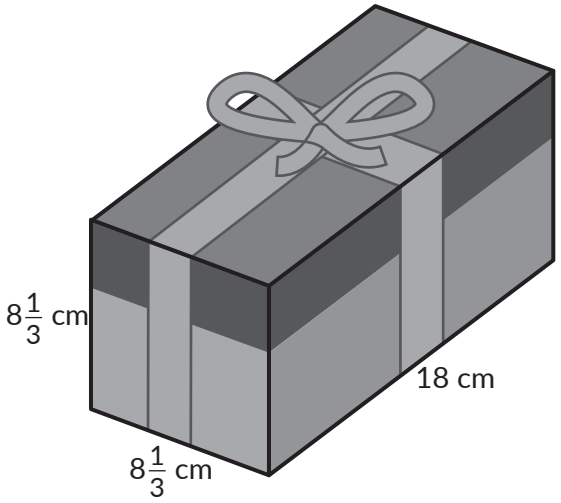
4.



5.



6.



B. Use your understanding of volume to write an equation and solve each problem.

1. A storage box with a square base has a side length of 2 feet and a height of $2\frac{1}{2}$ feet. What is the volume of the storage box?

2. Your uncle and aunt bought new bedroom furniture including a dresser. The rectangular dresser is 5 feet tall, $3\frac{1}{2}$ feet wide, and 2 feet long. What is the volume of this new dresser?

CC BY NC

3. A carpenter is building a new table. Each of the four legs is a rectangular prism with a height of 5 feet, a width of $\frac{1}{2}$ foot, and a length of $\frac{1}{2}$ foot. What is the total volume of wood that the carpenter used to make the table legs?

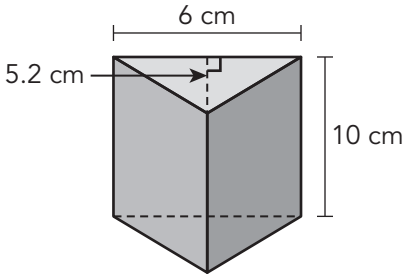
4. A square stained glass window is created for a kitchen. The window has a side length of 54 centimeters and a volume of 26,244 cubic centimeters. What is the depth of the square stained glass window?

5. Aaliyah bought a new rectangular ottoman for her living room. It opens so she can store items inside. The height of the ottoman is $1\frac{1}{2}$ feet and the volume is $6\frac{3}{4}$ cubic feet. What is the area of the base of the ottoman?

6. Kai is installing new gutters around the outside of his backyard shed. Each gutter is $3\frac{1}{3}$ yards long, $\frac{4}{5}$ yard high, and $\frac{1}{8}$ yard wide. What is the total volume of the four gutters Kai is installing on his shed?

Extension

Calculate the volume for the triangular prism.



Spaced Practice

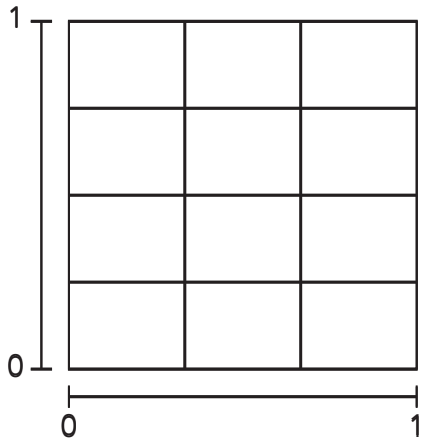
1. Ava wants to put together some of her favorite songs on her computer. She wants to store 60 minutes worth of music. Ava wonders how many songs she will be able to include. She looks online and finds a source that says the average song length is $3\frac{1}{2}$ minutes. If this is true, about how many songs will Ava be able to store? Show your work.

2. Emma is a camp counselor at a local summer camp. She is in charge of the weekly craft activity for 40 campers. Emma plans to make fabric-covered frames that each require $\frac{1}{6}$ yard of fabric. When Emma sets up for her craft activity, she measures the four separate fabric remnants her director gave her. The table shows how much of each fabric she has. How many campers can use plaid fabric? Show your work.

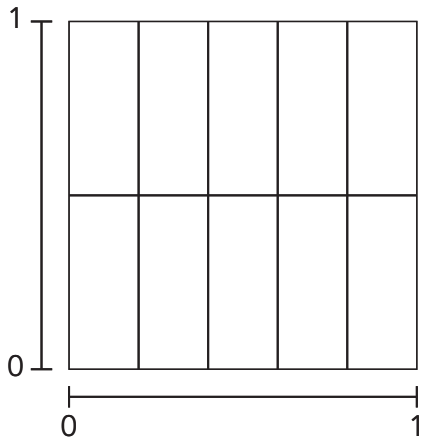
Fabric	Amount (yards)
Plaid	$\frac{11}{12}$
Tie-dyed	$1\frac{7}{9}$
Striped	$2\frac{2}{9}$
Polka-dotted	$1\frac{3}{4}$

3. Represent each product using an area model. Then, calculate the product.

a. $\frac{3}{4} \cdot \frac{1}{3}$



b. $\frac{1}{2} \cdot \frac{3}{5}$



4. Determine the GCF of each set of numbers.

   a. 72 and 30

   b. 30 and 54

5. Determine the LCM of each set of numbers.

   a. 10 and 12

   b. 8 and 9

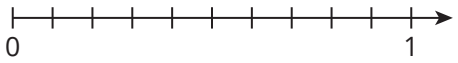
Name _____ Date _____

I. Plotting, Comparing, and Ordering Rational Numbers

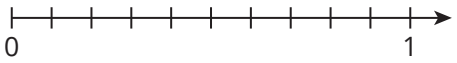
Topic Practice

A. Plot each pair of numbers on a number line. Then compare the values in each pair using >, <, or = .

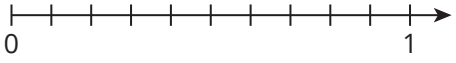
1. $0.05 ___ \frac{1}{20}$



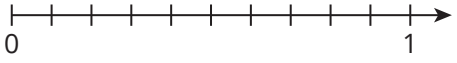
2. $0.27 ___ \frac{1}{5}$



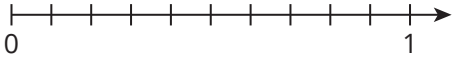
3. $\frac{1}{3} ___ 0.3$



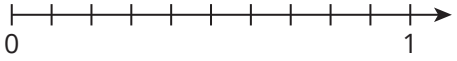
4. $\frac{2}{5} ___ 0.4$



5. $\frac{9}{10} ___ 0.95$



6. $0.55 ___ \frac{2}{3}$



B. Order the values in each group from least to greatest.

1. $0.5, \frac{3}{4}, 1, \frac{2}{5}, 0.36, 0.77$

2. $0.22, \frac{1}{4}, \frac{1}{5}, 0.5, \frac{2}{5}, 0.38$

3. $0.27, \frac{2}{3}, 1, 0.54, \frac{1}{2}, \frac{1}{4}$

4. $0.615, 0.7, \frac{3}{4}, 0.28, \frac{1}{3}, 0.8$

5. $\frac{1}{10}$, 0.12, $\frac{1}{100}$, 0.08, $\frac{1}{5}$, $\frac{1}{2}$

6. 0.33, $\frac{3}{4}$, $\frac{1}{5}$, 0.77, $\frac{71}{100}$, $\frac{2}{3}$

C. Order each set of rational numbers.

1. Harper wants to purchase four items at the sporting goods store. The items she wants to buy are soccer cleats for $24.99, shin guards for $12.99, soccer socks for $4.49, and a soccer ball for $19.95. List the item prices in order of least expensive to most expensive.

2. Minh wants to purchase three items at the sporting goods store. The items he wants to buy are football pants for $21.99, football pads for $25.49, and football cleats for $27.95. List the item prices in order of most expensive to least expensive.

3. Sofia, Chloe, and Jayden ran a 400-meter race. Sofia ran the race in 75.2 seconds. Chloe ran the race in 69.07 seconds. Jayden ran the race in $73\frac{1}{2}$ seconds. List the runners in order of fastest to slowest.

4. Victoria measured the heights of her three children. Aaliyah is $42\frac{3}{4}$ inches tall, Mateo is 46.8 inches tall, and Kai is 43.25 inches tall. List the children in order of shortest to tallest.

5. Liam, Elijah, Noah, and Samuel are practicing for the 100-meter relay race. The fastest time that each student ran a 100-meter sprint in practice is shown in the table. List the students in order of slowest to fastest.

Student	Time (seconds)
Liam	11.9
Elijah	12.6
Noah	12.52
Samuel	11.95

6. Ava, Emma, Isabella, and Harper are practicing for the 50-yard freestyle swimming race. The fastest time that each student swam the 50-yard race in practice is shown in the table. List the students in order of fastest to slowest.

Student	Time in Seconds
Ava	29.76
Emma	31.3
Isabella	30.02
Harper	29.85

Extension

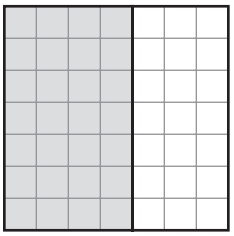
Order the values listed from least to greatest.

3.61 $4\frac{2}{3}$ $\frac{27}{8}$ 470%

385% $\frac{18}{5}$ 4.05 $\frac{29}{6}$

Spaced Practice

The model represents a numeric expression. Use the properties of operations to complete the equivalent expressions.

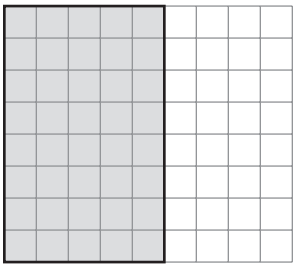
1. 

$7 \cdot (4 + 3)$

$= 7 \cdot$ _____ $+ 7 \cdot$ _____

$=$ _____ $+ 21$

$=$ _____

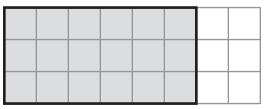
2. 

$8 \cdot (5 + 4)$

$= 8 \cdot$ _____ $+ 8 \cdot$ _____

$= 40 +$ _____

$=$ _____

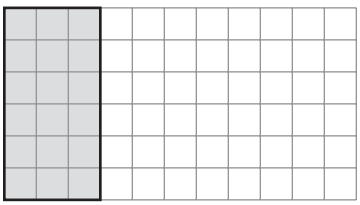
3. 

$3 \cdot ($_____ $+ 2)$

$= 3 \cdot 6 +$ _____ $\cdot 2$

$=$ _____ $+ 6$

$=$ _____

4. 

_____ $\cdot (3 + 8)$

$= 6 \cdot 3 +$ _____ $\cdot 8$

$=$ _____ $+ 48$

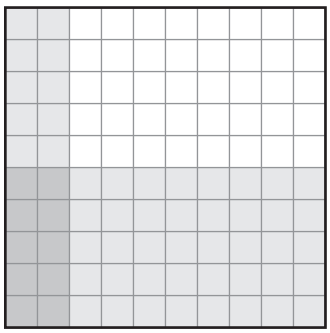
$=$ _____

II. Multiplying Decimals

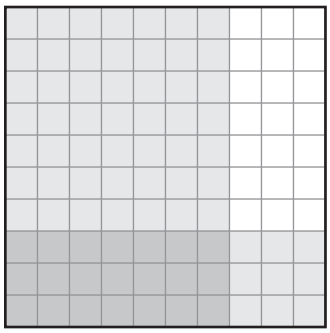
Topic Practice

A. Write the decimal multiplication equation shown by each model. Then determine each product.

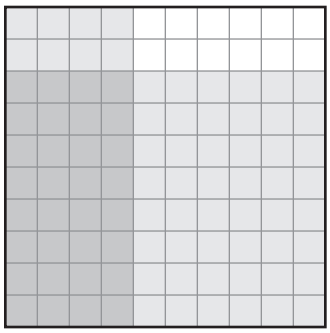
1.



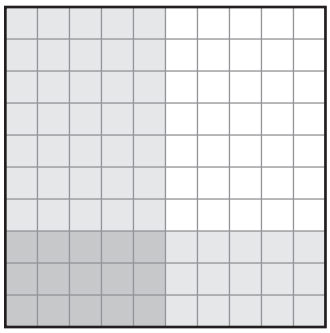
2.



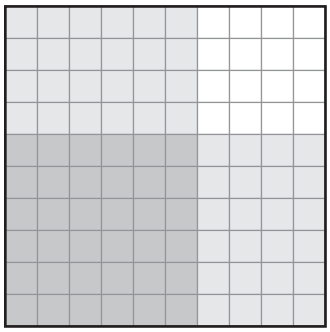
3.



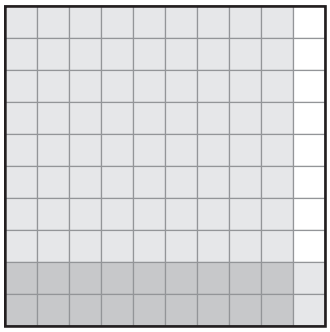
4.



5.



6.



CC BY NC

B. Estimate each product to the nearest whole number. Then calculate each product.

1. $5.9 \cdot 2.4$

2. $3.1 \cdot 6.2$

3. $4.17 \cdot 7.2$

4. $2.06 \cdot 8.25$

5. $9.154 \cdot 1.62$

6. $8.361 \cdot 2.042$

C. Calculate each product.

1. $4.6 \cdot 3.2$

2. $2.8 \cdot 5.7$

3. $1.05 \cdot 8.3$

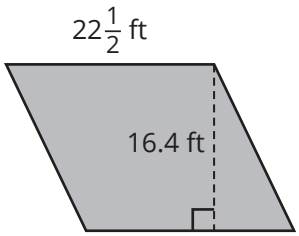
4. $6.14 \cdot 7.5$

5. $2.037 \cdot 9.4$

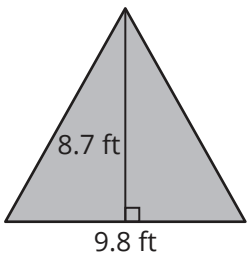
6. $3.005 \cdot 4.08$

D. Determine the area or volume of each figure.

1.

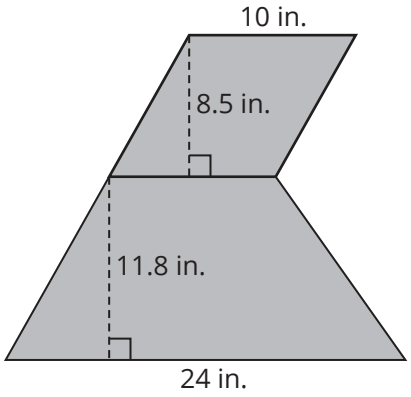


2.

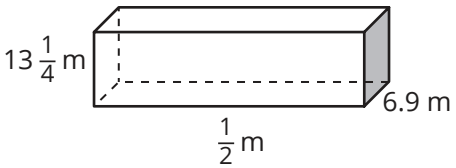


CC BY NC

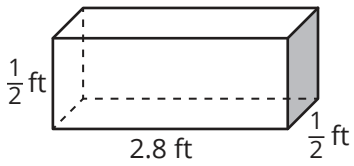
3. The figure is composed of a trapezoid and a rhombus.



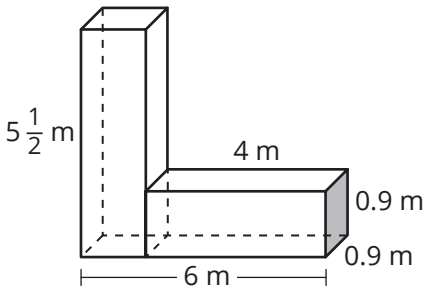
4.



5.

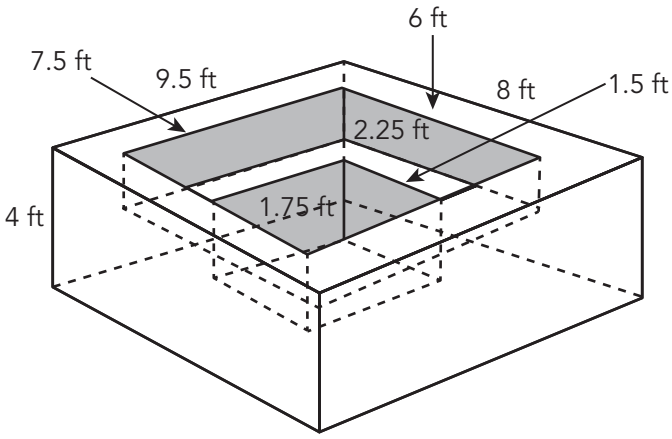


6.



Extension

Victoria is building a hot tub next to her swimming pool. The interior dimensions are 6 feet by 7.5 feet. It includes solid bench seating on all four sides. The bench has a width of 1.5 feet. The bench is positioned 1.75 feet from the ground and 2.25 feet from the top, as shown.



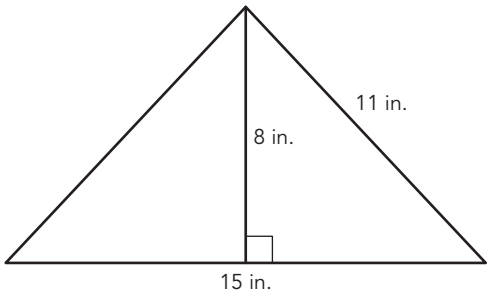
1. When the hot tub is filled, the water level will be 0.25 feet from the top. How much water will it take to fill the hot tub?

2. How many cubic feet of concrete are needed to build the hot tub?

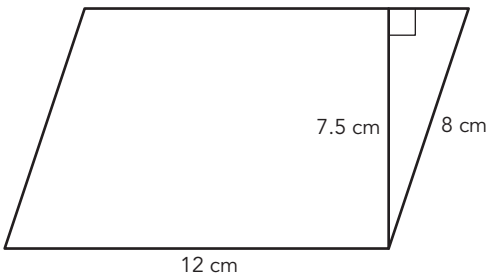
Spaced Practice

Determine the area of each figure.

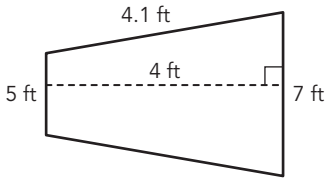
1. A flag is folded into a triangle to be displayed in a triangular display with the dimensions shown in the diagram. How many square inches of glass are needed to cover the display?



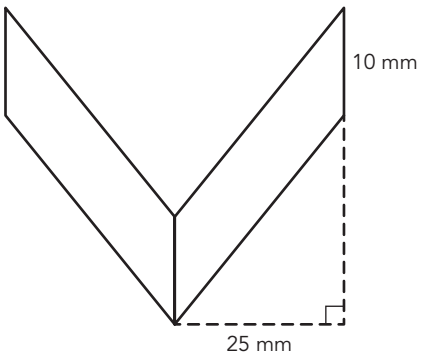
2. Ava cut a picture into the shape of a parallelogram to place into her scrapbook, shown below. What is the area of the picture?



3. The planning committee submitted a plan to the town architect to revitalize the town square. Their plan includes a new flagpole with a concrete base in the shape of a trapezoid. The base of the trapezoid and its dimensions are shown below. What is the area of the base proposed by the planning committee?



4. A pendant on a necklace is created from two congruent parallelograms that share a side. The pendant is shown below. Half of the pendant will be covered with gold leaf. How many square millimeters of gold leaf will be used?



III. Dividing Decimals

Topic Practice

A. Estimate each quotient to the nearest whole number. Then calculate the quotient. Round to the nearest hundredth, if necessary.

1. 36.452 ÷ 2.6

2. 13.9605 ÷ 2.27

3. 59.928 ÷ 5.28

4. 65.728 ÷ 6.4

5. 99.3672 ÷ 11.19

6. 29.987 ÷ 9.55

B. Calculate each quotient.

1. 24.38 ÷ 4.6

2. 77.28 ÷ 8.4

3. 11.88 ÷ 2.2

4. 50.63 ÷ 6.1

5. 10.025 ÷ 2.5

6. 9.632 ÷ 3.2

C. Convert each fraction to a decimal written to the nearest thousandths place. Identify whether the decimal is terminating or repeating.

1. $\frac{41}{50}$

2. $\frac{2}{3}$

3. $\frac{18}{25}$

4. $\frac{5}{9}$

5. $\frac{3}{8}$

6. $\frac{13}{18}$

D. Solve each problem.

1. Daniel is putting a fence around a garden bed that is shaped like a rhombus. The perimeter of the garden bed is 112.4 feet. How many feet of fencing does Daniel need for each side?

2. Liam is hanging a shelf that is shaped like an equilateral triangle. If the perimeter of the shelf is 82.65 inches, what is the length of one side?

3. Emma is looking for a curtain rod for one of her windows. The window is a square window with a perimeter of 204.96 inches. What is the minimum length of the curtain rod that Emma will need?

4. Kai is looking to add tile to one wall in his kitchen. Each tile is a rectangle that measures $1\frac{1}{2}$ inches by 2 inches. The wall that Kai wants to tile is a rectangle that measures 44.25 inches by 51 inches. How many tiles will Kai need to cover the wall?

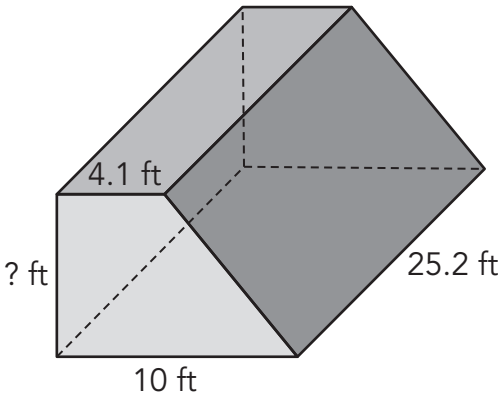
5. Mia is painting her living room. Two of the walls are 10.75 feet long and 7 feet tall, and two of the walls are 6.875 feet long and 7 feet tall. If half a gallon of paint covers 200 square feet, how much paint will Mia need?

6. Jayden is packing a moving truck with cube-shaped boxes that each have a side length of 1.5 square feet. The moving truck is 8 feet long, 6.5 feet wide, and 6.25 feet tall. What is the greatest number of boxes that Jayden can fit in the moving truck?

Extension

The volume of the trapezoidal prism is 1279.152 cubic feet.

Determine the height of the trapezoid base.



CC BY NC

Spaced Practice

1. Minh has decided to give her best friend a candle for her birthday. To wrap the candle, she spends $2.50 on a rectangular sheet of wrapping paper that is 24 inches by 19.5 inches. How many square inches are in one rectangular sheet of wrapping paper?

2. Determine the area of a triangle that has a height of 4 feet and a base of $6\frac{1}{2}$ feet.

3. Determine the quotient.

   $12\frac{3}{4} \div 1\frac{1}{5}$

4. Determine each product.

   a. $3.01 \cdot 5.8$

   b. $1.2 \cdot 1.2$

GRADE 6

MODULE 2

Relating Quantities

TOPIC 1: Ratios and Rates

I. Introduction to Ratio and Ratio Reasoning 71
II. Comparing Ratios and Rates to Solve Problems 81
III. Determining Equivalent Ratios 90
IV. Using Tables to Represent Equivalent Ratios 97
V. Graphs of Ratios. 103
VI. Using and Comparing Ratio Representations 109

TOPIC 2: Percents

I. Percent, Fraction, and Decimal Equivalence 119
II. Using Estimation and Benchmark Percents. 126
III. Determining the Part and the Whole in Percent Problems 133

TOPIC 3: Unit Rates and Conversions

I. Using Ratio Reasoning to Convert Units 143
II. Introduction to Unit Rates 150
III. Multiple Representations of Unit Rates 155

CC BY NC

Name _____ Date _____

I. Introduction to Ratio and Ratio Reasoning

Topic Practice

A. Determine whether each situation represents additive reasoning or multiplicative reasoning.

1. Angelina's plant has grown a total of 8 inches, and Mei's plant has grown a total of 9 inches. Mei's has grown more than Angelina's.

2. Carlos has 7 apples, and Jasmine has 4 times as many, or 28 apples.

3.

Valentina's Age (years)	8	9	10	15
Mason's Age (years)	12	13	14	19

4.

Number of Laps Sebastion Ran	3	9	15	18
Number of Laps Logan Ran	1	3	5	6

5. The Hawks scored 20 points in the first half of the game. The team scored twice as many points in the second half of the game.

6. The temperature was 70 degrees Fahrenheit. It rose 3 degrees in one hour.

CC BY NC

B. Write a part-to-part and a part-to-whole ratio for each problem situation using words, with a colon, and in fractional form.

1. Of the 200 students surveyed in 5th grade, 120 prefer bananas and 80 prefer apples.

2. Kayla's book collection contains 23 fiction books and 4 non-fiction books.

CC BY NC

3. Emily's movie collection consists of 45 action movies and 31 comedy movies.

4. Camilla received a bouquet of 2 dozen roses. In the bouquet, 12 were red and 12 were pink.

CC BY NC

5. Sarah planted 15 daffodils and 14 daylilies in her garden.

6. Of the 31 students surveyed, 19 prefer white bread. The remaining students prefer wheat bread.

CC BY NC

C. Write an equation representing the relationships to determine whether each statement involves additive reasoning or multiplicative reasoning. For statements representing multiplicative reasoning, give the ratio relationship between the quantities.

1. The pet store carries 12 varieties of cat food and 3 times as many varieties of dog food.

2. Jasmine is 38 inches tall. She grows 2 inches in one year.

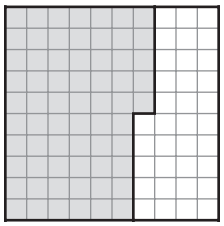
3. Lucas has $75 in his bank account. He deposits $40.

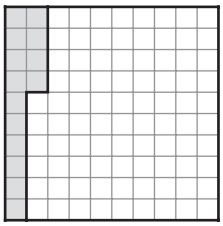
4. Nahimana walked 10 miles, which was twice as far as Mason walked.

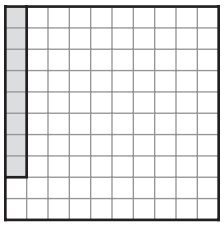
5. The first book in a series has 452 pages. The second book in the series has 57 more pages than the first book.

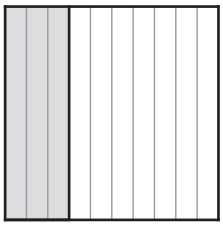
6. The temperature on March 1 was 43 degrees Fahrenheit. The temperature on July 1 was double the temperature on March 1.

D. Each grid represents a whole. Write each shaded part as a fraction and percent.

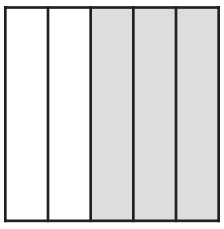
1. 

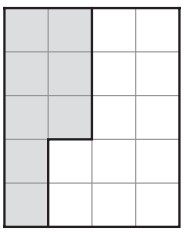
2. 

3. 

4. 

5. 60%



6. 

Extension

During the 2015 regular season, the Pittsburgh Pirates won 98 baseball games, 53 of which were won in their home stadium. The regular season includes 162 games.

Write a ratio for each and identify it as part-to-whole or part-to-part.

1. number of games won to number of games lost

2. number of games won to number of games played

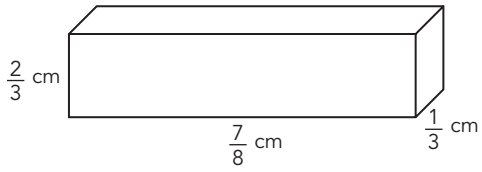
3. number of games lost to number of games played

4. number of games won at home to number of games won away

5. number of games won at home to number of games won

Spaced Practice

1. Determine the volume of the right rectangular prism shown



2. Calculate each product.

   a. $2.1 \cdot 2.2$ b. $5.23 \cdot 3.4$ c. $7.02 \cdot 4.15$

3. Determine each product.

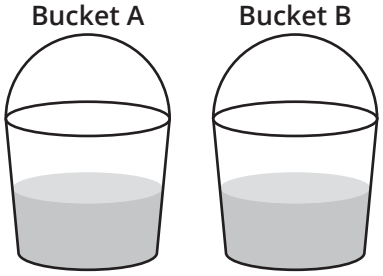
   a. $\frac{3}{8} \cdot \frac{4}{5}$ b. $2\frac{9}{10} \cdot \frac{2}{5}$

II. Comparing Ratios and Rates to Solve Problems

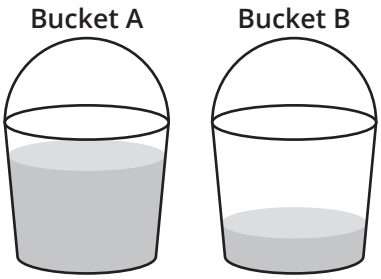
Topic Practice

A. Use the given information to answer each question.

1. Bucket A and Bucket B have the same shade of blue paint. When a painter adds white paint to Bucket B, which bucket will have the darker shade of blue paint?



For Questions 2 through 5 consider the diagram shown.



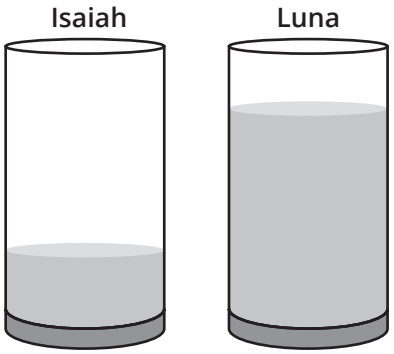
2. Bucket A has a darker shade of blue paint than Bucket B. When a painter adds white paint to Bucket B, which bucket will have a darker shade of blue paint?

3. Bucket A has a lighter shade of blue paint than Bucket B. When a painter adds white paint to Bucket A, which bucket has a darker shade of blue paint?

4. Bucket A has a darker shade of blue paint than Bucket B. When a painter adds white paint to Bucket A, which bucket will have a darker shade of blue paint?

5. Bucket A and Bucket B contain the same shade of blue paint. When a painter adds an equal amount of white paint to each bucket, which bucket will have a lighter shade of blue paint?

6. Luna and Isaiah each made a glass of fruit punch. Luna's glass has a stronger tasting fruit punch flavor than Isaiah's. When Luna adds three teaspoons of fruit punch mix to her glass and Isaiah adds three fluid ounces of water to his glass, which glass will contain the fruit punch with the stronger flavor?



7. Four friends are making pink lemonade. Each person used a different recipe.

   - Parker used 3 cups of water and 5 tablespoons of mix.
   - Mason used 6 cups of water and 8 tablespoons of mix.
   - Nahimana used 4 cups of water and 6 tablespoons of mix.
   - Camilla used 2 cups of water and 4 tablespoons of mix.

   List the recipes in order from strongest flavor to weakest flavor.

CC BY NC

B. Compare the ratios described in each problem situation.

1. Of the 50 students surveyed, 35 prefer water and 15 prefer juice. Which is greater: the ratio of students who prefer water to the total number of students surveyed, or the ratio of students who prefer juice to the total number of students surveyed?

2. Of the 51 students surveyed, 34 prefer cereal for breakfast and 17 prefer oatmeal. Which is greater: the ratio of students who prefer cereal to the total number of students surveyed, or the ratio of students who prefer oatmeal to the total number of students surveyed?

3. Of the 32 students surveyed, 8 prefer the color red and 24 prefer the color blue. Which is greater: the ratio of students who prefer red to the total number of students surveyed, or the ratio of students who prefer blue to the total number of students surveyed?

4. Of the 40 fifth-graders surveyed, 24 like to play soccer. Of the 65 sixth-graders surveyed, 26 like to play soccer. Which is greater: the ratio of fifth-graders who like to play soccer to the total number of fifth-graders surveyed, or the ratio of sixth-graders who like to play soccer to the total number of sixth-graders surveyed?

5. Of the 70 sixth-grade students surveyed, 49 plan to attend the spring dance. Of the 60 seventh-grade students surveyed, 54 plan to attend the spring dance. Which is greater: the ratio of sixth-grade students who plan to attend the spring dance to the total number of sixth-grade students surveyed, or the ratio of seventh-grade students who plan to attend the spring dance to the total number of seventh-grade students surveyed?

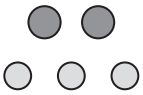
CC BY NC

6. Of the 12 petunias Angelina planted, 8 bloomed. Of the 9 marigolds Angelina planted, 6 bloomed. Which is greater: the ratio of petunias that bloomed to the total number of petunias planted, or the ratio of marigolds that bloomed to the total number of marigolds planted?

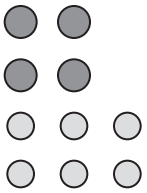
C. Identify the equivalent ratios in each set.

1. Each model shows a ratio of apples to oranges. Which models show the same ratio?

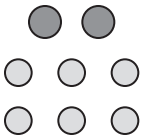
Model 1



Model 2

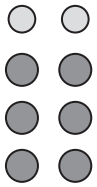


Model 3



2. Each model shows a ratio of baseballs to footballs. Which models show the same ratio?

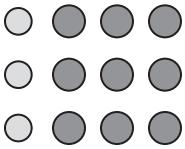
Model 1



Model 2

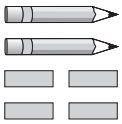


Model 3

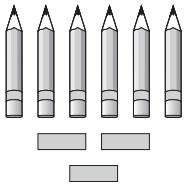


3. Each model shows a ratio of pencils to erasers. Which models show the same ratio?

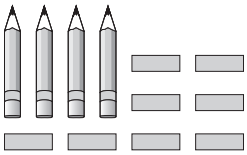
Model 1



Model 2

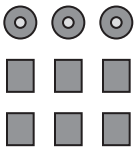


Model 3

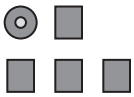


4. Each model shows a ratio of DVDs to books. Which models show the same ratio?

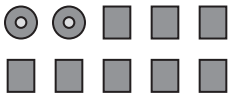
Model 1



Model 2



Model 3



5. Each model shows a ratio of heart to star beads. Which models show the same ratio?

Model 1



Model 2

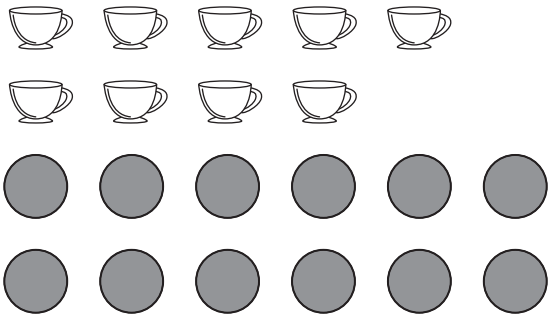


Model 3

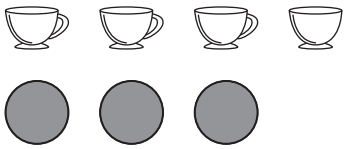


6. Each model shows a ratio of cups to saucers. Which models show the same ratio?

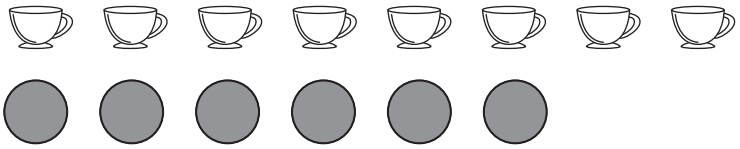
Model 1



Model 2



Model 3



Extension

Which of the given recipes will make cookies with the most chocolate chips per cookie? Order the recipes from the least chocolate chips per cookie to the most chocolate chips per cookie. Explain your answer.

Recipe 1 : $1\frac{3}{4}$ cups of chips for a batch of 2 dozen cookies

Recipe 2 : 1 cup of chips for a batch of 18 cookies

Recipe 3 : $\frac{3}{4}$ cup of chips for a batch of 12 cookies

Spaced Practice

1. During the spring sports season, students at a local middle school have the opportunity to play baseball, run outdoor track, or play lacrosse. Of the 75 students who play a spring sport, 30 run track, 25 play baseball, and 20 play lacrosse. Write the ratios and determine whether a part-to-part or part-to-whole relationship exists.

   a. number of track runners to number of baseball players

   b. number of track runners to total number of athletes

2. Determine each sum.

   a. $\frac{1}{6} + \frac{2}{3}$

   b. $\frac{5}{8} + \frac{1}{2}$

III. Determining Equivalent Ratios and Rates

Topic Practice

A. Draw a model to answer each question.

1. In a garden, 4 out of every 5 flowers are roses. How many roses are in the garden when there is a total of 20 flowers?

2. In a basket, 3 out of every 4 eggs are cracked. How many eggs are cracked when there is a total of 28 eggs in the basket?

3. A bottle of juice fills 8 cups. How many cups can be filled with 3 bottles of juice?

4. An employer can interview 3 people every hour. How long will it take the employer to interview 9 people?

CC BY NC

5. Avery is distributing tennis balls to kids at tennis camp. Each pair of players gets one sleeve of tennis balls. When Avery has 5 sleeves of tennis balls, how many players can Avery provide with tennis balls?

6. Nahimana is ordering pizza for a classroom pizza party. Each pizza serves 8 people. How many pizzas does Nahimana need to serve 28 people?

7. Lucas is bringing an orange for each of his classmates on a school field trip. Each bag of oranges contains 6 oranges. When Lucas wants to provide oranges for 14 classmates, how many bags of oranges does he need?

8. Diego has $1\frac{3}{4}$ bags of mini bagels. A full bag of mini bagels contains 8 servings. How many servings of mini bagels does Diego have?

CC BY NC

B. Scale up or down to determine the unknown quantity. Identify the operation and the scale factor that you used.

1. $\frac{10 \text{ yellow marbles}}{45 \text{ green marbles}} = \frac{?}{9 \text{ green marbles}}$

2. $\frac{24 \text{ inches}}{2 \text{ feet}} = \frac{?}{3 \text{ feet}}$

3. $\frac{250 \text{ miles}}{4 \text{ hours}} = \frac{100 \text{ miles}}{?}$

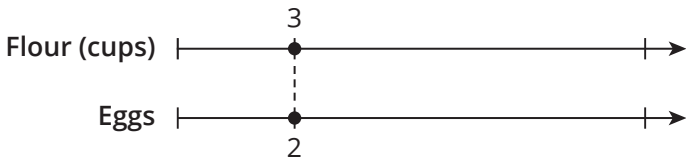
4. $\frac{127 \text{ centimeters}}{50 \text{ inches}} = \frac{2.54 \text{ centimeters}}{?}$

5. $\frac{160 \text{ feet}}{20 \text{ seconds}} = \frac{20 \text{ feet}}{?}$

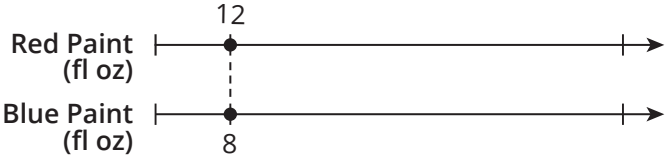
6. $\frac{72 \text{ red marbles}}{150 \text{ yellow marbles}} = \frac{216 \text{ red marbles}}{?}$

C. Use a double number line to answer each question.

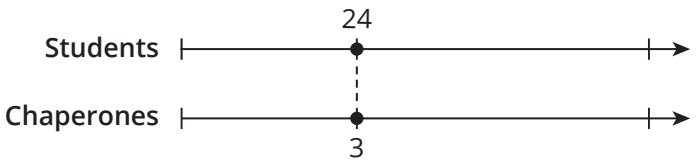
1. Mason is making pancakes. The double number line shows the rate flour : eggs. When Mason accidentally uses 3 eggs instead of 2 eggs, how much flour should he use?



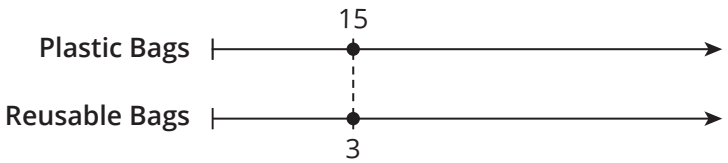
2. Adriana is mixing red paint and blue paint to create a shade of purple paint. The double number line shows the ratio red paint : blue paint. When Adriana has 75 fluid ounces of red paint, how much blue paint does she need?



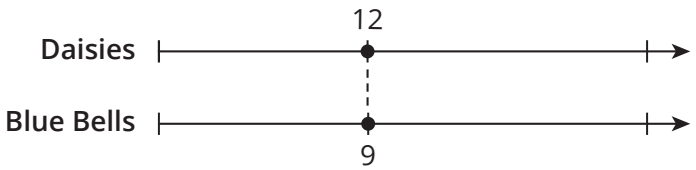
3. Carlos is going on a school field trip. The double number line shows the ratio students : chaperones. When 32 students are going on the field trip, how many chaperones must also go on the trip?



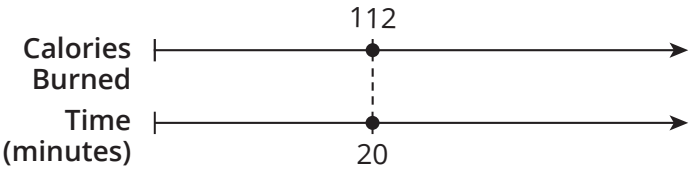
4. Mei is conducting a survey outside of a grocery store. The double number line shows the ratio of customers using plastic bags to customers using reusable bags on a typical day. When there are 50 customers that use plastic bags, how many use reusable shopping bags?



5. Valentina is planting a flower garden. The double number line shows the ratio of daisies to blue bells. When Valentina plants 16 daisies, how many blue bells will she plant?



6. Gabriel is exercising. The double number line shows the rate of calories burned to time. When Gabriel exercises for 45 minutes, how many calories will he burn?



Extension

Scale up or scale down to determine the unknown quantity.

1. $\frac{7 \text{ cups of red dye}}{10 \text{ cups of yellow dye}} = \frac{?}{25 \text{ cups of yellow dye}}$

2. $\frac{?}{175 \text{ inches}} = \frac{\$42}{50 \text{ inches}}$

3. $\frac{47 \text{ feet}}{60 \text{ seconds}} = \frac{?}{45 \text{ seconds}}$

Spaced Practice

1. In planning for the upcoming regional girls' tennis tournament, Coach Martinez looked at her players' statistics from the previous 2 months.

   Sarah : 7 matches won, 3 matches lost
   Sophie : 6 matches won, 4 matches lost
   Grace : 7 matches won, 4 matches lost
   Based on their records, which player should Coach Martinez choose to attend the regional tournament?
   Explain your reasoning.

2. A sports drink calls for 7 scoops for every gallon of water. Sarah thinks the drink is too weak, and she wants to change it. Describe how she can change either the number of scoops or the amount of water to make the drink stronger.

3. Determine each product.

a. $\frac{2}{5} \cdot \frac{7}{3}$

b. $4\frac{1}{6} \cdot 3\frac{4}{5}$

IV. Using Tables to Represent Equivalent Ratios and Rates

Topic Practice

A. Complete each ratio table. Show your calculations.

1.

Yellow Paint (fluid ounces)			8	16
Blue Paint (fluid ounces)	4	8	16	

2.

Yellow Paint (fluid ounces)	1	2	10	
Blue Paint (fluid ounces)		6		60

3.

Red Paint (fluid ounces)	1		50	100
Blue Paint (fluid ounces)		20		400

4.

Green Paint (fluid ounces)		15	30	
White Paint (fluid ounces)	5	25		75

5.

White Paint (fluid ounces)	2	6	8	
Red Paint (fluid ounces)	3			36

6.

White Paint (fluid ounces)	1	3		
Purple Paint (fluid ounces)		30	40	60

B. Use the information below to answer the questions.

Kayla buys a variety box of cereal bars. The box contains 5 blueberry bars, 3 strawberry bars, and 2 apple bars. The local bulk supply store is thinking about selling jumbo boxes of cereal bars. The jumbo boxes would have the same ratio relationships as the original variety box.

Complete the ratio table.

Blueberry	5		20		15	
Strawberry	3	6				
Apple	2			10		14

1. How many strawberry bars would be in a box with 40 blueberry bars?

2. How many strawberry bars would be in a box with 100 apple bars?

3. How many blueberry bars would be in a box with 50 apple bars?

4. How many apple bars would be in a box with 99 strawberry bars?

5. How many blueberry bars would be in a box with 69 strawberry bars?

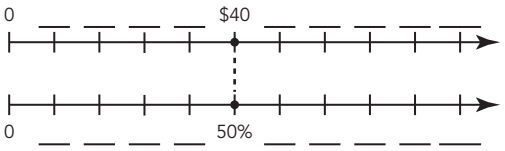
6. How many total bars would be in a box with 32 apple bars?

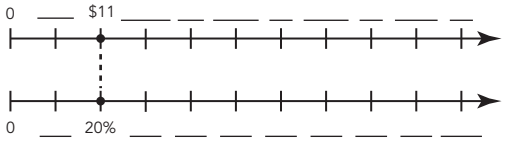
7. How many strawberry bars would be in a box with 70 total bars?

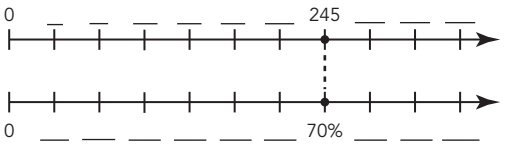
8. How many total bars would be in a box with 45 blueberry bars?

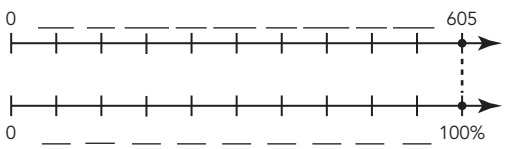
Extension

Complete each double number line.

1. 

2. 

3. 

4. 

Spaced Practice

1. In tennis, an ace is a legal serve that the opponent can not return and the opponent's racket does not even touch. Camilla has an excellent serve. Last week, Camilla hit 7 aces in 2 matches.

   a. When she plays 6 matches in the regional tournament, how many aces should she expect? Show your work.

   b. When she plays 10 matches in the regional tournament, how many aces should she expect? Show your work.

2. The winning time for the middle school 4-person 100-meter relay was 62.59 seconds. Suppose that each runner on the winning team ran exactly the same amount of time. What would the time be for each runner?

CC BY NC

3. A local park is on a rectangular piece of land that measures 0.75 mile by 1.25 miles. Draw and label a rectangle to represent the park. Then determine the area of the park.

4. Determine each product.

   a. $25 \cdot 0.31$

   b. $7.05 \cdot 3.72$

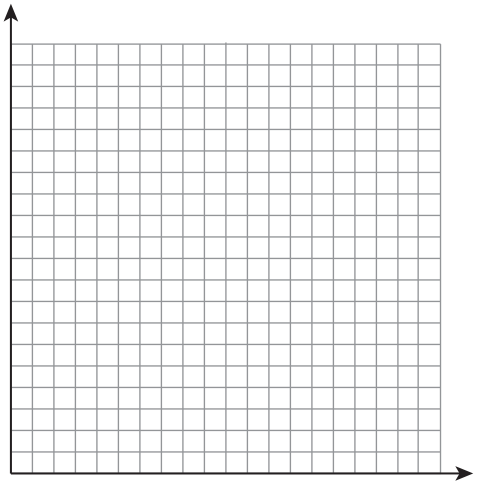
V. Graphs of Ratios and Rates

Topic Practice

A. Create a graph that represents the values shown in each rate table.

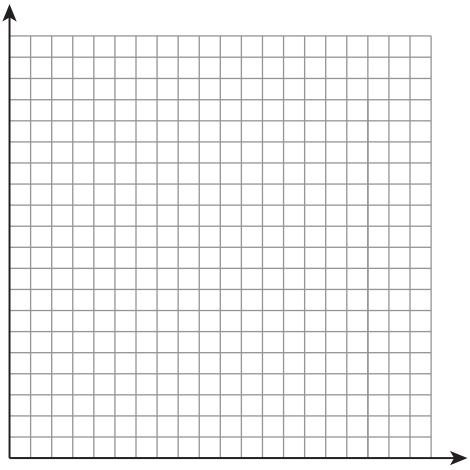
1.

Weight (pounds)	1	2	4	5
Cost (dollars)	4	8	16	20



2.

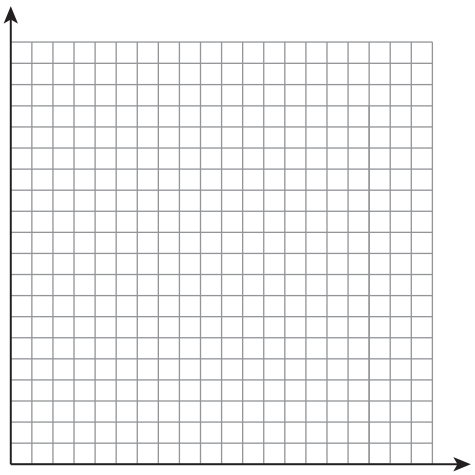
Time (seconds)	1	3	5	7
Distance (feet)	50	150	250	350



CC BY NC

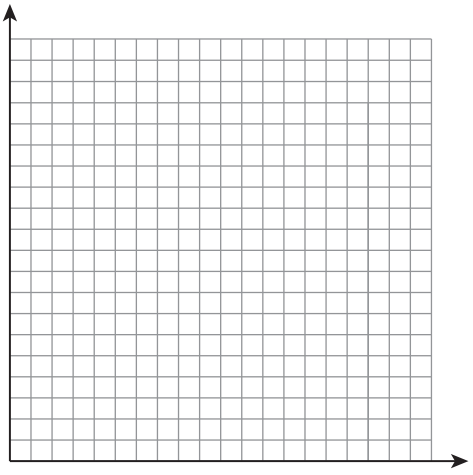
3.

Time (minutes)	20	40	60	80
Calories	80	160	240	320



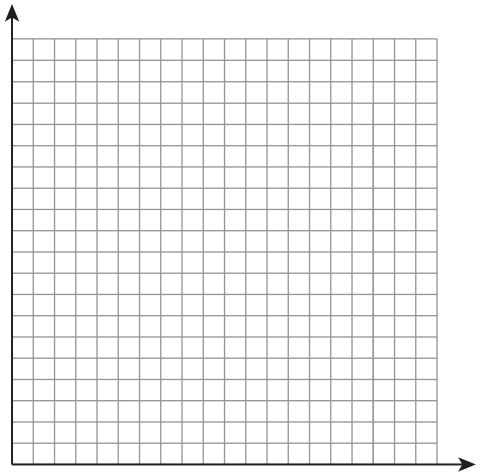
4.

Time (minutes)	10	15	20	25
Height (meters)	100	150	200	250



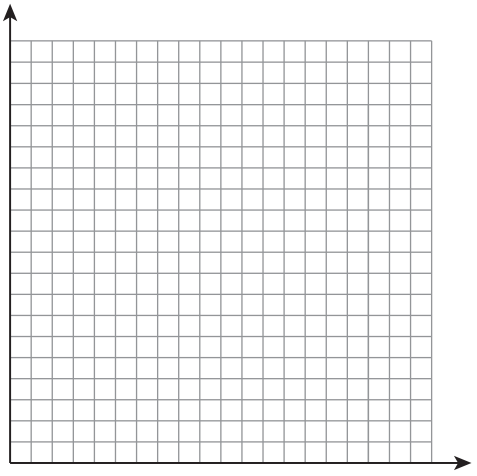
5.

Time (hours)	1.5	3	4.5	6
Distance (miles)	900	1800	2700	3600



6.

Time (minutes)	1	5	6	10
Distance (miles)	0.1	0.5	0.6	1



CC BY NC

B. Consider each table and graph in Part A. Write a scenario that could represent the data.

1.

2.

3.

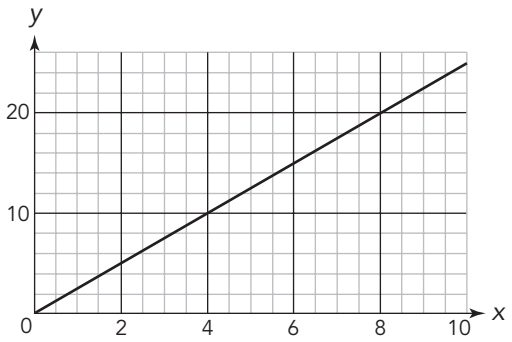
4.

5.

6.

Extension

Create a scenario that the relationship on the given graph could represent. Describe the quantities, label the axes, and identify at least 4 equivalent ratios.



CC BY NC

Spaced Practice

1. Emily loves to make balloon centerpieces for birthday parties. With 45 balloons, she can make 5 centerpieces. Create a double number line to explain your reasoning for each question.

   a. When Emily has 72 balloons, how many centerpieces can she make?

   b. When Emily makes a balloon centerpiece for herself, how many balloons does she need?

2. A customer used a $10 bill to pay for a 39-cent candy bar. Sarah returned 61 cents. What mistake did Sarah make? Explain how she should correct her mistake.

3. A grocery store is selling ground beef for $5.89 per pound. How much does it cost to buy 2.5 pounds of ground beef?

4. Use estimation to correctly place the decimal point in each quotient.

   a. $2.1\overline{)48.72} = 232$

   b. $8\overline{)204.8} = 256$

VI. Using and Comparing Ratio and Rate Representations

Topic Practice

A. Complete the ratio or rate table to answer each question. Show your calculations.

1. Jasmine is making soup for a family reunion. She knows that three batches of soup serves eighteen people. How many batches of soup should Jasmine make to serve 42 family members?

Batches of Soup	1	3		
Family Members		18	36	42

2. Luna is mixing red and white paint to create a shade of pink to paint her room. After experimenting, Luna decides that she can create the perfect shade of pink by mixing 3 fluid ounces of red paint and 1 fluid ounce of white paint. How much red and white paint does Luna need to make 1 gallon of pink paint?
(1 gallon = 128 fluid ounces)

Pink Paint (fluid ounces)		128
Red Paint (fluid ounces)	3	
White Paint (fluid ounces)	1	

CC BY NC

3. Lucas is responsible for distributing soccer balls to the children at soccer camp. During practice, Lucas would like each group of 5 children to share two soccer balls. How many soccer balls does Lucas need when 25 children attend camp?

Soccer Balls	2		
Children	5	20	25

4. Mason is bringing boxes of fruit snacks to class for a holiday party at school. Mason knows that 2 boxes of fruit snacks will serve 11 students. How many boxes of fruit snacks does Mason need to serve 33 students?

Boxes	2		
Students	11	22	33

5. Nahimana is planting flowers in her garden. Each variety pack of bulbs contains 4 lilies and 6 dahlias. How many dahlias will Nahimana plant when she plants 12 lilies?

Lilies	4	8	12
Dahlias	6		

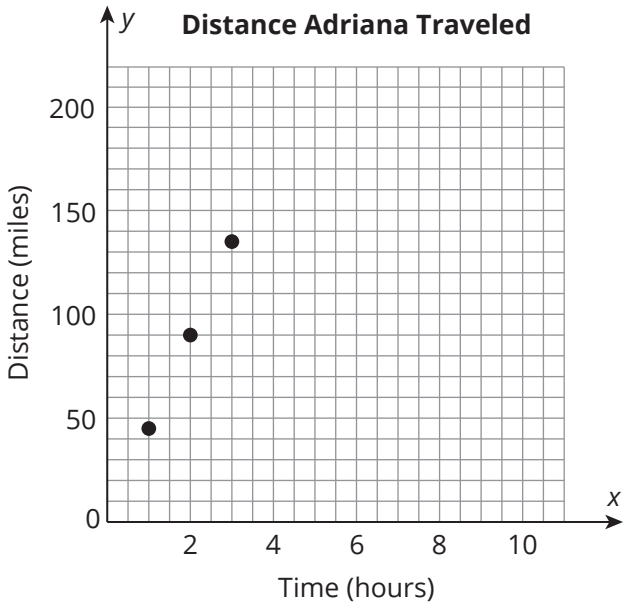
6. Kayla is celebrating her birthday at a movie theater. She invites 11 friends for a movie and popcorn. She is told that 1 large bucket of popcorn is enough for 3 people to share. How many buckets of popcorn does Kayla need?

Buckets of Popcorn	1		
People	3	9	12

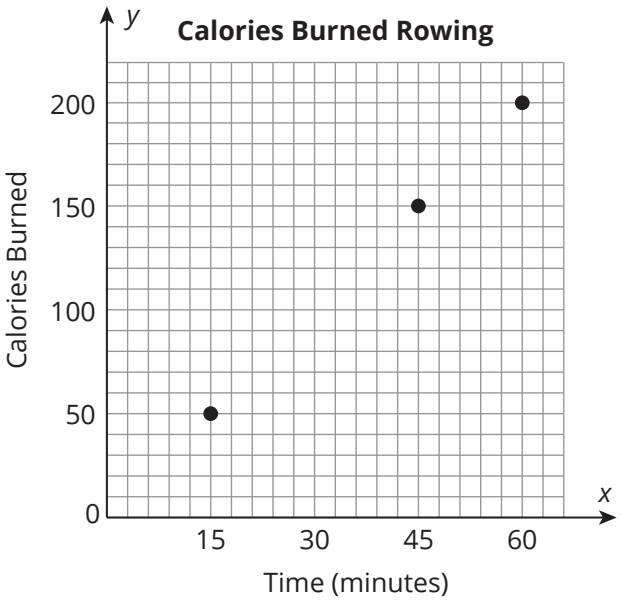
CC BY NC

B. Use the given graph to answer each question.

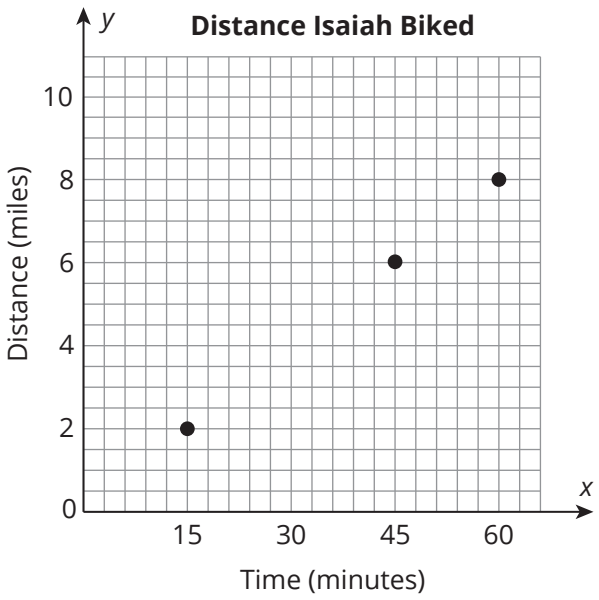
1. Adriana is driving down south for a beach vacation. The graph shows the rate time : distance. When Adriana drives at a constant speed for 4 hours, how many miles has she traveled?



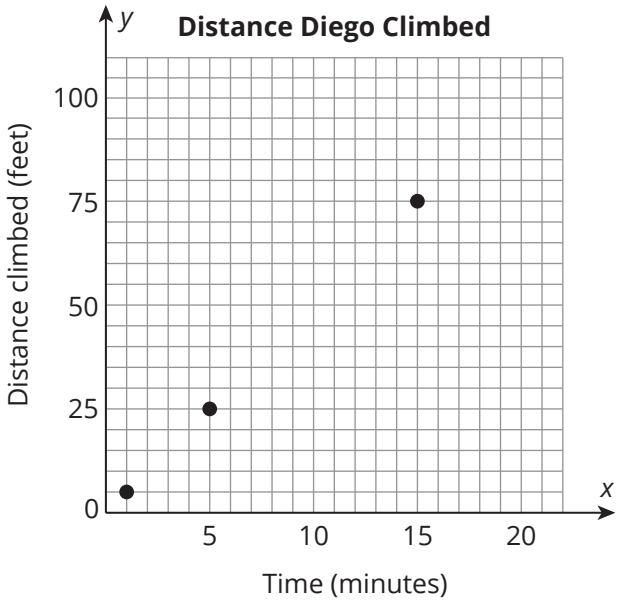
2. Angelina is using a rowing machine to exercise at her local gym. The graph shows the rate calories burned : time. How many calories did Angelina burn rowing for 30 minutes?



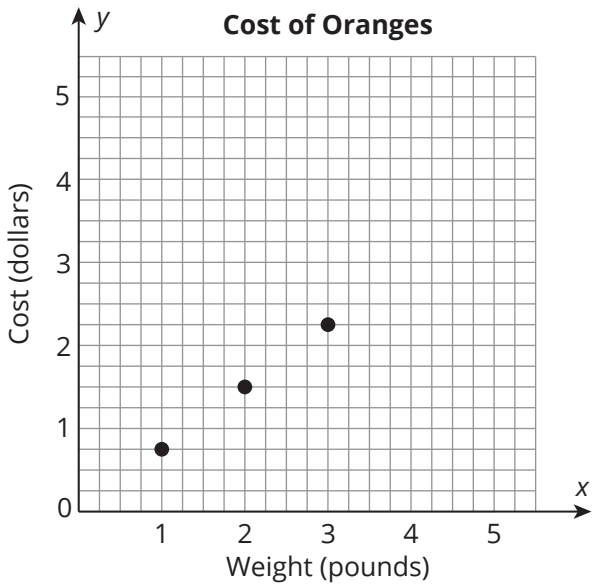
3. Isaiah is biking at a constant rate. The graph shows the rate time : distance. How long did it take Isaiah to bike 4 miles?



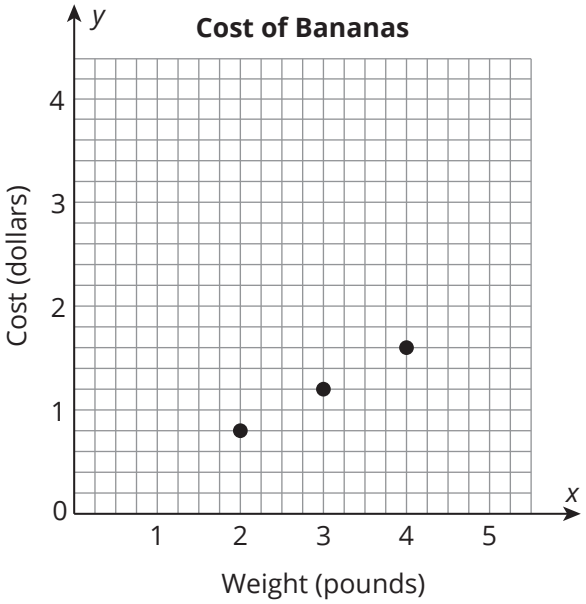
4. Diego is climbing a challenging section of a mountain. The graph shows the rate time : distance climbed. How far did Diego climb after 10 minutes?



5. Mei is grocery shopping. Oranges are on sale. The graph shows the rate cost : weight. How much will it cost Mei to purchase 4 pounds of oranges?

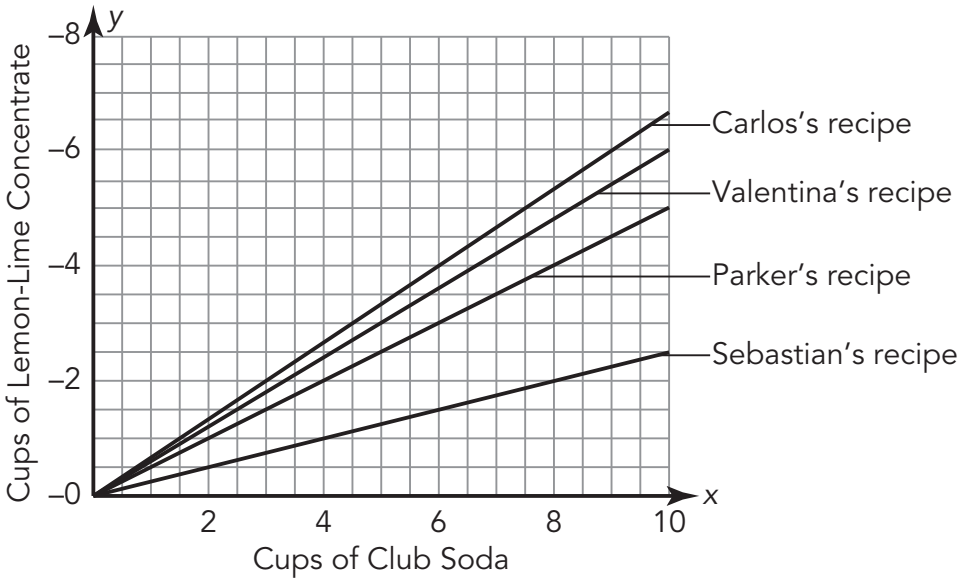


6. Logan is grocery shopping. Bananas are on sale. The graph shows the rate cost : weight. When Logan wants to spend $2, how many pounds of bananas can he purchase?



Extension

The graph shown represents four recipes for lemon-lime punch. Which recipe has the strongest taste of lemon-lime? Which recipe has the weakest taste of lemon-lime? Use the graph to explain your answer.



CC BY NC

Spaced Practice

1. Emily and her friends are testing their typing skills. Emily took an online typing test to compare her typing speed with her friends' speeds. During the 2 minute test, she typed 144 words. Her friend, Camilla took a longer test; she typed 150 words in 3 minutes. Their other friend, Jasmine typed 65 words in 1 minute.

   a. Create a rate table to show each friend's typing speed for 1 through 6 minutes.

Emily						

Camilla						

Jasmine						

b. Plot each set of equivalent rates on a coordinate plane. Use × to denote Emily's typing speed, □ to denote Camilla's typing speed, and ★ to denote Jasmine's typing speed. Be sure to label the axes and title the graph.

c. Draw three separate lines through the points that represent each rate. What do you notice?

d. Who is the fastest typist? Who is the slowest typist? Explain how you can tell by looking at the three lines on your graph.

CC BY NC

2. Emily uses her typing skills to write a research paper for her history class. When she hits "Print," she realizes that her printer is broken—for every 5 pages she attempts to print, the printer messes up 3 of them! Create a ratio table to display the number of pages her printer will mess up. Then create a graph for your table of values. Be sure to label the axes and title the graph.

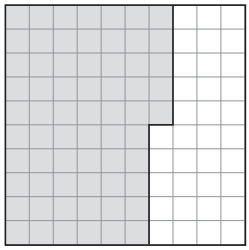
Number of pages attempted to print				
Number of messed-up pages				

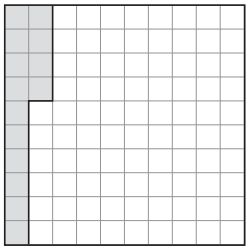
Name _____ Date _____

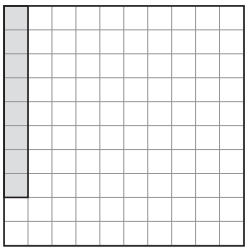
I. Percent, Fraction, and Decimal Equivalence

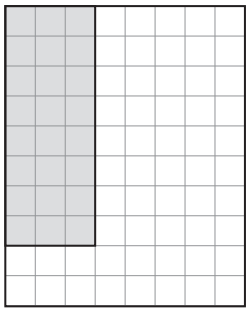
Topic Practice

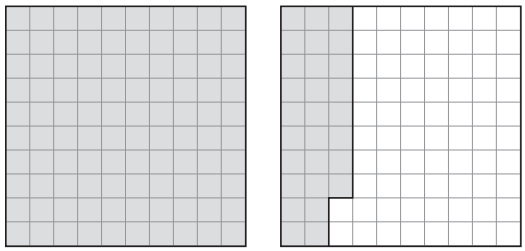
A. Each grid shown represents a whole. The grid is made up of equal-sized squares. Write the number of shaded squares out of total number of squares as a fraction, decimal, and percent.

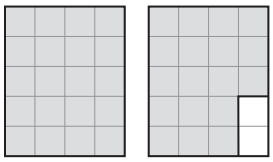
1. 

2. 

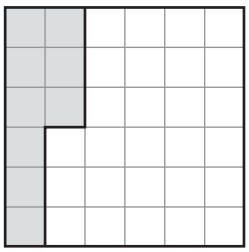
3. 

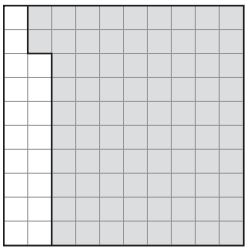
4. 

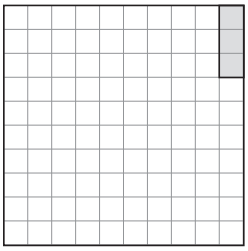
5. 

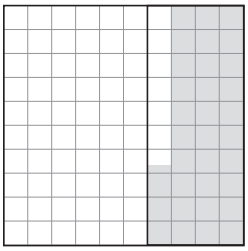
6. 

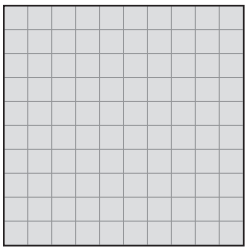
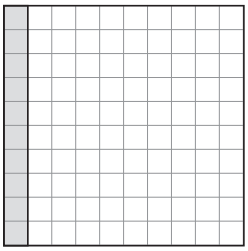
CC BY NC

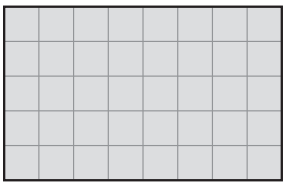
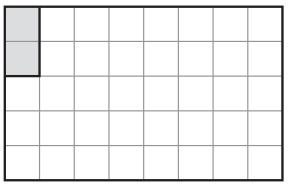
7. 

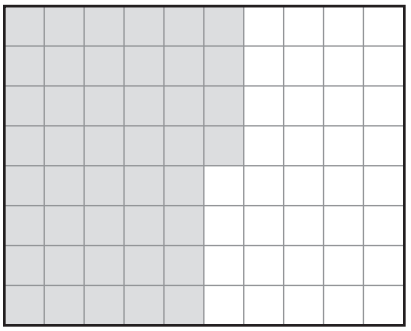
8. 

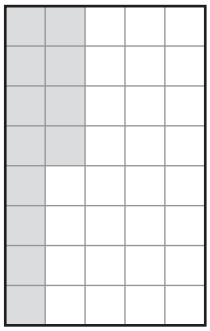
9. 

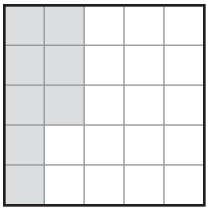
10. 

11. 


12. 


13. 

14. 

15. 

B. Represent each problem situation as a fraction, decimal, and percent to answer the given question.

1. Camilla got 18 out of 20 questions correct on a science test. What percent of the questions did Camilla get correct?

2. Carlos got 42 out of 50 questions correct on a math test. What percent of the questions did Carlos get correct?

CC BY NC

3. In Mr. Martinez's class, 16 out of 25 students prefer to play soccer rather than basketball. What percent of the students prefer to play soccer?

4. In Mr. Martinez's class, 14 out of 25 students prefer to play baseball rather than football. What percent of the students prefer to play football?

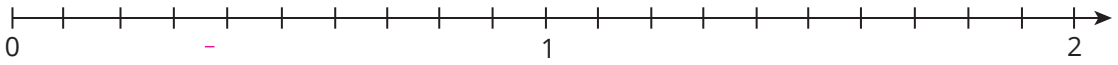
5. Isaiah has a collection of 60 movies. Twenty-four of the movies are animated movies. What percent of Isaiah's movie collection are animated movies?

6. Lucas is practicing his free throws during basketball practice. He attempts 20 free throws and makes 13 baskets. What percent of his attempts were baskets?

7. Emily has $80. She spends $12 on books. What percent of the money does Emily spend on books?

8. Sebastian has $27.00 in his wallet. He spends $5.94 at the grocery store. What percent of his money does Sebastian spend at the grocery store?

C. Plot and label each of the values from Part A on the number line shown.



Extension

Write each percent as a fraction and as a decimal. Explain your strategy.

1. 117%

2. 1048%

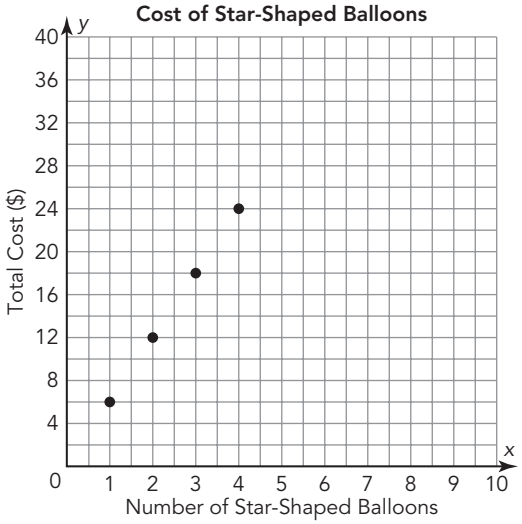
3. 0.15%

4. 0.0593%

CC BY NC

Spaced Practice

1. Sarah loves to make balloon centerpieces for birthday parties. With 45 balloons, she can make 5 centerpieces. To add more excitement to the centerpieces, Sarah decides to order some star-shaped balloons from an online store. The graph shows the costs of orders of star-shaped balloons.



   a. If Sarah has 18 regular balloons, how many centerpieces can she make? Create a double number line to show your answer.

   b. If Sarah wants to make centerpieces for 6 cousins, how many regular balloons does she need? Create a double number line to show your answer.

c. Write each point on the graph as a ratio of number of star-shaped balloons: total cost of the order.

d. How much would an order of 8 star-shaped balloons cost? Explain the method you used.

2. Use the standard algorithm to determine each quotient.

a. $885 \div 6$

b. $9218 \div 330$

CC BY NC

II. Using Estimation and Benchmark Percents

Topic Practice

A. Order the numbers from least to greatest.

1. $\frac{2}{3}$, 0.68, 60%, $\frac{4}{5}$, 0.79

2. 1.3, 13%, $\frac{5}{4}$, 42%, $\frac{2}{5}$

3. $\frac{11}{8}$, 125%, 0.415, $\frac{4}{7}$, 50%

4. $\frac{10}{12}$, 0.80, 84%, $\frac{5}{7}$, 73%

5. $\frac{1}{8}$, 80%, 0.08, $\frac{4}{25}$, 0.15

6. 0.23, $\frac{1}{4}$, $2\frac{1}{8}$, 2.1, 22%

7. $\frac{2}{3}$, $\frac{27}{14}$, $3\frac{1}{3}$, 48%, 2.5

8. 6%, 0.04, $\frac{9}{8}$, 2.5, 25%

B. Calculate each percent using benchmark percents. Show your work.

1. 18% of 200

2. 32% of 150

3. 54% of 300

4. 15% of 200

CC BY NC

5. 45% of 350

6. 27% of 150

C. In an online survey, about 73% of people between the ages of 21 and 50 watched the first week of the Olympics on television. Use this estimate to determine how many people between the ages of 21 and 50 watched the first week of the Olympics in a group of the given size. Calculate your answers using benchmark percents.

1. 90

2. 115

3. 250

4. 104

5. 78

6. 500

D. The table shows the breakdown of medals won by the top three countries in the 2021 Summer Olympics.

Country	Gold	Silver	Bronze
United States	39	41	33
China	38	32	18
Japan	27	14	17

1. Consider the gold medals to the total number of medals won by each country. Represent the gold medals won as a fraction, decimal rounded to the nearest hundredth, and percent.

Country	Fraction	Decimal	Percent
United States			
China			
Japan			

CC BY NC

2. Write the countries in order of greatest to least percentage of gold medals.

3. Consider the silver medals to the total number of medals won by each country. Represent the silver medals won as a fraction, decimal rounded to the nearest hundredth, and percent.

Country	Fraction	Decimal	Percent
United States			
China			
Japan			

4. Write the countries in order of greatest to least percentage of silver medals.

5. Compare the bronze medals to the total number of medals won by each country. Represent the bronze medals won as a fraction, decimal rounded to the nearest hundredth, and percent.

Country	Fraction	Decimal	Percent
United States			
China			
Japan			

6. Write the countries in order from greatest to least percentage of bronze medals.

Extension

Assume the weight of an average chimpanzee's brain is 400 grams. If the average hedgehog's brain weight is 0.8% of a chimp's brain weight, use benchmark percents to determine the average weight of a hedgehog's brain.

Spaced Practice

1. Complete the table. Write each number as a fraction, decimal, and percent.

Fraction	Decimal	Percent
		3%
	1.5	
$\frac{13}{20}$		
$\frac{2}{3}$		

2. Miss Williams is the teacher of a preschool class. She must split the children's time between playing and learning. For every 30 minutes, the children will spend 18 minutes playing and 12 minutes learning. Complete the table of equivalent ratios.

Total amount of time	30	90		
Playing time	18			144
Learning time	12		48	

3. Use the standard algorithm to determine each quotient.

   a. $8302 \div 28$

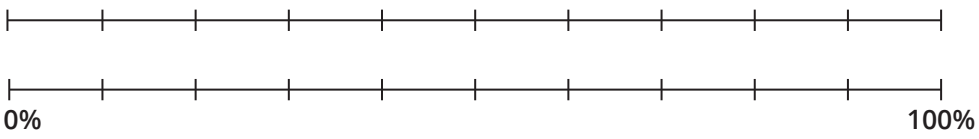
   b. $39.13 \div 4.3$

III. Determining the Part and the Whole in Percent Problems

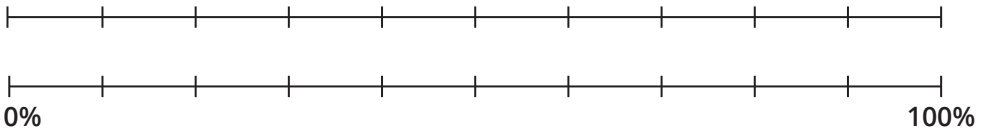
Topic Practice

A. Complete each double number line to answer the question.

1. 35% of 60 is what number?



2. 25% of 132 is what number?

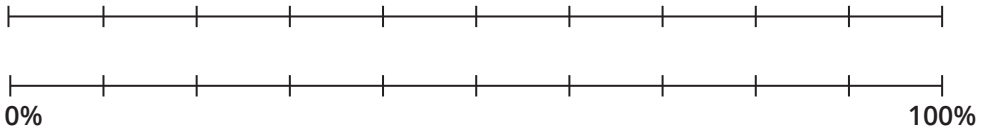


3. 5% of 40 is what number?

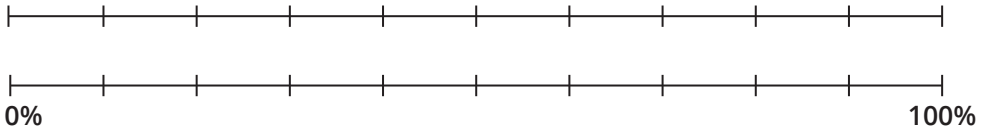


CC BY NC

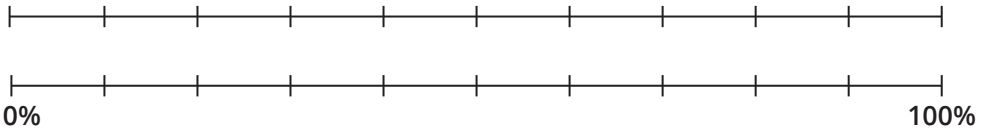
4. 15% of 80 is what number?



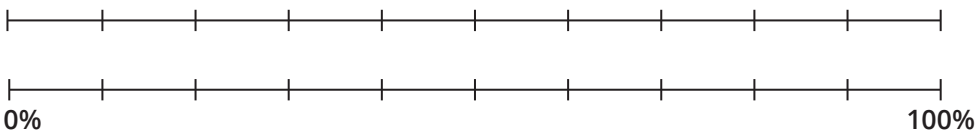
5. 24 is what percent of 80?



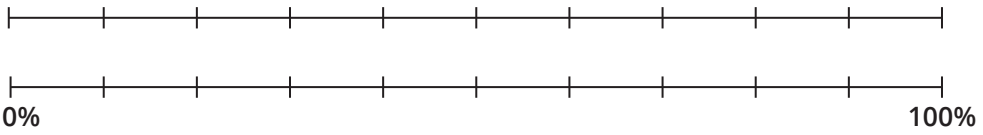
6. 3 is what percent of 60?



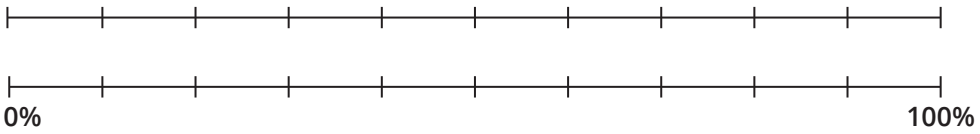
7. 66 is what percent of 120?



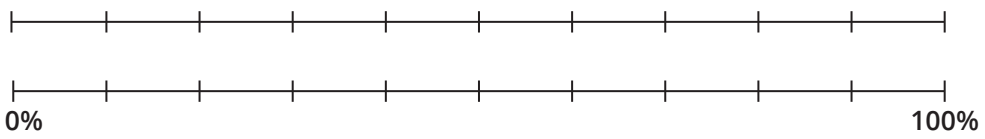
8. 15 is what percent of 75?



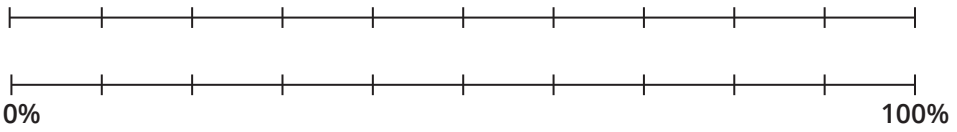
9. 30% of what number is 21?



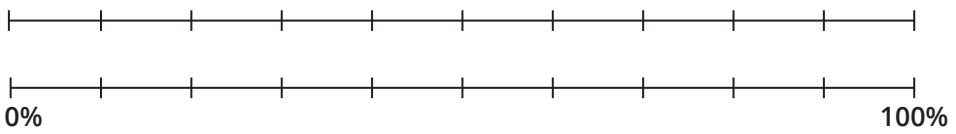
10. 40% of what number is 26?



11. 25% of what number is 50?



12. 30% of what number is 114?



B. Use the given information to answer each question.

1. To avoid overcrowding, a local animal shelter has a monthly goal to find 30% of their dogs homes. If they started with 80 dogs this month and reached their monthly goal, how many dogs did they find homes for?

2. Don Juan Pond in Antarctica is believed to be the saltiest body of water on Earth. The lake water is approximately 40% salt. If you collected 125 liters of water from the lake, how many liters of salt would it contain?

3. Gabriel received a check for $50 yesterday. He used 30% of this amount to buy music from his streaming service. How much money did Jorge spend on music?

4. Logan wants to buy a new video game console that costs $300. His parents agree to pay 40% of the cost of the console. How much must Logan earn to buy the console?

5. When Isaiah plays basketball, he scores on 35% of his attempts. How many times does he score in 20 attempts?

6. Jasmine estimated that she ate cereal for breakfast 80% of the days of the year. Given a year with 365 days, on how many days did Jasmine eat cereal?

CC BY NC

C. Use the given information to answer each question.

1. A basket contains 14 red apples. The rest of the apples are green. The number of red apples is 70% of the total number of apples. How many apples are in the basket? How many apples are green?

2. Carlos is trying to collect all the cards of a special collector's-edition set of hockey cards. He has 18 cards, which is 40% of the set. How many cards are in the collection? How many more cards does he need?

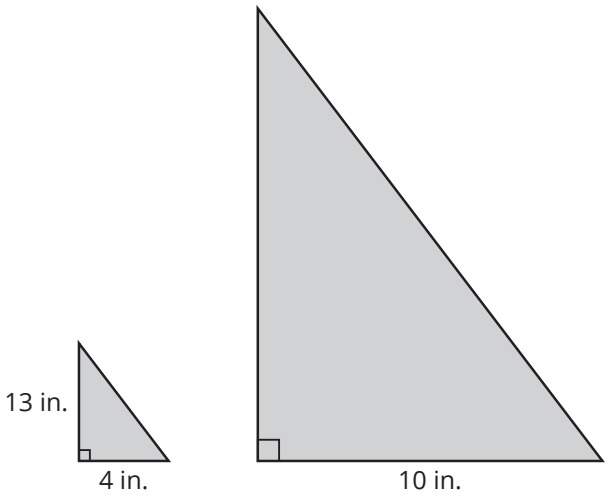
3. A pizza parlor sold 200 sausage pizzas last week. That was 80% of the total number of pizzas they sold. How many pizzas did they sell last week? How many pizzas did they sell that were **NOT** sausage?

4. The local pet store received a shipment of 80 tropical fish. The shipment included 60 clownfish. What percent of the tropical fish in the shipment were clownfish? What percent of the tropical fish were **NOT** clownfish?

5. 150 students were surveyed about their favorite pets. 45 students said they preferred cats. What percent of students who took the survey preferred cats? What percent of students preferred a different animal?

6. Luna has downloaded 250 megabytes of a file that has a total of 1000 megabytes onto her computer. What percent has Luna already downloaded? What percent of the total file does Luna have left to download?

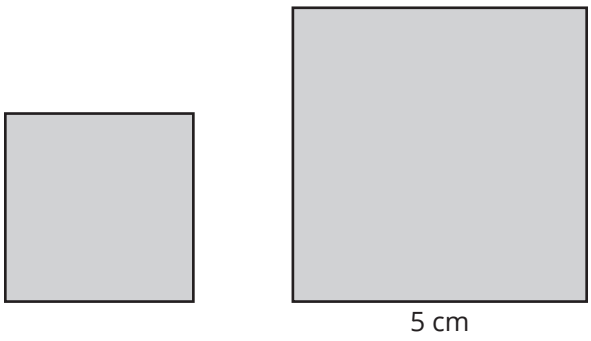
7. The area of triangle A is 26% the area of triangle B. Determine the height of triangle B.



8. The area of square A is 64% the area of square B. Determine the length of the side of square A.

Square A

Square B



Extension

Avery ate at a restaurant one night with 2 friends. The cost of her meal was 10% of the cost of the 3 meals before the tip. Four receipts from the restaurant that night are shown. Some of the groups gave an 18% tip and some gave a 15% tip, but you're not sure which is which.

Which guest was Avery, and where was she sitting?

TABLE 1

Guest 1: [redacted]

Guest 2: $18.00

Guest 3: $12.00

Tip: $4.96

TABLE 2

Guest 1: $38.45

Guest 2: $34.81

Guest 3: [redacted]

Tip: $14.65

TABLE 3

Guest 1: $18.22

Guest 2: [redacted]

Guest 3: $41.00

Tip: $11.74

TABLE 4

Guest 1: $35.11

Guest 2: $35.05

Guest 3: [redacted]

Tip: $15.90

Spaced Practice

1. Gabriel has a 28% free throw rate in basketball. That means when he shoots a free throw, he makes a basket 28% of the time. Gabriel shoots 120 free throws in a season. How many baskets is he likely to make? Use benchmark percents of 1% and 10% to help you determine the answer.

   a. What is 1% of 120?

b. What is 10% of 120?

c. What is 20% of 120?

d. What is 8% of 120?

2. In Tampa, Florida, the sun shines about 66% of the year. About how many days does the sun shine in Tampa?

3. Logan is painting his room a certain shade of green. The paint is a mixture of 3 parts blue paint to 2 parts yellow paint. To get the correct shade of green, how much yellow paint should he add to 6 quarts of blue paint?

4. Nahimana answered 9 out of 10 questions correctly on her math quiz. Her twin sister Kayla answered 22 out of 25 questions correctly on her math quiz. Did they have the same ratio of correct answers to total number of questions?

CC BY NC

5. Determine each product.

   a. $0.6 \cdot 95$

   b. $210 \cdot 0.75$

Name _____ Date _____

Grade 6 Customary and Metric Conversion Chart (located on page 144) is available to use as needed.

I. Using Ratio Reasoning to Convert Units

Topic Practice

A. Use scaling up or down to determine each measurement conversion.

1. There are 16 ounces in 1 pound. How many pounds are in 48 ounces?

2. There are 5280 feet in 1 mile. How many feet are in 3.5 miles?

3. There are 2000 pounds in 1 ton. How many tons is 7500 pounds?

4. There are 100 dekameters in 1 kilometer. How many dekameters are in 8.5 kilometers?

CC BY NC

5. There are 10 centimeters in 1 decimeter. How many decimeters are in 37 centimeters?

6. There are 1000 milligrams in 1 gram. How many milligrams are in 12 grams 75 milligrams?

Grade 6 Customary and Metric Conversion Chart

Length

Customary	Metric
1 mile (mi) = 1,760 yards (yd)	1 kilometer (km) = 1,000 meters (m)
1 yard (yd) = 3 feet (ft)	1 meter (m) = 100 centimeters (cm)
1 foot (ft) = 12 inches (in.)	1 centimeter (cm) = 10 millimeters (mm)

Weight and Mass

Weight	Mass
1 ton (T) = 2,000 pounds (lb)	1 kilogram (kg) = 1,000 grams (g)
1 pound (lb) = 16 ounces (oz)	1 gram (g) = 1,000 milligrams (mg)

Volume and Capacity

Customary	Metric
1 gallon (gal) = 4 quarts (qt)	1 liter (L) = 1,000 milliliters (mL)
1 quart (qt) = 2 pints (pt)	
1 pint (pt) = 2 cups (c)	
1 cup (c) = 8 fluid ounces (fl oz)	

B. Use the conversion chart and scale up or down to calculate each measurement conversion.

1. Sarah drove 175 miles to visit her grandparents. How many feet did she travel?

2. An English Mastiff dog weighs 165 pounds. What is its weight in ounces?

3. Isaiah is making dinner for his family. The recipe he is using calls for 0.5 kilogram of ground chicken. How many grams of ground chicken does he need?

4. Camilla needs to refill her lawn mower gas tank. The tank holds 4.2 liters of gas. How many milliliters of gas does the tank hold?

CC BY NC

5. Lucas is going to compete in a 5000-meter race walk. What is the distance of the race in kilometers?

6. Avery's favorite basketball player is 6 feet 9 inches tall. How tall is Avery's favorite basketball player in yards?

C. Multiply by a unit rate to determine each measurement conversion using unit analysis.

1. How many yards are in 504 inches?

2. How many pounds are in 480 ounces?

3. How many gallons are in 200 quarts?

4. How many ounces are in 1 ton?

5. How many inches are in 1 mile 825 feet?

6. How many fluid ounces are in 2 pints?

7. How many millimeters are in 2 meters 420 centimeters?

8. How many inches are in 7 feet 4 inches?

Extension

Mason measured the dimensions of a rectangular box to be 45 centimeters by 35 centimeters by 2 meters.

1. Determine the volume of the box in cubic meters.

2. Convert the volume of the box to cubic centimeters.

CC BY NC

Spaced Practice

1. At a middle school, 99 girls, or 33% of the girls, play basketball. How many girls attend the middle school?

2. Parker gets a 35% employee discount on anything she buys at a local shoe store. When Parker got a $5.25 discount on her new flip-flops, how much did they cost originally?

3. Mr. Jackson manages a small sporting goods store. He wants to make sure that his store is stocked with enough equipment for all of the community sports. He surveys 240 of his customers and asks them to choose the one sport that they're most likely to buy sports equipment for this season.

Sport	Percent of Responses
Basketball	30%
Baseball	20%
Football	35%
Wrestling	15%

   a. How many of the surveyed customers will need baseball equipment?

   b. How many of the surveyed customers will need wrestling equipment?

4. Estimate each quotient to the nearest whole number. Then calculate the quotient.

   a. $0.796 \div 9.95$

   b. $23.84 \div 6.4$

CC BY NC

II. Introduction to Unit Rates

Topic Practice

A. Write two different unit rates associated with each situation. Identify which unit rate is more useful.

1. $3.36 for 12 ounces of spaghetti sauce

2. $38.40 for 16 gallons of gas

3. 630 miles on an 18-gallon tank of gas

4. $24 for a book of 15 tickets

5. 4 buses for 112 children

6. 1000 pencils in a case of 100 pencil boxes

7. 15 miles jogged in 3.75 hours

8. 6 pies cut into 48 slices

B. Solve each problem by determining and then comparing the rates in each situation.

1. Sebastian is able to complete 14 math problems in 21 minutes. Gabriel is able to complete 36 math problems in 1 hour. Determine how many problems each student can complete per minute. Who can complete problems more quickly?

2. Diego drove 64 miles and used 2 gallons of gas. Jasmine drove 36 miles and used 1 gallon of gas. Determine how many miles each person drove per 1 gallon of gas. Who drove more fuel-efficiently?

CC BY NC

3. Luna's home computer downloads an 18-megabyte program in 1 minute. Nahimana's home computer takes 42 seconds to download a 10-megabyte program. Determine how many megabytes each computer downloads per second. Whose computer downloads faster?

4. Diego went fishing and caught 28 fish in 7 hours. Logan went fishing for 9 hours and caught 27 fish. Determine how many fish each person caught per hour. Who caught fish more quickly?

5. Kayla travels for 81 minutes to visit a friend who lives 6 miles away. Adriana travels 5 miles to visit a friend. It takes 81 minutes to get there. Determine how many miles each person travels in one minute. Who travels more rapidly?

6. Angelina baked 49 cookies in 240 minutes. Carlos was baking for 5 hours and made 63 cookies. Determine how many cookies each person baked per hour. Who baked cookies faster?

7. Mei and Isaiah have a reading assignment for English class. Mei takes 54 minutes to read 27 pages. Isaiah takes 16 minutes to read 8 pages. Determine how many pages each student can read per minute. Who can read more quickly?

8. Lucas biked for 2 hours and traveled 21 miles. Valentina biked 42 miles in 5 hours. Determine how many miles each person biked in one hour. Who biked more quickly?

C. Use the given information to solve each problem.

1. Mason is driving 54 miles per hour. At this rate, how many miles will Joe travel in 6 hours?

2. Sebastian runs on the treadmill at a rate of 6.2 miles per hour. At this rate, how far will Sebastian run in 4 hours?

3. Hamburger meat sells for $3.99 per pound. How much does it cost to purchase 5 pounds of hamburger?

4. When having a meal at a restaurant, the tip is $0.20 per dollar. How much is the tip for a meal that costs $18.50?

5. Emily wants to finish a half-marathon (13.1) miles in 2 hours. What rate will she have to run to finish the half-marathon in this time?

6. Sarah drives 225 miles in 5 hours. At this rate, how far will she drive in 8 hours?

CC BY NC

Extension

Describe how sales tax can be a rate. Determine the sales tax for your state or a nearby state and calculate the costs of different items after applying the sales tax.

Spaced Practice

1. Determine each conversion.

   a. 24 in. = _____ yd

   b. 6 qt = _____ c

   c. 18 ft = _____ in.

   d. 5 mi = _____ ft

   e. 2.5 yd = _____ ft

2. At a middle school, 99 boys, or 36% of the boys, play basketball. How many boys attend the middle school? Show your work.

3. At a middle school, there is a total of 250 girls, 22% of whom play basketball. How many girls at the middle school play basketball? Show your work.

4. Determine each value.

   a. 7% of 26

   b. 28% of 90

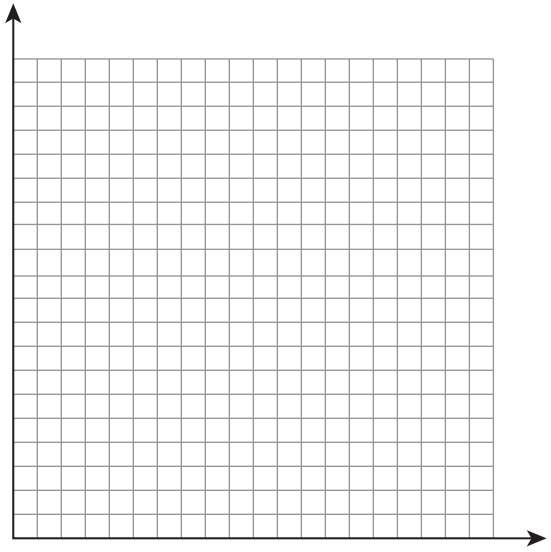
III. Multiple Representations of Unit Rates

Topic Practice

A. Create a graph of the values shown in the table. Use your graph to determine if the ratios are equivalent.

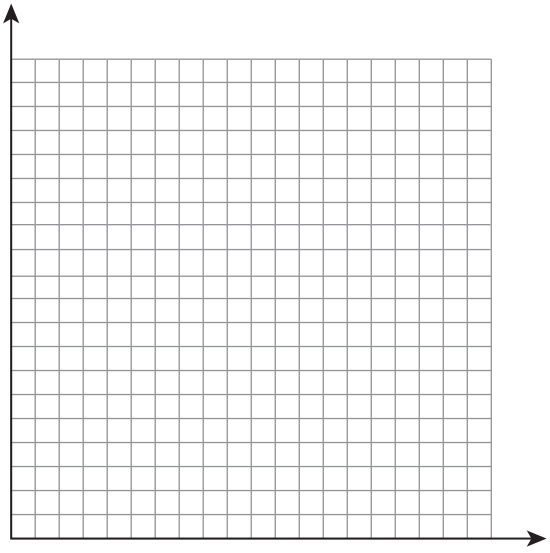
1.

Weight (pounds)	1	2	4	5
Cost (dollars)	3	7	12	12



2.

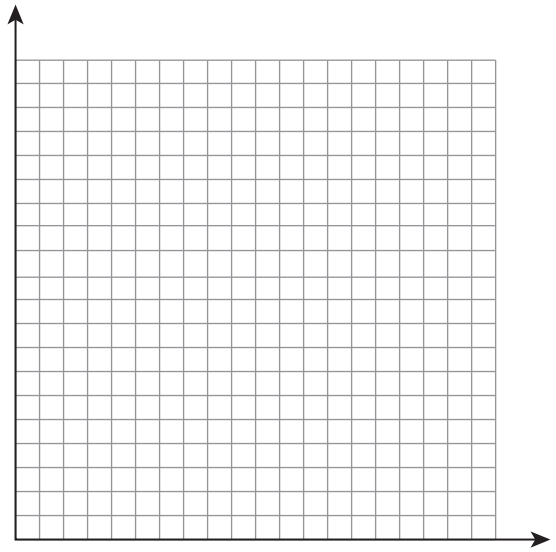
Time (hours)	1	3	5	7
Distance (miles)	25	75	125	175



CC BY NC

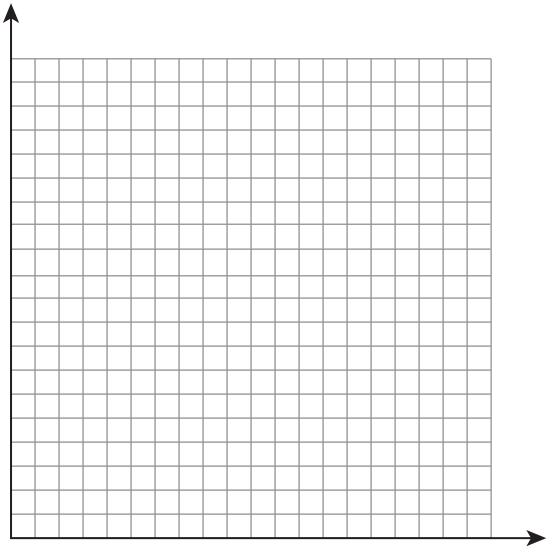
3.

Time (minutes)	15	20	45	60
Calories	80	160	240	300



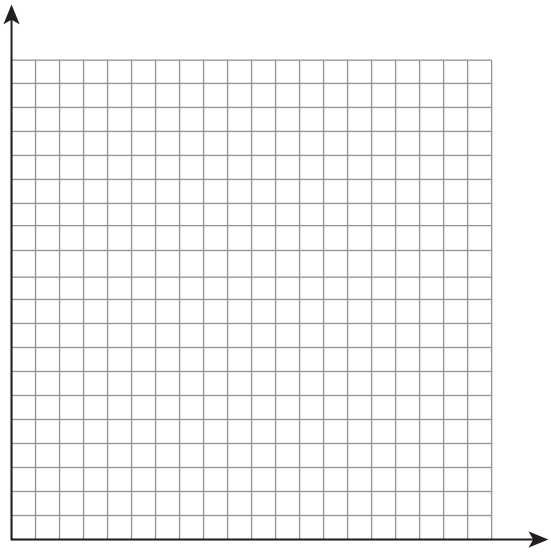
4.

Time (seconds)	1	10	15	20
Data (Mb)	10	100	150	200



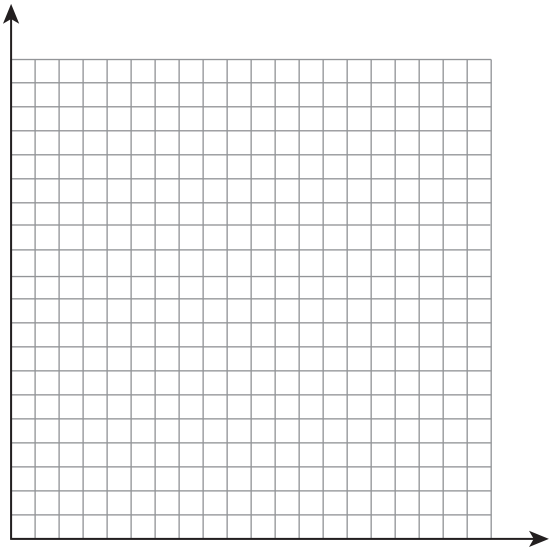
5.

Time (minutes)	15	30	45	60
Distance (miles)	1.5	3	4.5	6



6.

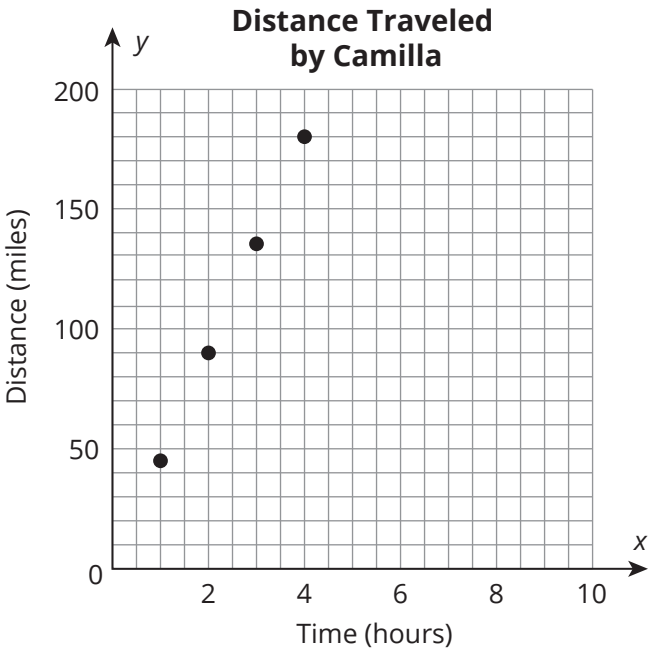
Time (minutes)	1	6	7	10
Height (feet)	6	30	36	60



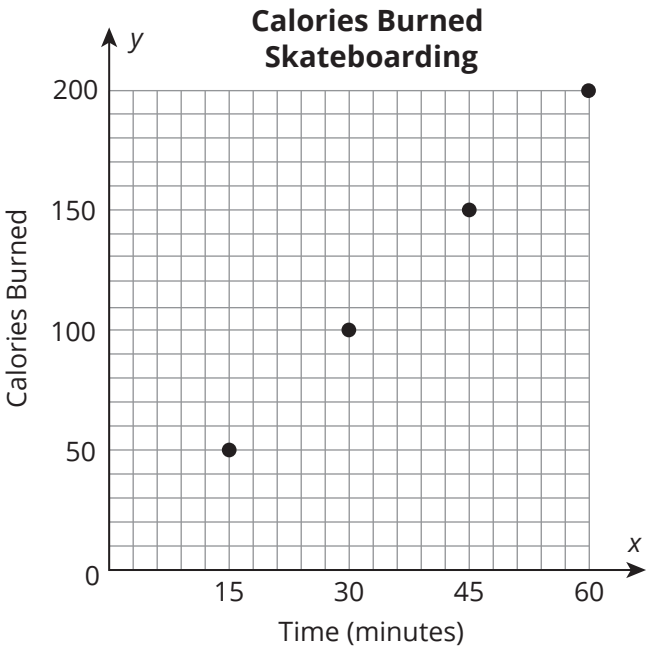
CC BY NC

B. Use the graph to determine the unit rate.

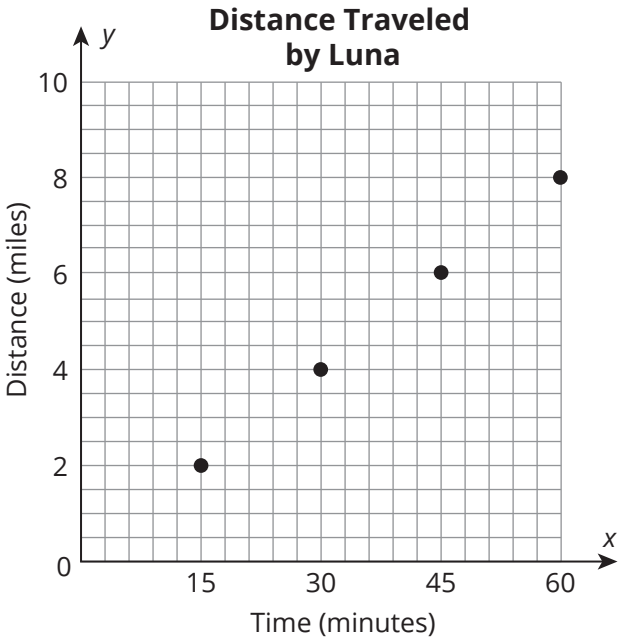
1. Camilla is driving to the mountains for a summer camping trip. The graph shows the ratio time : distance. Write a unit rate to represent Camilla's speed.



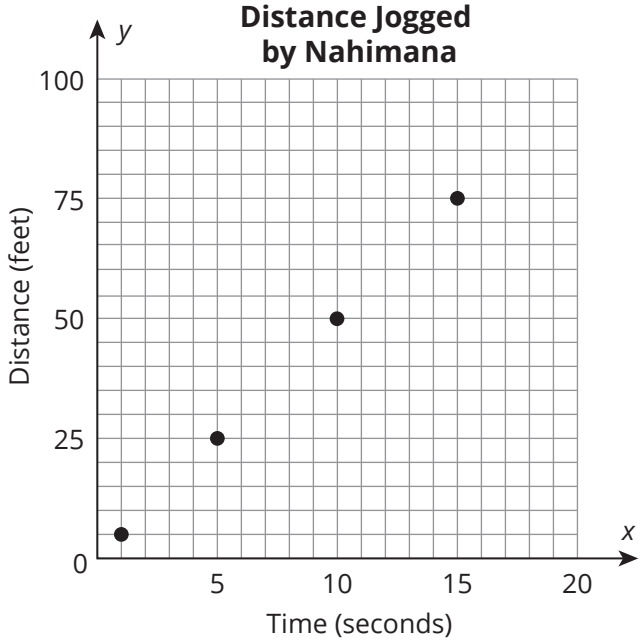
2. Jasmine is skateboarding through her neighborhood. The graph shows the ratio of calories burned : time. Write a unit rate to represent Jasmine's exercise.



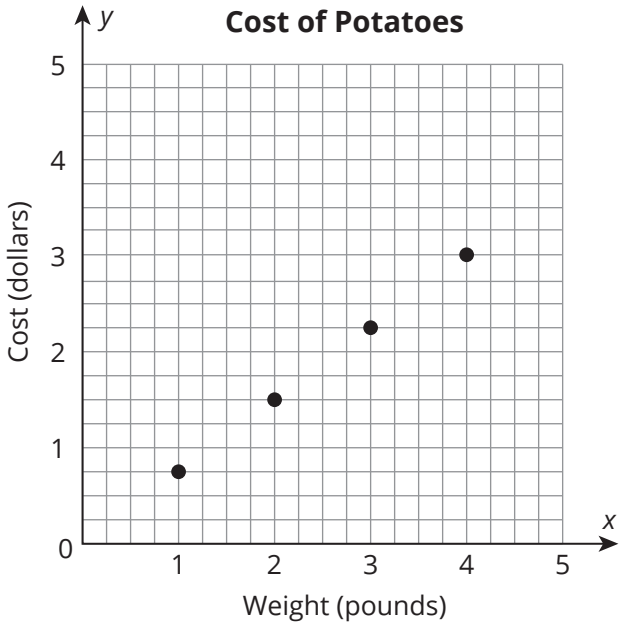
3. Luna is riding her scooter at a constant rate. The graph shows the ratio time : distance. Write a unit rate to represent Luna's speed.



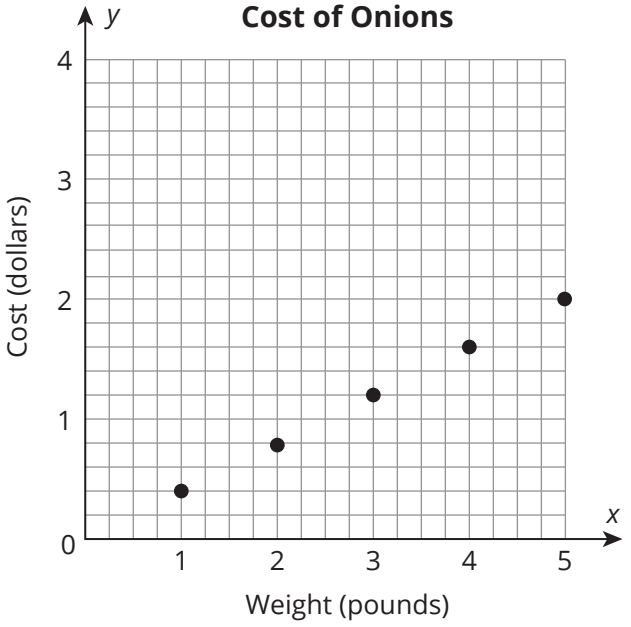
4. Nahimana is jogging along a river trail. The graph shows the ratio time : distance. Write a unit rate to represent Nahimana's jog.



5. Kayla is grocery shopping. Potatoes are on sale. The graph shows the ratio cost : weight. Write a unit rate to represent the cost of potatoes.



6. Diego is grocery shopping. Onions are on sale. The graph shows the ratio cost : weight. Write a unit rate to represent the cost of onions.



Extension

Acceleration is a rate that compares speed with time. Gravity, for example, is acceleration at 9.8 meters per second per second, or $\frac{\frac{9.8\,m}{1\,s}}{1\,s}$.

When an object is in free fall, its speed at any moment is caused by acceleration due to gravity. How fast, in miles per hour, is a body in free fall moving after 4 seconds?

Spaced Practice

1. A banquet hall is preparing for a wedding with 312 guests. When one table seats 8 guests, how many tables will be needed for the wedding?

2. Adriana is traveling in Mexico. She exchanges $200 for pesos. When the exchange rate is 19.29 pesos per US dollar, how many pesos should she expect to receive from the exchange?

3. Use benchmark percents to calculate each value. Show your work.

   a. 35% of 142

   b. 22% of 864

4. One popular item at the school store is scented pencils. The pencils come in packs of 24 from the retailer.

   Write an algebraic expression that represents the total number of pencils the store has available to sell.

5. Determine each sum.

   a. $4.0842 + 13.87 + 6.371$

   b. $12.89 + 7.45 + 3.005$

CC BY NC

GRADE 6

MODULE 3

Moving Beyond Positive Quantities

TOPIC 1: Signed Numbers and the Four Quadrants

I. Introduction to Negative Numbers 165
II. Absolute Value 172
III. Rational Number System 178
IV. Extending the Coordinate Plane 184

TOPIC 2: Operating with Integers

I. Using Models to Understand Integer Addition 193
II. Adding Integers, Part I 198
III. Adding Integers, Part II 203
IV. Subtracting Integers 209
V. Multiplying and Dividing Integers 218

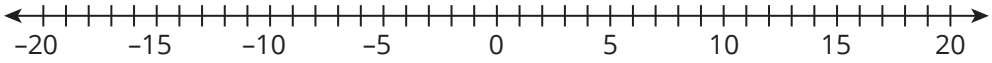
CC BY NC

Name _____ Date _____

I. Introduction to Negative Numbers

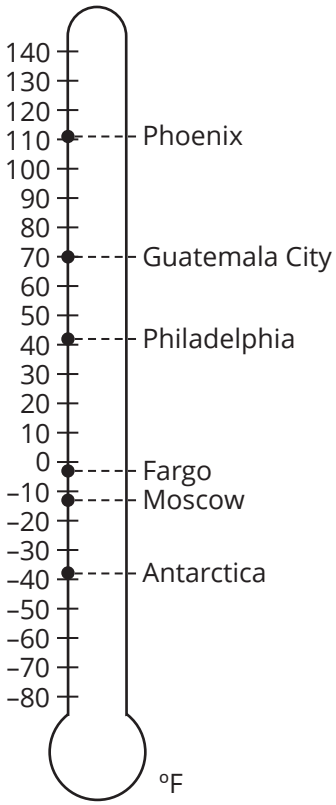
Topic Practice

A. Plot each number and its opposite on the number line.



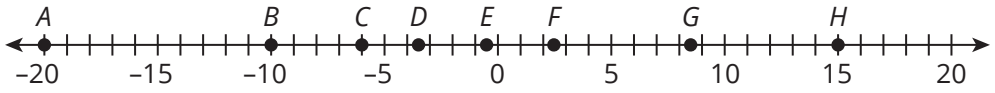
1. 4
2. -17
3. $-(-5)$
4. $11\frac{1}{2}$
5. $-(-20)$
6. -8.9

B. A thermometer is like a vertical number line. This thermometer shows the temperatures for 6 locations around the world in degrees Fahrenheit. Use the thermometer to estimate the temperature in each location.



1. Antarctica
2. Philadelphia
3. Phoenix
4. Moscow
5. Guatemala City
6. Fargo

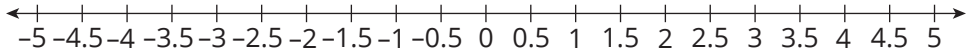
C. Use the number line to answer each question.



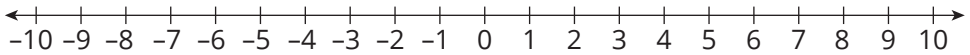
1. Which point represents a value that is less than −1 and greater than −5?
2. Which point represents a value that is greater than −9 and less than −5?
3. Which point represents a value that is less than 9 and greater than 5?
4. Which point represents a value that is greater than 14 and less than 18?
5. Which point represents a value that is equal to or less than −20?
6. Which point represents a value that is less than 2 and greater than −3?
7. Which point represents a value that is greater than −11 and less than −6?
8. Which point represents a value that is less than 3 and greater than 0?

D. Plot the rational numbers in each set on a number line. Then, order the values from least to greatest.

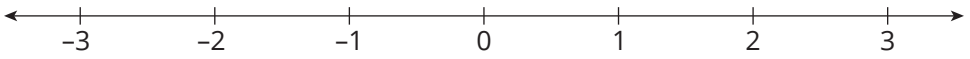
1. $-4.2, 3.10, 4\frac{1}{8}, 3.01, 2.3, -\frac{14}{5}, -3.017$



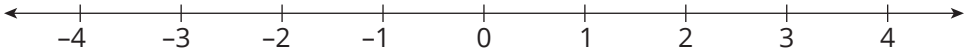
2. $6.84, \frac{61}{7}, -6.34, 6\frac{1}{4}, -\frac{83}{10}, -8.15$



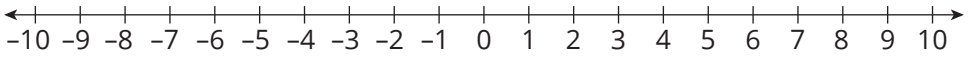
3. $-1.98, -0.23, 0, 1.89, -1\frac{3}{5}, 102\%, \frac{3}{2}$



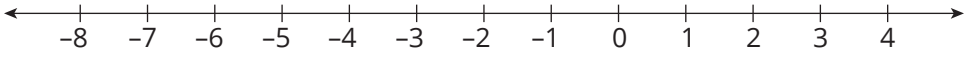
4. $-2.35, 2.35, 2.54, -2.54, 2.01, -2.01$



5. $9.3, -\frac{28}{5}, 9.90, 9\frac{8}{11}, 3.78, \frac{39}{10}, -5\frac{1}{6}$



6. $-0.02, 0, -6.98, 2\frac{1}{16}, \frac{22}{10}, -6.89, 2.01$



E. Order each set of rational numbers according to the directions given in the problem.

1. Unlike Texas, California has some cities that are below sea level, which means their elevation is negative. The elevations of several locations in California were recorded in 2024. List the locations in order of elevation from least to greatest.

Bombay Beach, CA: −223 ft	Salton City, CA: −125 ft
Malibu, CA: 105 ft	Death Valley, CA: −282 ft
Napa, CA: 20 ft	Mecca, CA: −187 ft
El Centro, CA: −39 ft	Newport Beach, CA: 25 ft

CC BY NC

2. Students in Mrs. Jackson's class must complete at least 40 math problems for homework every week. The homework progress of students on Wednesday is given below. List the students in order of their homework progress from least to greatest.

   Maria: 0.6 Abby: 70%

   William: 52.5% Noah: $\frac{2}{3}$

   Luis: $\frac{45}{40}$ Malik: 0.575

3. The owners of a local store keep a record of their bank balance for the first 8 months they are in business. Overdrafts or weeks when they owe money are represented by parentheses. For example, ($25) means that the company owes the bank $25. Amounts not in parentheses are when the company made money. Write each as a positive or negative number and then order the balances from least to greatest.

Month	1	2	3	4	5	6	7	8
Balance	($112.11)	$212.08	($55.62)	$315.45	$210.73	($115.40)	($232.21)	$118.23
+/–								

4. Order the daily low temperatures for the winter week in Bismarck, North Dakota, from coldest to warmest.

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Daily Low Temperature	–3.1°F	2.5°F	–0.2°F	–1.1°F	–5°F	–1.4°F	–2.3°F

5. The melting points of several elements are given below. List the elements in order of melting point from lowest to highest temperature.

   Sulfur: 113°C Oxygen: −218°C Sodium: 98°C

   Hydrogen: −259°C Helium: −272°C Nitrogen: −210°C

6. A wrestler spends 8 weeks training for a different weight class. Each week, he tracks how many pounds he has gained or lost compared to his starting weight. The results are shown in the table. List the weeks in order of lightest to heaviest weight.

Week	Difference between starting weight and current weight
1	$-\frac{3}{4}$ lb
2	$\frac{13}{8}$ lbs
3	1.3 lbs
4	−0.8 lb
5	$\frac{3}{8}$ lb
6	−0.5 lb
7	$\frac{6}{5}$ lbs
8	$\frac{5}{6}$ lb

Extension

Create a new situation, similar to Activity 1.3 *Representing Money on a Number Line*, in which zero can have two different meanings.

Spaced Practice

Complete each customary measurement conversion.

1. There are 4 quarts in 1 gallon. How many quarts are in 4 gallons?

2. There are 12 inches in 1 foot. How many feet are in 174 inches?

Complete each metric measurement conversion.

3. There are 10 centimeters in 1 decimeter. How many decimeters are in 37 centimeters?

4. There are 100 meters in 1 hectometer. How many hectometers are in 201 meters?

Multiply by a unit rate to determine each measurement conversion using unit analysis.

5. How many inches are in 1 mile?

6. How many fluid ounces are in 4 quarts?

Calculate each quotient. Simplify your answer.

7. $5\frac{3}{4} \div 1\frac{3}{4}$

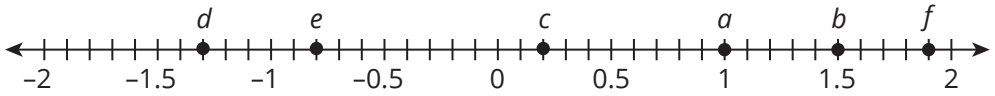
8. $6\frac{2}{3} \div 2\frac{1}{2}$

CC BY NC

II. Absolute Value

Topic Practice

A. Complete the table for each point on the number line.



Point	Value	Opposite	Distance From 0	Absolute Value
a				
b				
c				
d				
e				
f				

B. Write an absolute value statement and an integer to represent each situation.

1. The temperature went from 45 degrees Fahrenheit to 10 degrees Fahrenheit.

2. The value of his stock went from $500 to $250 last year.

3. The water level dropped from 10 feet to 2 feet.

4. His savings account decreased from $1500 to $100.

5. Her elevation went from 3025 feet to 1209 feet.

6. The population decreased from 18,453 to 11,231.

C. Complete each statement.

1. $|-2| =$ _____

2. $|15| =$ _____

3. $|-10| =$ _____

4. $|0| =$ _____

5. $|8| =$ _____

6. $|-16| + |-12| =$ _____

7. $|-7| + |-8| =$ _____

8. $|20| + |-4| =$ _____

9. $|3| + |-2| =$ _____

10. $|-5| + |7| =$ _____

CC BY NC

D. Solve each set of problems using the given scenario.

Huyen lives on the 21st floor of her apartment building. Her assigned parking spot is on the 6th level below ground. Her friend Olivia lives on the 14th floor, and the building's gym is on the 3rd floor. Write an expression using absolute value for each situation and then calculate the answer.

1. How many floors does Huyen travel to get home after she parks her car?

2. How many floors would Huyen travel if she leaves the gym and goes straight to her car?

3. How many floors does Huyen travel if she leaves her apartment to visit Olivia?

4. If Olivia's parking space is one level up from Huyen's, how many floors up does Olivia travel to get from her car to her apartment?

5. How many floors does Huyen travel if she leaves her apartment and goes to the gym?

The table shows the gains and losses of an investment account. The account was opened with an initial amount of $1000. Use an absolute value expression to answer each question.

Month	1	2	3	4	5	6	7	8
Gain or Loss	($356.94)	$2304.37	$1450.76	($200.40)	($10.13)	$725.15	($509.28)	$162.23

6. Rewrite the loss amounts in the table as negative numbers.

7. Between which two months did the account post the greatest gain? What was this gain?

8. Between which two months did the account see the greatest loss? What was this loss?

CC BY NC

9. What is the difference between the account's best and worst months?

10. What was the value of the account at the end of the first month?

Extension

Write a scenario to represent each rational number.

1. -12

2. $-4\frac{1}{2}$

3. 7.3

4. -0.7

Spaced Practice

A common error in advertising occurs when announcing prices less than $1.00. Read the scenario and then answer each question.

1. Daniela's store advertises that 12-fluid-ounce sodas are 0.99 cents each and programs this price into her cash registers. Using the advertised price, determine the income generated by selling 500 sodas.

2. Michael's restaurant advertises a chicken wing special on Monday nights. The advertisement states that wings are 0.25 cents each. Fernando and his two friends each ordered 20 wings. Using the advertised price, determine how much Fernando and his two friends should each pay.

3. Use the $>$, $<$, or $=$ symbol to complete each statement.

   a. $-5 \bigcirc -8$

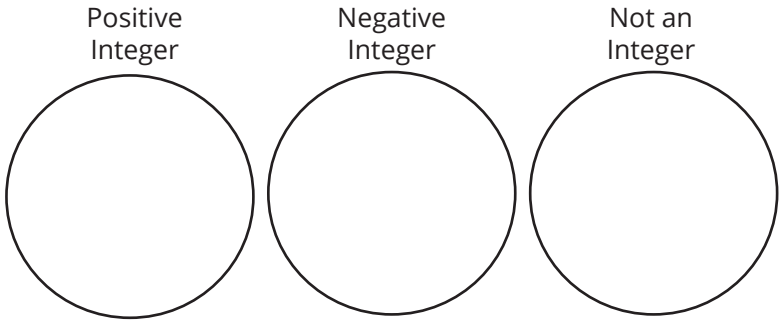
   b. $-3 \bigcirc 0$

   c. $5 \bigcirc -5$

III. Rational Number System

Topic Practice

A. Place each number below in the correct circle in the diagram provided. Then, determine the opposite of each number.



1. 26

2. $\frac{1}{8}$

3. -4

4. 15.8

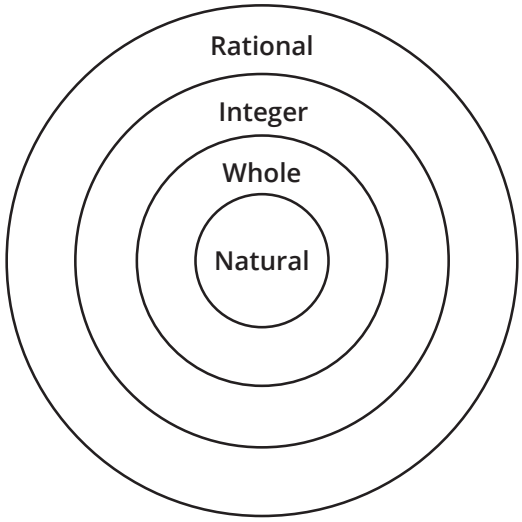
5. $-\frac{3}{4}$

6. -39

7. 81

8. -2.7

B. Place each number in the table in the correct location in the Venn diagram. Make sure to put each number in the most inclusive circle to which it belongs. Then, complete the table to check all sets to which the number belongs.

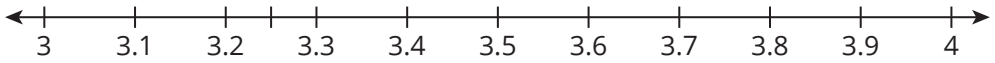


Number	Natural Number	Whole Number	Integer	Rational
7				
4.98				
−5				
$\frac{3}{4}$				
0.549				
−6.2				
0				
$-\frac{5}{8}$				
−4,698,820				
1				

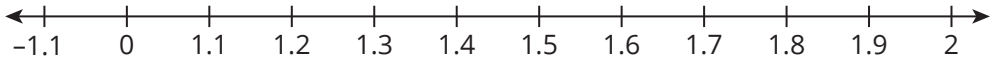
CC BY NC

C. Graph the rational numbers in each pair. Then determine a rational number that lies between the given pair of rational numbers.

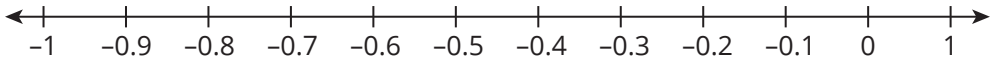
1. 3.2 and 3.3



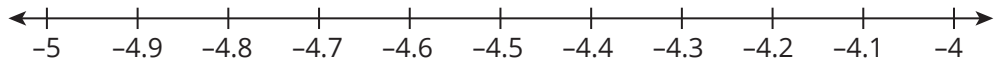
2. $1\frac{1}{4}$ and $1\frac{1}{2}$



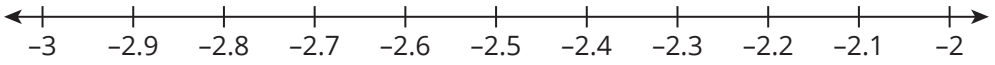
3. -0.7 and -0.8



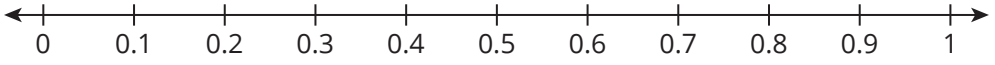
4. $-4\frac{2}{3}$ and -5



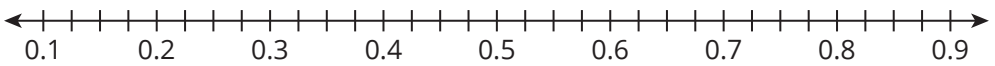
5. -2.6 and -2.7



6. 0.3 and 0.4



7. Plot the rational numbers 0.4 and 50%. Then, plot and label a rational number between them.



Extension

Are there more integers or more natural numbers? Even though there are infinitely many of both, it seems like there should be more integers than natural numbers. But, actually, there are just as many integers as there are natural numbers!

If you can show how to assign an integer to every natural number, you will demonstrate that the two sets of numbers are equal. How do you think this can be done?

Spaced Practice

1. Write an absolute value expression to calculate the answer to each question.

   a. The temperature at 9:00 A.M. was − 10 degrees. The temperature at 2:00 P.M. was 40 degrees. What was the change in temperature?

   b. You began your hike at 30 feet below sea level. You are now at 200 feet. How far have you hiked?

2. Calculate each sum, difference, product, and/or quotient.

   a. $68.52 - 12.708 + 3.92$

b. $6.14 \cdot 7.5$

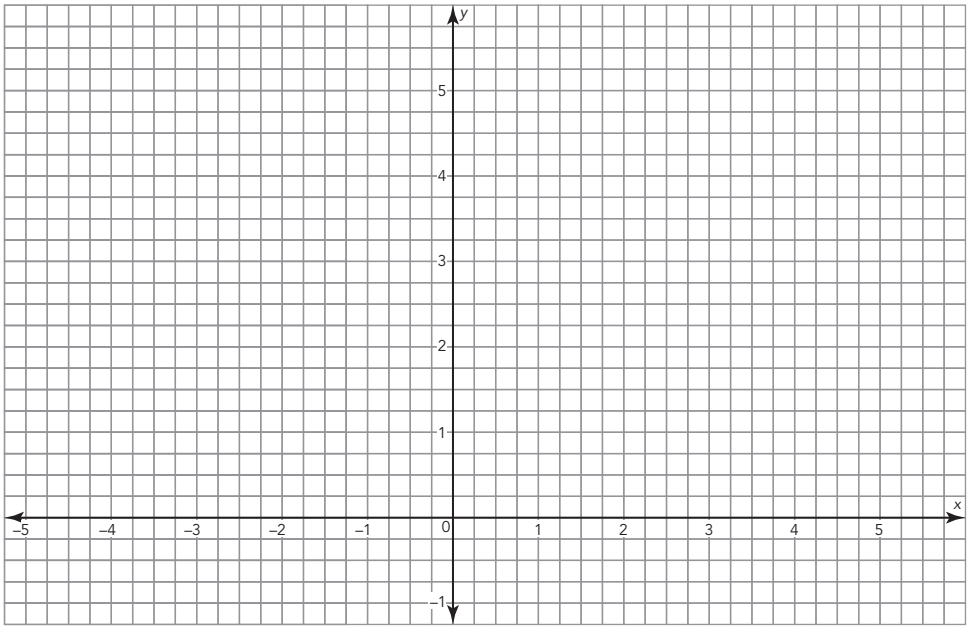
c. $25.012 \div 5.2$

3. Plot each ordered pair on a coordinate plane.

a. (2, 4)

b. (5.5, 1.75)

c. $\left(4\frac{2}{5}, 4\frac{4}{5}\right)$

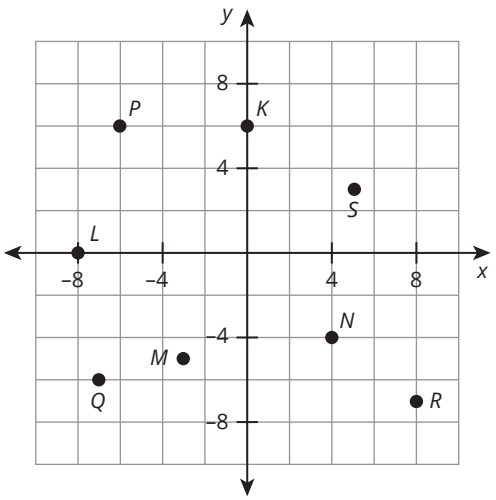


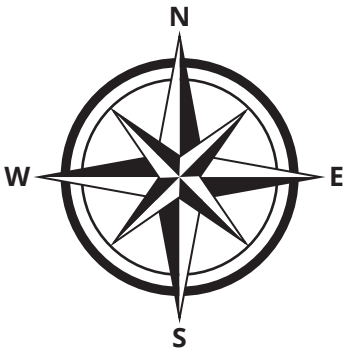
CC BY NC

IV. Extending the Coordinate Plane

Topic Practice

A. The coordinate plane shown represents a map of downtown Mathopolis. Each square represents two city blocks. Suppose your house is located at the origin. Explain how you could get from your house to the given destination if you were to first walk east or west (right of left) and then walk north or south (up and down). Then, determine the coordinates of the destination point.





1. Point *K*: friend's house

2. Point *L*: gas station

3. Point *M*: library

4. Point *N*: school

5. Point *Q*: convenience store

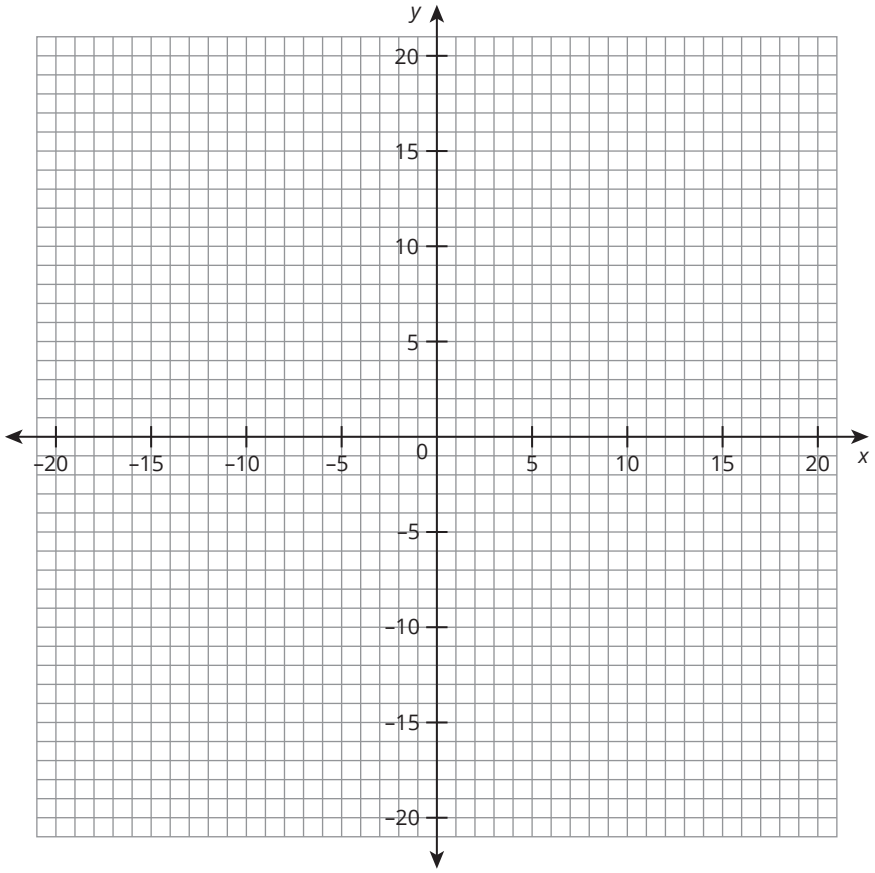
6. Point *P*: cousin's house

7. Point *R*: park

8. Point *S*: grocery store

CC BY NC

B. Plot each of the given points on the coordinate plane. Determine in which quadrant the point is located or on which axis the point lies.



1. (0, 0)

2. (−7.5, 0)

3. $\left(4, 12\frac{1}{2}\right)$

4. $\left(-16, -\frac{9}{2}\right)$

5. (14, −11)

6. (0, −6)

7. (−6.5, −18.5)

8. (15, 10)

9. (−7, 11)

10. (17, −3.25)

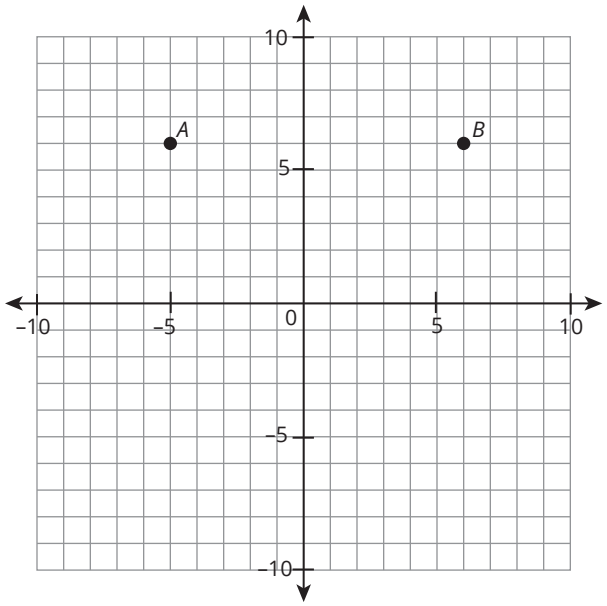
11. $\left(-10\frac{1}{2}, -14\frac{3}{4}\right)$

12. (−13.5, 20.25)

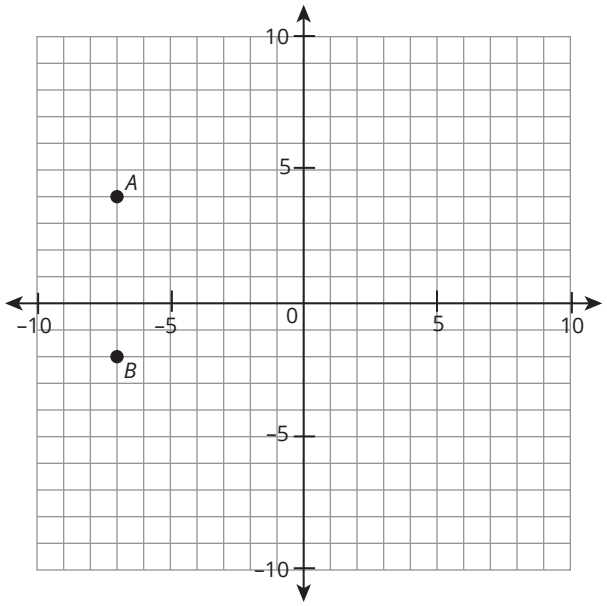
CC BY NC

C. Points *A* and *B* are labeled on each coordinate plane. Identify the ordered pair associated with each point. Write a numeric expression using absolute value and calculate the distance between point *A* and point *B*.

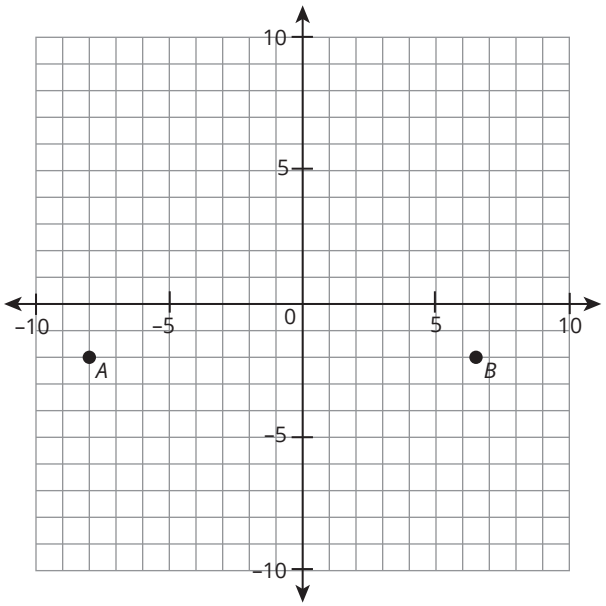
1.



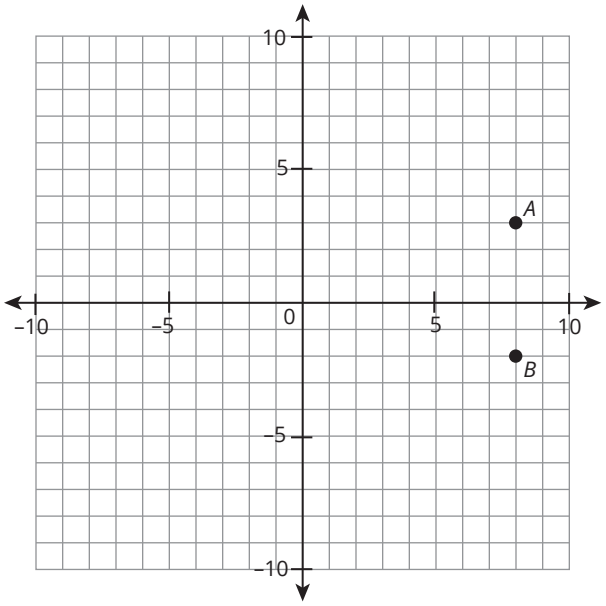
2.



3.

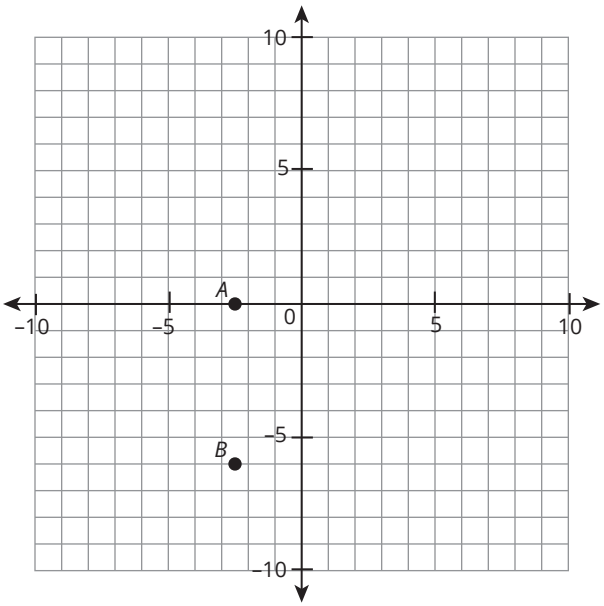


4.

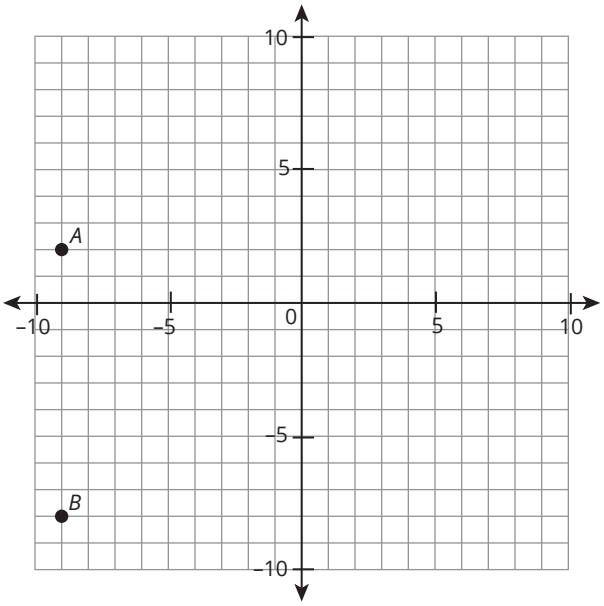


CC BY NC

5.



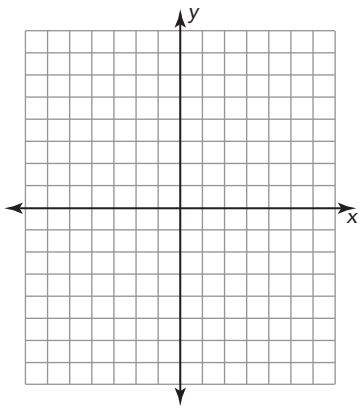
6.



Extension

Create a Rectangle *ABCD* on a coordinate plane that meets the following conditions:

- All four points are in different quadrants,
- Point *A* is in Quadrant II with coordinates $(-a, b)$,
- The distance from point *A* to point *B* is $3a$,
- The distance from point *A* to point *D* is $4b$,
- Neither axis is a line of symmetry in the rectangle,



CC BY NC

Spaced Practice

Determine two rational numbers that are between the two given rational numbers.

1. 3.4 and 3.5

2. $\frac{12}{5}$ and $\frac{13}{5}$

State the opposite of each number and plot both numbers on a number line.

3. $2\frac{1}{8}$

4. -5.97

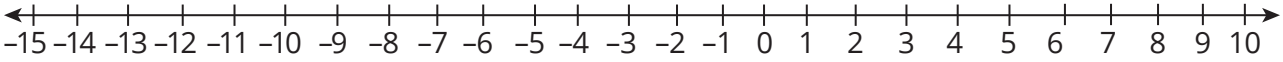
Name _____ Date _____

I. Using Models to Understand Integer Addition

Topic Practice

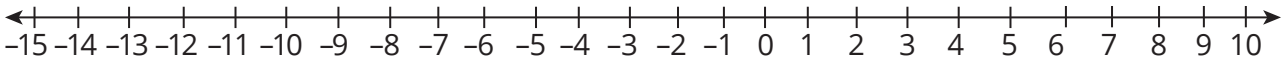
A. Use the number line to determine the ending position by adding and subtracting the indicated steps from each starting position.

	Starting Position	Steps Backward	Steps Forward	Ending Position
1.	+1	3	6	
2.	+5	6	2	
3.	+3	6	4	
4.	0	9	12	
5.	−5	2	7	
6.	+1	8	9	
7.	−5	3	5	
8.	−1	9	6	
9.	+8	4	2	
10.	−10	3	4	



B. Write an addition equation to describe each set of steps forward and backward. Use the number line to verify your solution.

	Starting Position	Steps Backward	Steps Forward	Equation
1.	+3	2	6	
2.	−7	5	3	
3.	+8	10	4	
4.	+4	9	3	
5.	−7	2	8	
6.	0	8	4	
7.	−9	1	10	
8.	−8	7	6	
9.	0	6	3	
10.	+9	11	12	



C. Determine a roll of two number cubes (numbered 1 through 6) that will result in a final score of 10. Write an equation to describe the results of each roll. The result of the red number cube represents a negative number, and the result of the black number cube represents a positive number. When needed, create a model, such as a number line, to verify your equations.

	Starting Score	Roll of the Red Number Cube	Roll of the Black Number Cube	Equation
1.	+7			
2.	+8			
3.	+5			
4.	+9			
5.	+12			
6.	+6			
7.	+14			
8.	+10			

CC BY NC

Extension

Draw a model to represent the addition problem $-3\frac{1}{2} + \left(-1\frac{1}{4}\right)$. Then, determine the solution.

Spaced Practice

Write an absolute value statement and an integer to represent each situation.

1. The temperature went from 45 degrees Fahrenheit to 10 degrees Fahrenheit.

2. The value of a stock went from $500 to $250 last year.

3. The water level dropped from 10 feet to 2 feet.

4. His savings account decreased from $1500 to $100.

5. Her elevation went from 3025 feet to 1209 feet.

6. The population decreased from 18,453 to 11,231.

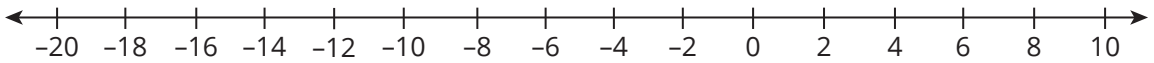
CC BY NC

II. Adding Integers, Part I

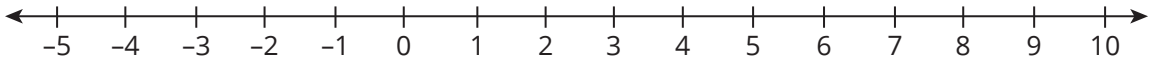
Topic Practice

A. Represent each sum on the number line. Then, write the sum.

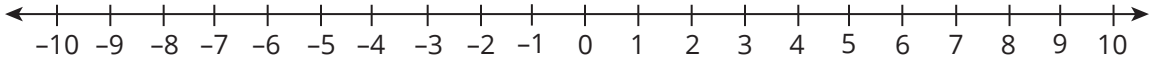
1. $-13 + 1$



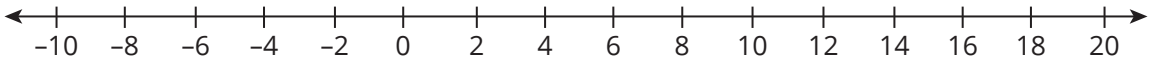
2. $4 + (-4)$



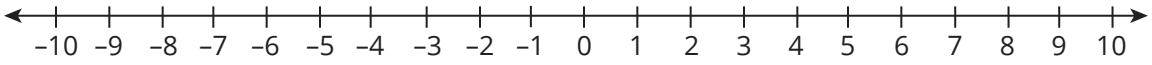
3. $-6 + 3$



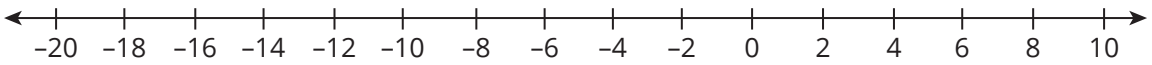
4. $11 + (-5)$


–10 –8 –6 –4 –2 0 2 4 6 8 10 12 14 16 18 20

5. $4 + (-5)$

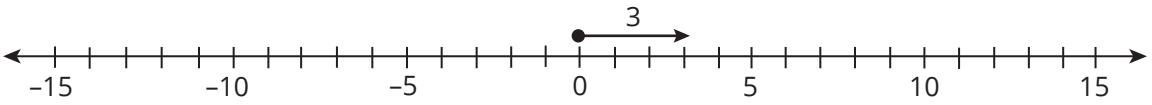

–10 –9 –8 –7 –6 –5 –4 –3 –2 –1 0 1 2 3 4 5 6 7 8 9 10

6. $-5 + (-9)$

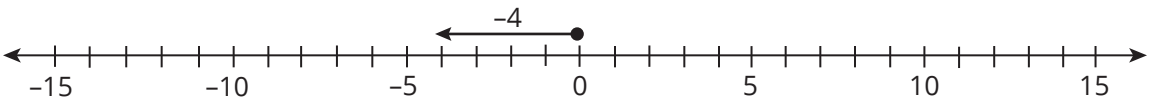

–20 –18 –16 –14 –12 –10 –8 –6 –4 –2 0 2 4 6 8 10

B. Complete each number line model and then determine the unknown addend.

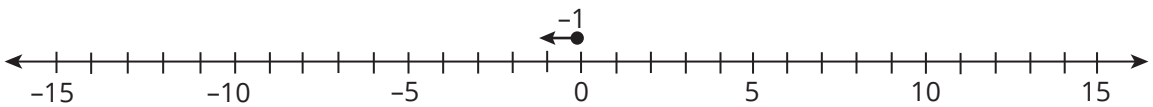
1. $3 + _____ = -9$



2. $-4 + _____ = 5$



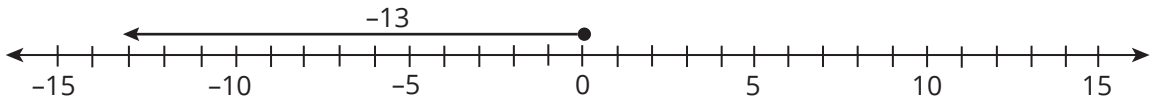
3. $-1 + _____ = -11$



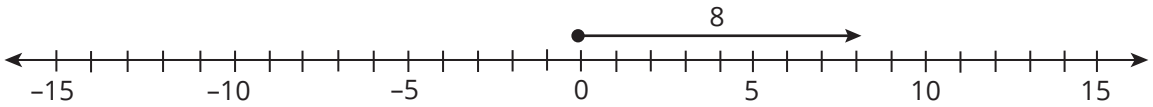
4. $6 + _____ = -2$



5. $-13 + _____ = -7$



6. $8 + _____ = -3$



Extension

Draw a number line model to determine each sum.

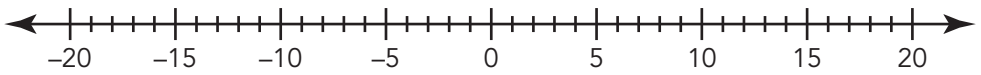
1. $-1.6 + -0.7$

2. $-2.1 + 0.8$

3. $2.2 + -4.1$

Spaced Practice

Plot each number and its opposite on the number line.



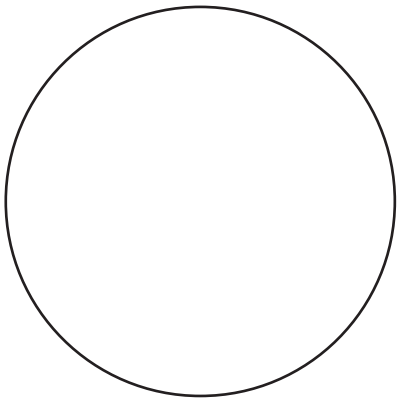
1. 4
2. −17
3. − (−5)
4. 11
5. − (−20)
6. −8

III. Adding Integers, Part II

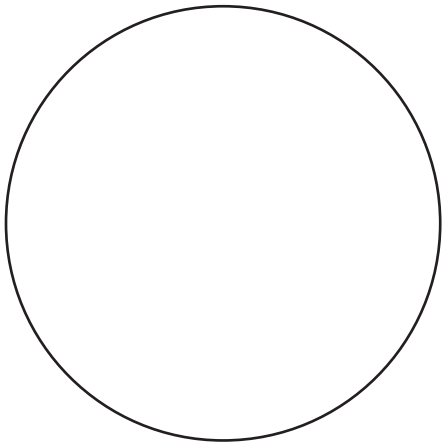
Topic Practice

A. Draw a picture with two-color counters to represent and solve each number sentence.

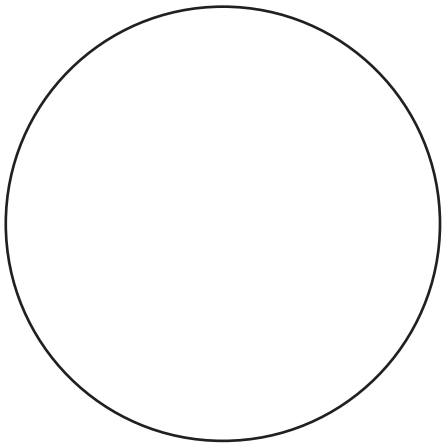
1. $-9 + 3 =$ _____



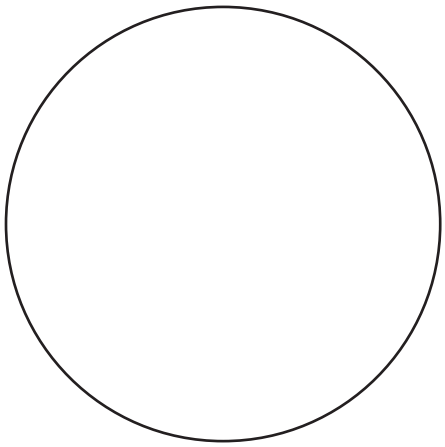
2. $-9 + (-3) =$ _____



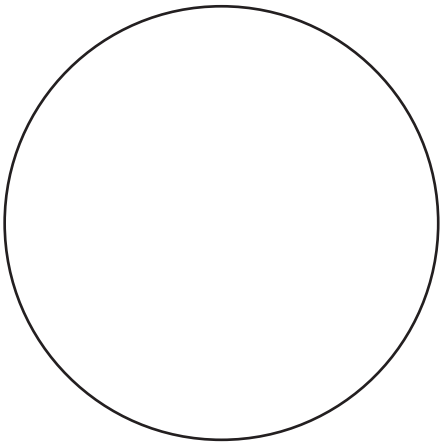
3. $2 + (-5) =$ _____



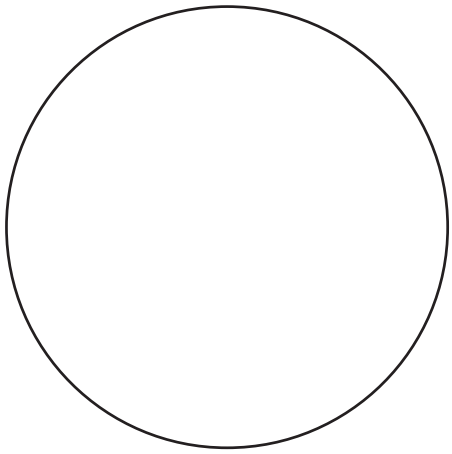
4. $5 + (-2) =$ _____



5. $-11 + 7 =$ _____

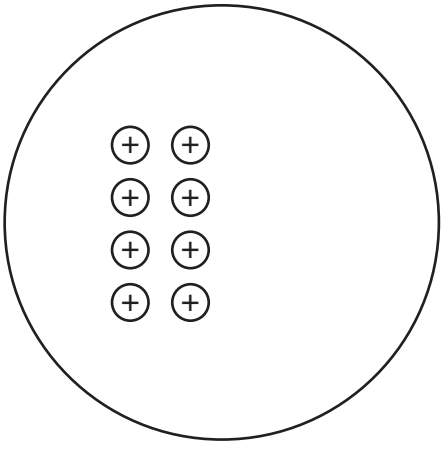


6. $-5 + 12 =$ _____

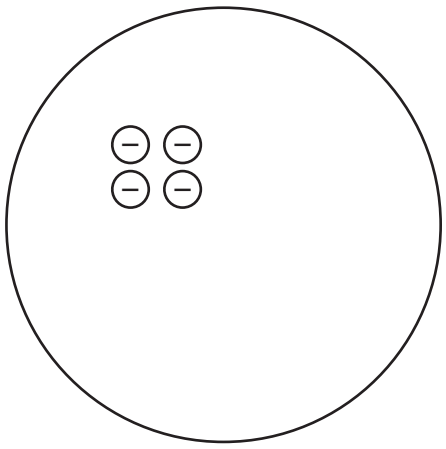


B. Complete each model and determine the unknown addend.

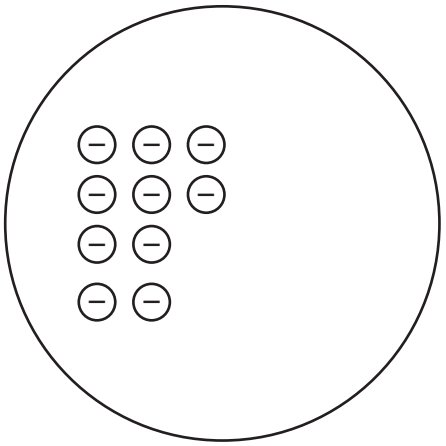
1. $8 +$ _____ $= 6$



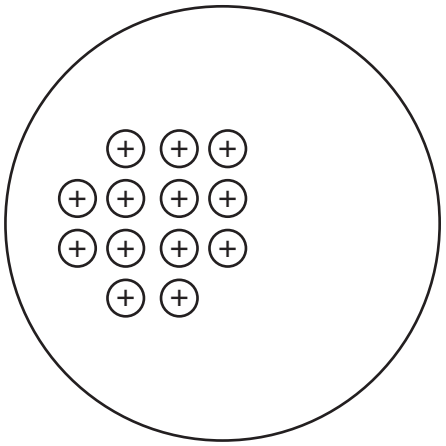
2. $-4 +$ _____ $= 3$



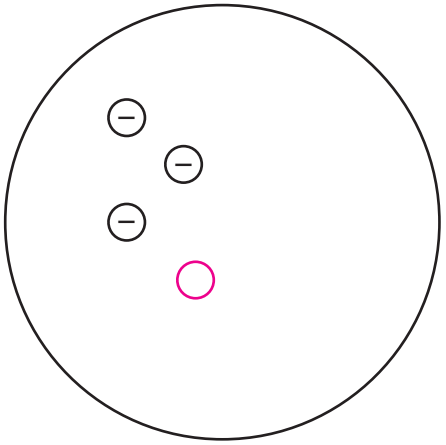
3. $-10 + _____ = -2$



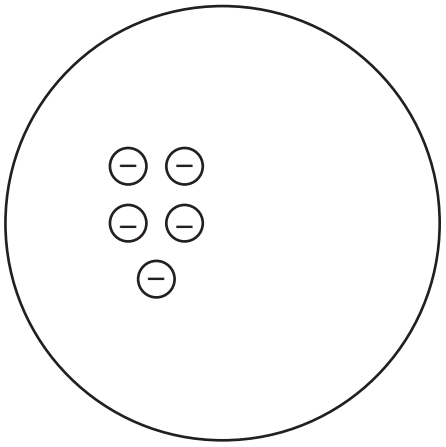
4. $13 + _____ = 6$



5. $-3 + _____ = -8$



6. $-5 + _____ = 0$



CC BY NC

C. Determine each sum.

1. $0 + (-5)$

2. $-5 + (-4)$

3. $-1 + (-10)$

4. $7 + (-2)$

5. $18 + (-20)$

6. $6 + (-6)$

7. $-10 + 4$

8. $-2 + 16$

9. $-11 + (-6)$

10. $4 + (-6) + (-3)$

11. $7 + (-14) + 5$

12. $-1 + (-4) + 8$

Extension

Determine each sum.

1. $21\frac{3}{8} + \left(-51\frac{1}{4}\right)$

2. $-65\frac{2}{5} + 103$

3. $-34.528 + 78.12$

4. $863.78 + (-1024.01)$

Spaced Practice

Use a number line to determine each sum.

1. $-3 + 4$

2. $-3 + (-4)$

Calculate the sale price of each item.

3. A pair of headphones is on sale for 15% off the original price of $305.

4. A hoverboard is on sale for 10% off the original price of $247.50.

Solve each proportion.

5. $\frac{3}{4} = \frac{x}{18}$

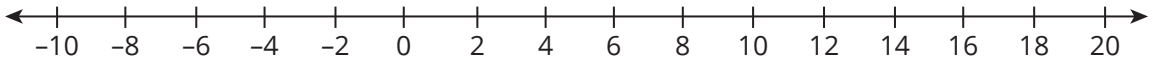
6. $\frac{5}{8} = \frac{21}{x}$

IV. Subtracting Integers

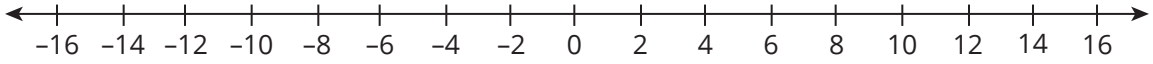
Topic Practice

A. Represent each difference on the number line. Then, write the difference.

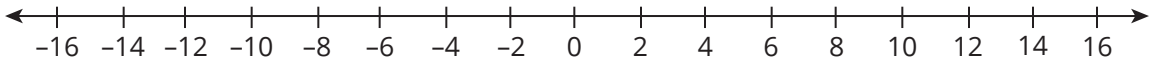
1. $11 - (-3)$



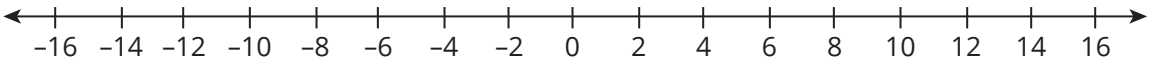
2. $-7 - 4$



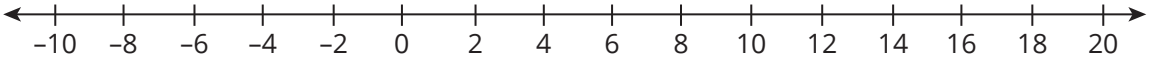
3. $2 - (-10)$



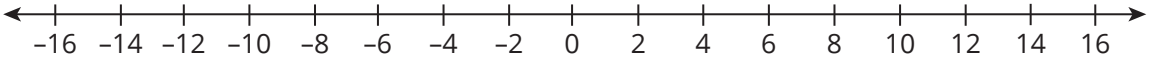
4. $-9-(-2)$


–16 –14 –12 –10 –8 –6 –4 –2 0 2 4 6 8 10 12 14 16

5. $8-12$

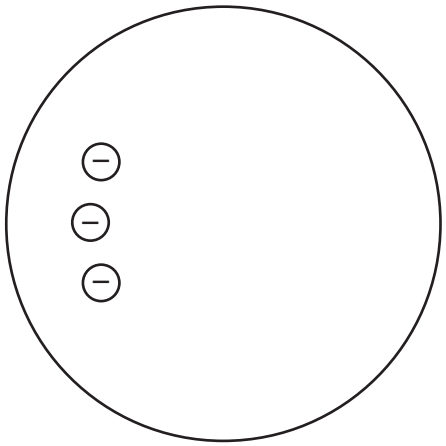

–10 –8 –6 –4 –2 0 2 4 6 8 10 12 14 16 18 20

6. $-5-7$

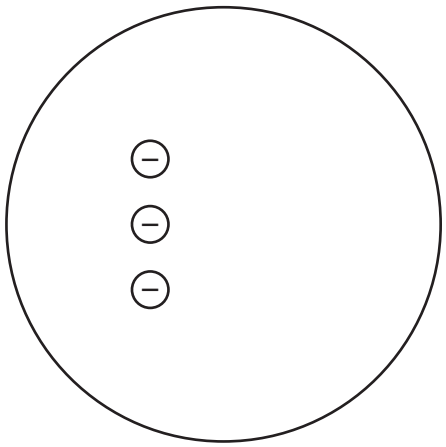

–16 –14 –12 –10 –8 –6 –4 –2 0 2 4 6 8 10 12 14 16

B. Draw a representation for each subtraction problem. Then, calculate the difference.

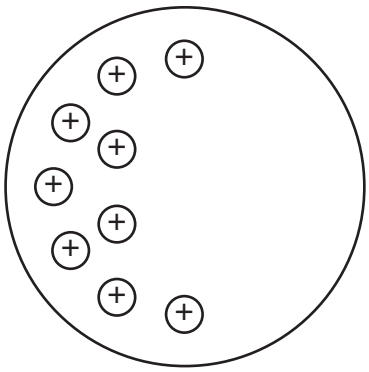
1. $-3 - 6 =$ _____



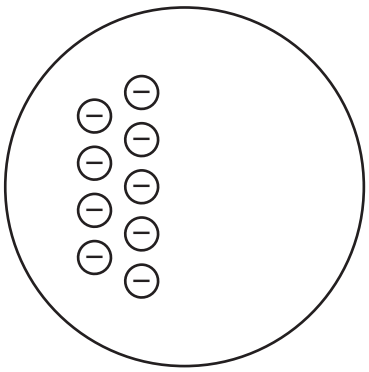
2. $-3 - (-6) =$ _____



3. $9 - (-5) =$ _____

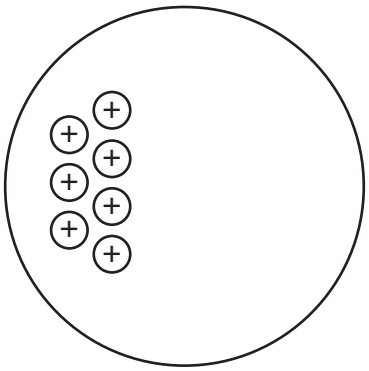


4. $-9 - 5 =$ _____

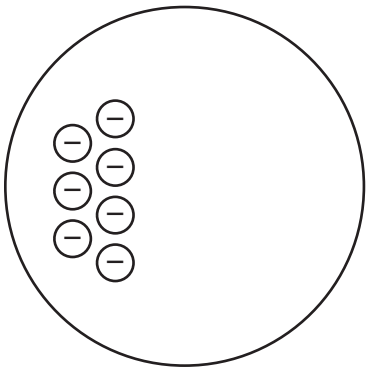


CC BY NC

5. $7 - (-2) =$ _____



6. $-7 - 2 =$ _____



C. Determine each difference.

1. $0 - (-7)$

2. $-2 - (-12)$

3. $7 - (-2)$

4. $-3 - (-3)$

5. $-10 - (-5)$

6. $10 - (-6)$

7. $12 - (-8)$

8. $-8 - 14$

9. $-10 - 4$

10. $12 - (-2) - 5$

11. $7 - (-3) - (-4)$

12. $-5 - 4 - (-2)$

D. Write and solve an equation to answer each question.

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

2. Madison owes $22 on her lunch account balance. On Monday, she pays $15 toward her balance, but then charges $4 for lunch that day. What is Madison's lunch account balance at the end of the day Monday?

CC BY NC

3. The Subterranean roller coaster rises up to approximately 51 feet above the ground before dropping approximately 101 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. Ana jumped 2 inches below the qualifying height, but her friend Maria made it to 2 inches over the qualifying height. What is the difference, in inches, betwen Maria's jump and Ana's jump?

5. A drilling crew digs to a height of −33 feet during their first day of drilling. On the second day, the crew digs down 20 feet more from where they ended on the first day. On the third day, the crew digs down 25 feet more. Describe the total number of feet the crew digs to the bottom of the hole after the third day.

6. The freezing point of helium is −458 degrees Fahrenheit. When you increase that temperature by 112 degrees Fahrenheit, you reach the freezing point of nitrogen. What is the freezing point of nitrogen?

Extension

1. Determine each difference without using a number line.

   a. $3.1 - (-3.3)$

b. $-8.3 - 8.8$

c. $42.5 - 45.6$

d. $-28.4 - (-79.5)$

2. The deepest point in the ocean is the Marianas Trench in the Pacific Ocean, at about 6.9 miles below sea level. The highest point in the world is Mount Everest in the Himalayan Mountains, at about 5.5 miles above sea level. Plot each elevation as a rational number on a number line, and use absolute value to determine the number of miles between the deepest point in the ocean and the highest point in the world.

CC BY NC

Spaced Practice

For each point, indicate its location relative to the origin.

1. (18, 10)

2. (−2, 6)

3. (24, −13)

4. (0, −8.75)

5. (−7, −4)

6. (−36, 0)

7. (5.5, 11)

8. $\left(-3\frac{1}{3}, 12\frac{2}{3}\right)$

9. (−100, −1)

10. (0, 0.5)

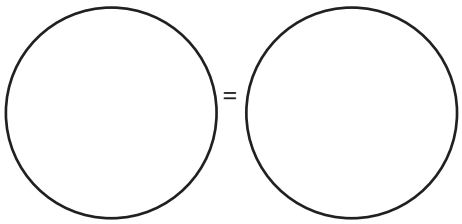
CC BY NC

V. Multiplying and Dividing Integers

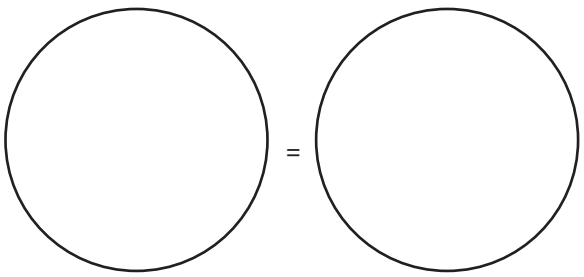
Topic Practice

A. Draw a two-color counter model to determine each product. Describe the expression in words.

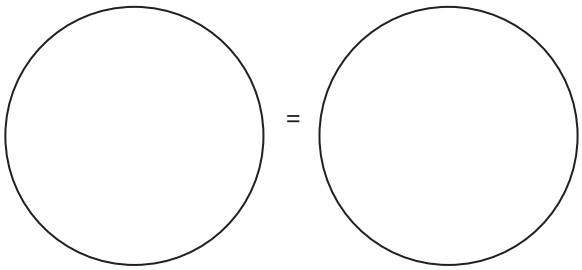
1. $2 \cdot (-6) =$ _____



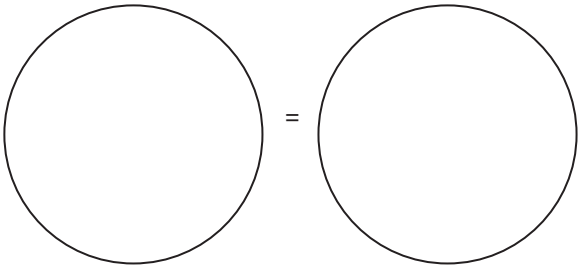
2. $-4(-2) =$ _____



3. $7 \cdot 3 =$ _____

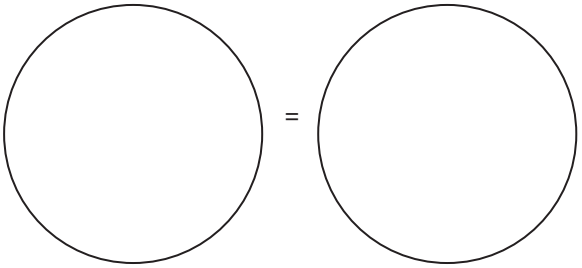


4. $6(-3) =$ _____

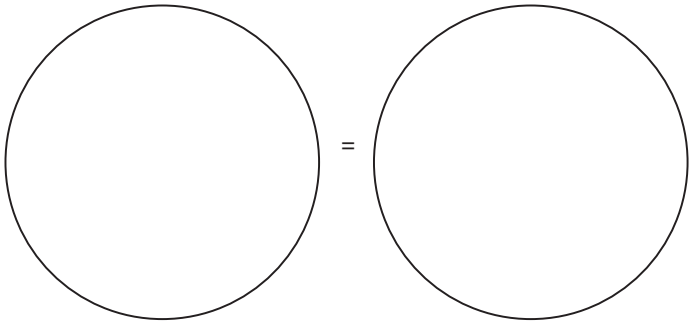


CC BY NC

5. $-2 \cdot 7 =$ _____

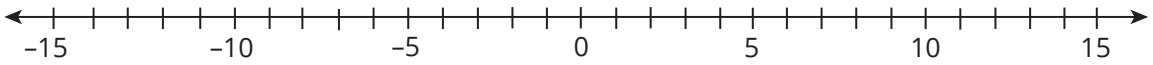


6. $-5 \cdot (-7) =$ _____

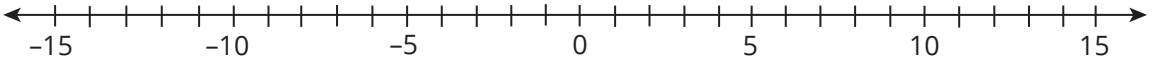


B. Complete a number line representation to determine each product.

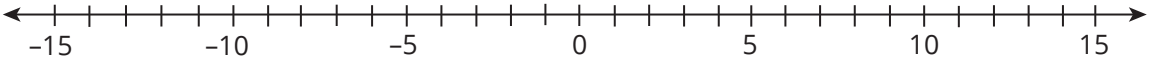
1. $2(-7) =$ _____



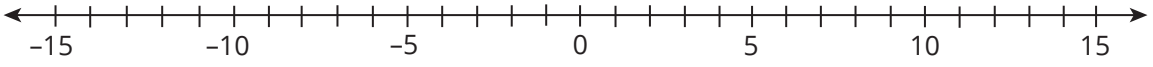
2. $5(-3) =$ _____



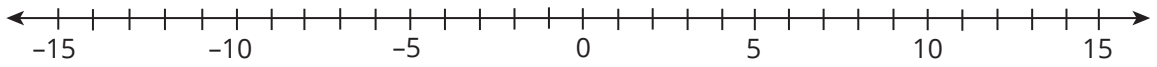
3. $5 \cdot 3 =$ _____



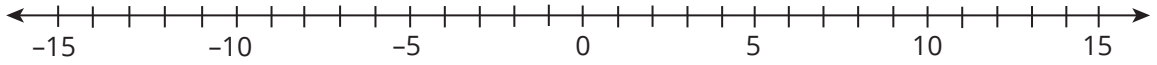
4. $-3 \cdot 3 =$ _____



5. $-3 \cdot (-3) =$ _____



6. $2(-3) =$ _____



C. Complete each fact family.

1. $-8 \cdot (-7) =$ _____
   $-7 \cdot (-8) =$ _____
   _____ $\div (-8) = -7$
   $56 \div$ _____ $= -8$

2. $4 \cdot$ _____ $= -4$
   _____ $\cdot 4 = -4$
   $-4 \div$ _____ $= 4$
   $-4 \div 4=$ _____

3. _____ $\cdot 5 = -35$
   _____ $\cdot (-7) = -35$
   _____ $\div 5 = -7$
   $-35 \div$ _____ $= 5$

4. $-8 \cdot$ _____ $= 32$
   $-4 \cdot$ _____ $= 32$
   $32 \div (-8) =$ _____
   $32 \div (-4) =$ _____

5. $-7 \cdot 3 =$ _____

$3 \cdot (-7) =$ _____

_____ $\div (-7) = 3$

$-21 \div 3 =$ _____

6. _____ $\cdot (-5) = -50$

$-5 \cdot 10 =$ _____

$-50 \div$ _____ $= 10$

$-50 \div 10 =$ _____

7. $-12 \cdot (-4) =$ _____

$-4 \cdot (-12) =$ _____

$48 \div (-12) =$ _____

_____ $\div (-4) = -12$

8. _____ $\cdot (-2) = -12$

_____ $\cdot 6 = -12$

$-12 \div 6 =$ _____

$-12 \div$ _____ $= 6$

9. $-3 \cdot$ _____ $= -9$

$3 \cdot$ _____ $= -9$

_____ $\div (-3) = 3$

_____ $\div 3 = -3$

10. _____ $\cdot (-9) = 54$

$-9 \cdot$ _____ $= 54$

$54 \div$ _____ $= -6$

_____ $\div (-6) = -9$

11. $10 \cdot$ _____ $= -20$

_____ $\cdot 10 = -20$

$-20 \div$ _____ $= -2$

_____ $\div (-2) = 10$

12. $-11 \cdot 4 =$ _____

$4 \cdot$ _____ $= -44$

$-44 \div (-11) =$ _____

$-44 \div$ _____ $= -11$

CC BY NC

D. Determine each product or quotient.

1. $1 \cdot (-4)$

2. $36 \div (-9)$

3. $-10(-7)$

4. $\frac{-40}{-5}$

5. $-45 \div 9$

6. $-12 \cdot 2$

7. $11(-3)$

8. $\frac{18}{-6}$

E. Determine each solution.

1. $-28 - 4$

2. $5 + (-12)$

3. $-9(8)$

4. $-121 \div (-11)$

5. $-3(5 - 9)$

6. $4(-8)(-5) \div (-10)$

F. Write and solve an equation to answer each question.

1. The temperature drops from 3°C to −10°C overnight. By how many degrees did the temperature change?

2. The price of a stock decreases by $4 per day for 8 days. What is the total change in value of the stock over the 8 days?

3. A submarine starts at a depth of −75 feet and ascends 30 feet. What is the new depth of the submarine?

4. The temperature on a cold day is −2°F. The next day the temperature is predicted to be 3 times colder. What is the predicted temperature?

5. A scuba diver descends at a constant rate. After 5 minutes, the diver is at a depth of −100 feet. How fast is the depth of the diver changing?

6. Mario owes $3 on his lunch account balance. He deposits $12 to his account and then purchases a milk for $1. What is the new balance of Mario's account?

CC BY NC

Extension

You can represent multiplication as repeated addition. Repeated multiplication leads to exponents. Use what you know about multiplying signed numbers to evaluate each expression.

1. $(-3)^3$

2. $(-4)^2$

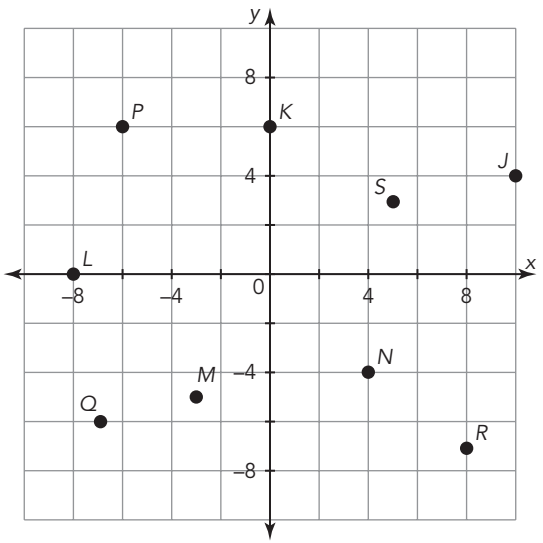
3. $(-2)^5$

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

5. What do you notice?

Spaced Practice

Use the coordinate plane shown. Write the coordinates of each point.



1. Point *K*

2. Point *M*

3. Point *R*

4. Point *L*

5. Point *Q*

6. Point *J*

7. Point *N*

8. Point *P*

CC BY NC

GRADE 6

MODULE 4

Determining Unknown Quantities

TOPIC 1: Expressions

I. Evaluating Numeric Expressions 231
II. Introduction to Algebraic Expressions 236
III. Equivalent Expressions 243
IV. Verifying Equivalent Expressions 250

TOPIC 2: Equations and Inequalities

I. Reasoning with Equal Expressions 257
II. Solving One-Step Addition Equations 265
III. Solving One-Step Multiplication Equations 270
IV. Solving Equations to Solve Problems 278
V. Solving Inequalities with Inverse Operations 288

TOPIC 3: Graphing Quantitative Relationships

I. Independent and Dependent Variables 295
II. Using Graphs to Solve Problems 308
III. Multiple Representations of Equations 319
IV. Relating Distance, Rate, and Time. 330
V. Problem Solving on the Coordinate Plane 343

TOPIC 4: Financial Literacy: Accounts, Credit, and Careers

I. Checking Accounts 355
II. Debit Cards vs. Credit Cards 368
III. Understanding Credit Reports. 381
IV. Career Exploration. 390
V. Paying for College 400

CC BY NC

Name _____ Date _____

I. Evaluating Numeric Expressions

Topic Practice

A. Write each exponent expression as a product of factors. Then, evaluate each expression.

1. 5^2

2. 7^3

3. 4^5

4. $(-3)^2$

5. 2^9

6. 8^3

7. -6^4

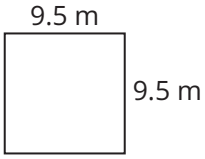
8. $(-9)^3$

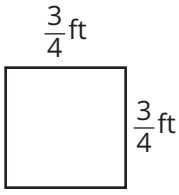
9. 1^6

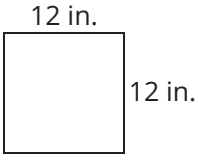
10. 10^3

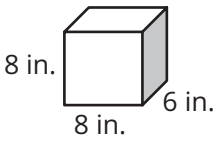
CC BY NC

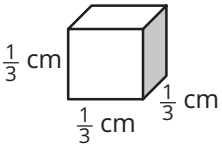
B. Write the area or volume of the figure in two ways: as a repeated product and using exponents. Then, determine the actual area or volume of the figure.

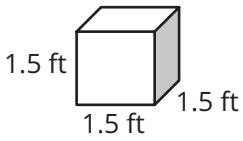
1. 

2. 

3. 

4. 

5. 

6. 

C. Evaluate each numeric expression using the order of operations.

1. $4^2 \cdot 3$

2. $3^3 - 14 \div 2 + 5$

3. $-17 - 2^3$

4. $144 \div 6^2 \cdot 8 + 2^2$

5. $-32 \div 4^2$

6. $2^4 - 3 \cdot 5 + 9$

7. $9 + 5^2 - 2(3)^2$

8. $11^2 - 7(6) - 4^3 \div 2$

9. $(4 - 10) \cdot 2^2 + (-4)(-5)$

10. $((3 \cdot 4^2) + 2) \div 5$

11. $(13 - 8)^2$

12. $(2^3 - 29) \div (12 - 9)$

13. $29 - (2^2 + 35)$

14. $((5 \cdot 7) - (8 \cdot 4))^3 - 10$

15. $-40 \div (11 - 9)^2$

16. $7^2 + ((46 - 7 \cdot 2) \div 2^3)^2$

CC BY NC

D. Write an equivalent numeric expression using prime factorization.

1. $2(100) + 9$

2. $(24 + 18) \div 14$

3. $21^2 \cdot 12$

4. $2(121) + 3(169)$

5. $1400 \div (21 + 28)$

6. $16 + 30 \cdot 45$

Extension

Evaluate each power raised to a power.

1. $(3^2)^2$

2. $(5^2)^4$

3. $(4^3)^2$

Spaced Practice

Graph each rate in the given pair on a coordinate plane.
Explain whether or not the rates are equivalent.

1. $\frac{15 \text{ cups flour}}{8.25 \text{ cups sugar}}, \frac{5 \text{ cups flour}}{2.75 \text{ cups sugar}}$

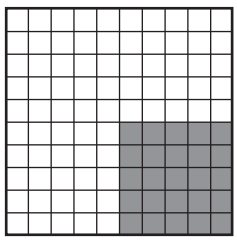
2. $\frac{245 \text{mi}}{3.5 \text{ h}}, \frac{150 \text{mi}}{2 \text{ h}}$

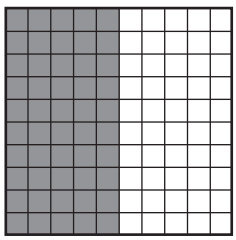
Calculate each conversion.

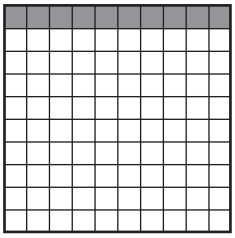
3. 4 grams = _____ milligrams

4. 6400 ounces = _____ pounds

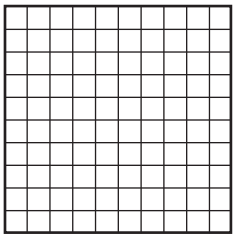
5. What fraction does each grid represent?

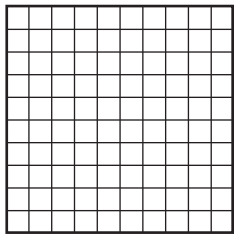
a. 

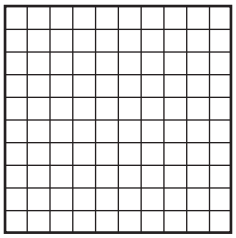
b. 

c. 

6. Shade the grid to represent each benchmark fraction.

a. $\frac{3}{4}$ 

b. $\frac{1}{5}$ 

c. $\frac{3}{10}$ 

II. Introduction to Algebraic Expressions

Topic Practice

A. Identify whether the given represents an expression or an equation.

1. -9

2. $-12 + 14 = 2$

3. $9x + 7 - 3x$

4. $\frac{1}{2}(8x - 10) + 9x$

5. Forty-three less than twice a number, n, is 5 more than a number, n.

6. Two times the quantity of ten times a number, n, and seventeen

B. a. Define a variable and write an expression to represent each problem situation.
b. Evaluate the expression using the given information.

1. a. Chris gets a $20 allowance. He also earns money mowing lawns. Define a variable for the amount of money Chris earns mowing lawns. Use the variable to write an expression for the amount of money Chris has to spend.

   b. When Chris earns $40 mowing lawns, how much money will he have to spend?

2. a. Four students are assigned a project. They must each write an even portion of their summary paper. Define a variable for the number of pages in the summary paper. Use the variable to write an expression for the number of pages each student must write.

   b. When the paper is supposed to be 40 pages, how many pages does each student need to write?

CC BY NC

3. a. Mr. Davis joined the Book-of-the-Month Club. The club gives him a coupon for $5 off his total purchase. Define a variable for the total purchase price. Use the variable to write an expression for the price Mr. Davis will pay for his purchase after the coupon is applied.

   b. When Mr. Davis's total purchase is $70.23, how much will he pay after the coupon is applied?

4. a. Elena is trying to read as many books over the summer as she can. Elena has already read 15 books. She plans to read 2 additional books per week. Define a variable for the number of weeks she reads additional books. Use the variable to write an expression for the total number of books Elena reads over the summer.

   b. When Elena reads additional books for 11 weeks, how many total books will Elena have read this summer?

5. a. Every Saturday, Jorge buys comic books. A third of the comics he buys are collector's items, and he puts them in storage. In storage, Jorge already has 5 collector's item comic books his father gave him. Jorge's uncle gave him 3 times the amount of collector's item comic books as his father to put in storage, too. Define a variable for the number of comic books Jorge buys. Use the variable to write an expression for the total number of comic books Jorge will have in storage.

   b. When Jorge buys 18 comic books, how many will be put into storage?

6. a. Mariana is making friendship bracelets for her friends. She has 9 yards of a special multicolor string to use for the bracelets. She uses $\frac{3}{4}$ yard of string to make each bracelet. Define a variable for the number of friendship bracelets Mariana makes. Use the variable to write an expression for the amount of string Mariana has remaining.

   b. How much string will Mariana have remaining when she makes bracelets for 20 friends?

CC BY NC

C. Write the meaning of each algebraic expression. Then, evaluate the algebraic expression for the given value and write an equation that shows the algebraic expression and its value.

1. $27 - c$ if $c = 13$

2. $-6a + 11$ if $a = 8$

3. $7x - 9$ if $x = -3$

4. $34 - 2y$ if $y = -5$

5. $\frac{1}{2}(4m - 18)$ if $m = -6$

6. $3\left(\frac{d}{5} + 42\right)$ if $d = -70$

Extension

Jaylen raises chickens and goats on a farm.

1. Write an expression for the total number of animal legs on Jaylen's farm.

2. How many animal legs are on the farm if Jaylen has 16 chickens and 6 goats?

3. Suppose Jaylen counted 74 animal legs on the farm. How many of each animal might Jaylen have on the farm?

Spaced Practice

Evaluate each numeric expression.

1. $-56 \div 8 + 3 \cdot 6$

2. $9 \cdot 8 - 29 + 30 \div 15 - 15$

CC BY NC

Determine which is the better buy.

3. $12.99 for 42 ounces or $2.99 for 10 ounces

4. 3 pounds for $5.00 or $1.50 per pound

Determine at least two equivalent rates for each given rate.

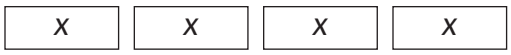
5. $\frac{2\text{eggs}}{5 \text{ cups of milk}}$

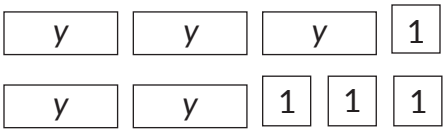
6. $\frac{20 \text{ red}}{12 \text{ blue}}$

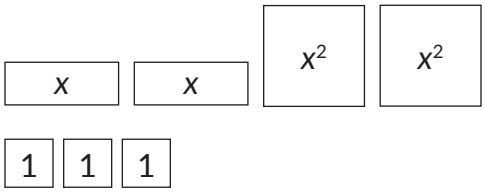
III. Equivalent Expressions

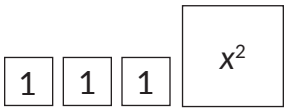
Topic Practice

A. Write an algebraic expression to represent each model. Then, combine like terms to create an equivalent algebraic expression.

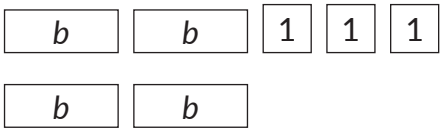
1. 

2. 

3. 

4. 

5. 

6. 

B. Write a multiplication expression to represent each model.

1.

x	x	x	1
x	x	x	1
x	x	x	1
x	x	x	1

2.

x	1	1	1
x	1	1	1

3.

x	x	x	1	1	1	1	1
x	x	x	1	1	1	1	1
x	x	x	1	1	1	1	1

4.

x	x
x	x
x	x
x	x

5.

x	1
x	1

6.

y	y	y	y
y	1	1	1

y	y	y	y
y	1	1	1

y	y	y	y
y	1	1	1

C. Rewrite each expression using the distributive property. Then, combine like terms when possible.

1. $3(5x + 2)$

2. $10(x + 1)$

3. $2(x + 3) - 6(x + 3)$

4. $7(2y + 3) - 9$

5. $-8(x + 4) + 5(x + 4)$

6. $3(5x + 1) - 5(x + 6)$

7. $\frac{1}{4}(8x + 16)$

8. $2(7x - 8) + x$

9. $9x + 4(2x + 20)$

10. $\frac{3}{8}(16x - 48) + 3x$

11. $\frac{26 - 12x}{2}$

12. $\frac{3(5x + 11) + 7}{5}$

CC BY NC

13. $\frac{4x - 9}{2}$

14. $\frac{6(x + 1) + 30}{6}$

15. $\frac{13 + 2(7x - 3)}{7}$

D. Rewrite each expression as a product of two factors so that the coefficient of the variable is 1.

1. $2x + 4$

2. $12x - 5$

3. $15x + 7$

4. $\frac{3}{4}x - 12$

5. $1.2x + 1.44$

6. $\frac{1}{2}x + 16$

Extension

1. Simplify the algebraic expression to include as few terms as possible.

   $3[2x + 4(5x + 1)] + \frac{1}{4}\left[8x + 12\left(\frac{2}{3}x + \frac{1}{6}\right)\right]$

2. Rewrite each algebraic expression as the product of two factors such that the coefficient of the term with the greatest exponent is 1.

   a. $2x^2 + 5x + 1$

   b. $\frac{3}{4}x^3 - 9x^2 + \frac{2}{3}x + 10$

   c. $2.6x^2 + 3.9x - 12.48$

Spaced Practice

1. An elementary school has a school store that sells many items, including folders, pencils, erasers, and novelty items. The parent association is in charge of buying items for the store.

   a. One popular item at the store is animal-themed folders. Each pack of folders contains 6 folders. The store currently has 4 packs in the store and would like to order more. Write an algebraic expression for the total number of folders they will have after they order more folders. Let x represent the number of packs of folders they buy.

   b. The latest fad is animal-shaped rubber bracelets. The bracelets come in a pack of 24. Write an algebraic expression that represents the cost of each bracelet. Let c represent the cost of a pack of 24 bracelets.

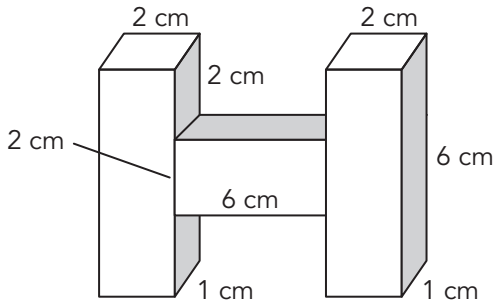
2. Determine which rate is faster.

   a. 185 miles in 3 hours or 490 miles in 8 hours

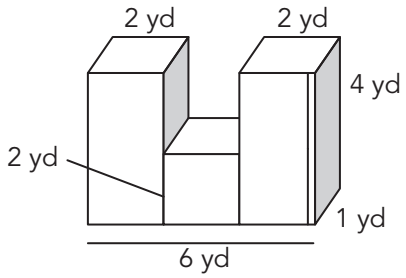
   b. 70 miles per hour or 114,400 yards per hour

3. Calculate the volume of each solid formed by rectangular prisms.

a.



b.



Identify whether the given represents an expression or an equation.

4. Fifteen more than three times a number is seven less than twice a number

5. One half of the quantity of five times a number plus eight

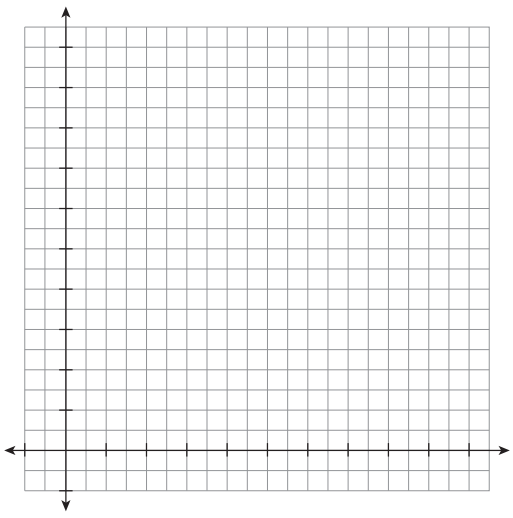
IV. Verifying Equivalent Expressions

Topic Practice

A. Determine whether the expressions are equivalent. Use a table, a graph, and properties in each problem to verify your answer. Use algebra tiles to verify the answer, when possible.

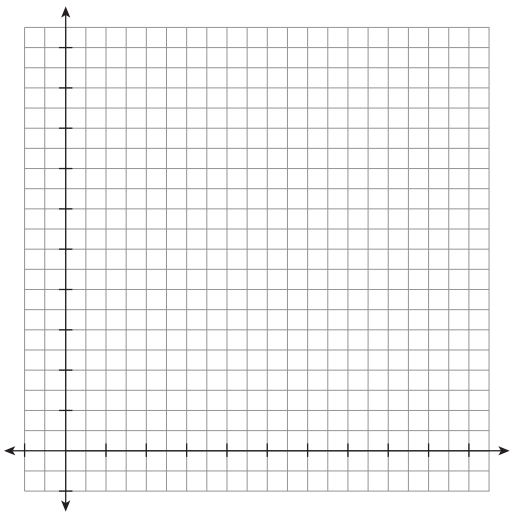
1. $4x + 2$ and $4\left(x + \frac{1}{2}\right)$

x	$4x + 2$	$4\left(x + \frac{1}{2}\right)$



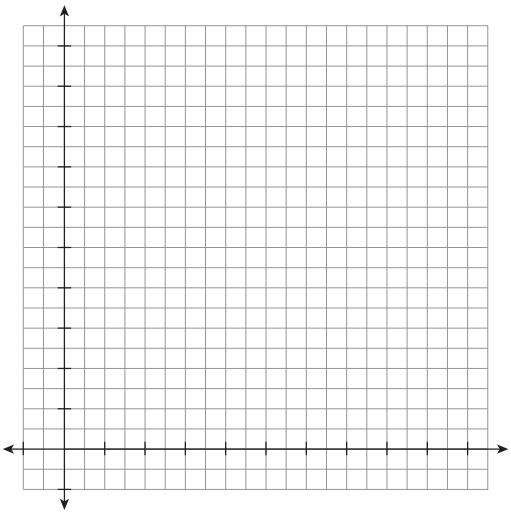
2. $x + 3(2x + 1)$ and $7x + 3$

x	$x + 3(2x + 1)$	$7x + 3$



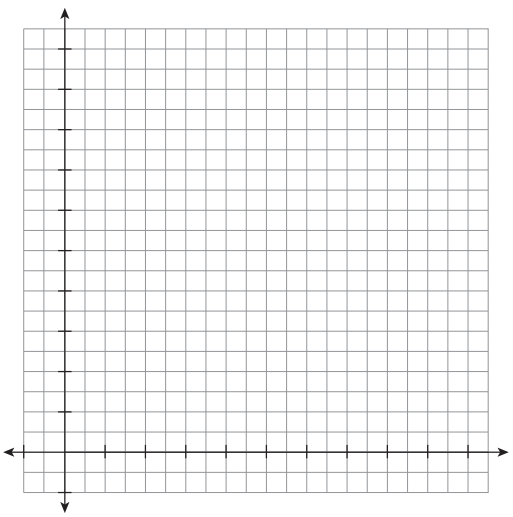
3. $\frac{2}{3}(x + 3)$ and $\frac{2}{3}x + 5$

x	$\frac{2}{3}(x + 3)$	$\frac{2}{3}x + 5$



4. $2(4x + 3) - 4x$ and $4x + 2$

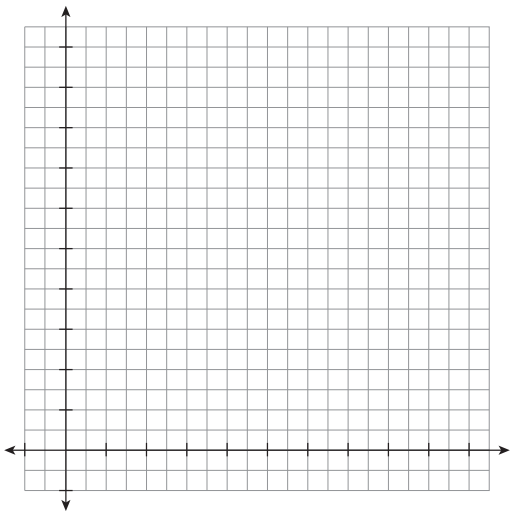
x	$2(4x + 3) - 4x$	$4x + 2$



CC BY NC

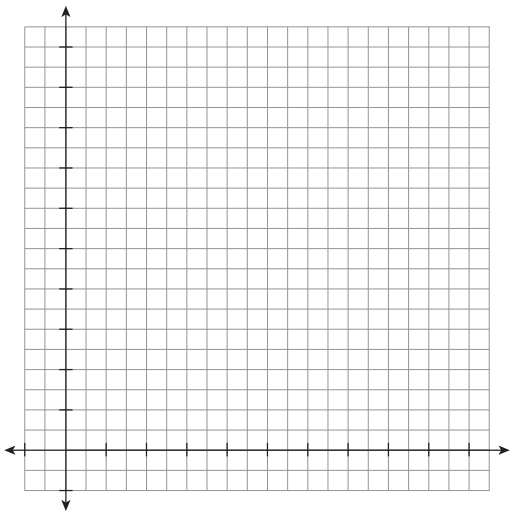
5. $\frac{1}{4}(8x + 4) + x$ and $3x + 4$

x	$\frac{1}{4}(8x + 4) + x$	$3x + 4$



6. x and $2(x + 1) - 3\left(\frac{2}{3} + \frac{1}{3}x\right)$

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



CC BY NC

B. Complete each step of the simplification of the expression, if not provided. Then, identify the property or operation applied, if not provided. A word bank is provided.

Word Bank

Given	Combine like terms.	Distributive property
Commutative property	Associative property	Identity property
Inverse property		

1. $3(x - 5) + 4x + 11$ — Given
   $3x - 15 + 4x + 11$ — _____
   $3x + 4x - 15 + 11$ — _____
   $7x - 4$ — Combine like terms.

2. $-12 + (4 + x) + 22$ — Given
   $-12 + (x + 4) + 22$ — _____
   $-12 + x + (4 + 22)$ — _____
   $-12 + x + 26$ — _____
   $x - 12 + 26$ — _____
   $x + 14$ — _____

3. $6(5 - x) + 8 + 3(2x - 5)$ — _____
   $30 - 6x + 8 + 6x - 15$ — _____
   $30 + 8 - 15 - 6x + 6x$ — _____
   $23 - 6x + 6x$ — _____
   $23 + 0$ — Inverse property
   23 — _____

4. $16 - 3(2x - 4)$

	Given
	Distributive property
	Commutative property
	Combine like terms.

5. $\frac{1}{2}(12x - 4) + 9 - 3(x + 1)$

	Given
	Commutative property

6. Complete as many steps as needed to rewrite the given expression in simplest terms. Identify the property or operation applied in each step.

$12 - 2(3x) + \frac{3}{4}(8x - 12)$ Given

Extension

Simplify each expression using properties of numbers and operations. Show your work.

1. $\frac{3}{2}(6x^2 + 8x - 9)$

2. $5x(-2.7x^2 - 4.1x + 12.9)$

CC BY NC

Spaced Practice

Use the distributive property and combine like terms to rewrite each expression.

1. $9(6m + 3) + 6(1 - 4m)$

2. $\frac{3(4x + 8y)}{6} + 2y - x$

Determine the better buy.

3. 6 car washes for $50 or 4 car washes for $36

4. 10 markers for $2.40 or 32 markers for $7.00

Determine the least common multiple (LCM) of each pair of numbers.

5. 6 and 10

6. 7 and 12

Name _____ Date _____

I. Reasoning with Equal Expressions

Topic Practice

A. Determine which value(s), if any, make the equation true. Then, determine whether the equation has one solution, no solution, or an infinite number of solutions.

1. {4, 9, 13, 21, 25}

   $a + 0 = 13$

2. {18, 34, 36, 100}

   $b = 4b$

3. {1, 3, 5, 7, 9, 11}

   $d - 7 = 1 + 3$

4. {4, 8, 12, 17, 24, 37}

   $c + 1 = c - 1$

5. {0, 4, 9, 13, 15}

   $2 + f = 13 - 2$

6. {2, 3, 6, 7, 11, 15}

   $h + 15 = 15 + h$

CC BY NC

7. {2, 6, 12, 18, 36}

   $3 = \frac{g}{6}$

8. {0, 1, 3, 4, 5, 8}

   $32 = 4j$

9. {2, 7, 9, 13, 16, 21}

   $20 - k = 7$

10. {3, 5, 8, 14, 18, 19}

    $m = 1m$

B. Use the given equations to answer the set of questions.

Suppose you have the equation $x = 12$.

1. Use the addition property of equality to write 3 equations that have the same solution.

2. Use the subtraction property of equality to write 3 equations that have the same solution.

3. Use the multiplication property of equality to write 3 equations that have the same solution.

4. Use the division property of equality to write 3 equations that have the same solution.

Suppose you have the equation $x + 1 = 8$.

5. Use the addition property of equality to write 3 equations that have the same solution.

6. Use the subtraction property of equality to write 3 equations that have the same solution.

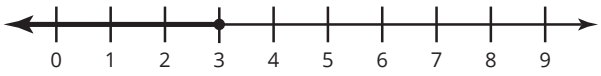
CC BY NC

7. Use the multiplication property of equality to write 3 equations that have the same solution.

8. Use the division property of equality to write 3 equations that have the same solution.

C. Write the inequality represented by the given graph.

1. 

2. 

3. 

4. 

5. 

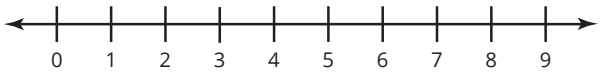
6. 

D. Graph the solution set for each given inequality

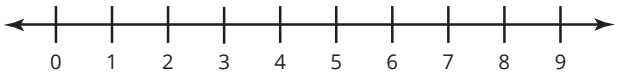
1. $x < 6$



2. $x \geq 7.5$



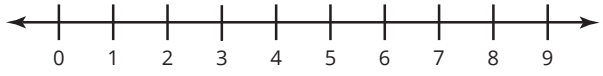
3. $3\frac{1}{2} \geq x$



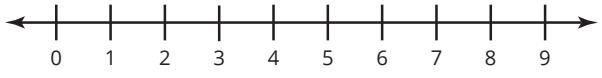
4. $x > 8.25$



5. $1.8 \leq x$



6. $x < 9$



E. Define a variable and write an inequality to represent each statement. Finally, sketch a graph of each inequality.

1. Children under the age of 5 are admitted to the museum for free.



2. To ride a rollercoaster, a rider must be at least 60 inches tall.



3. The height of a fireplace must be 36 inches or less.



4. A bridge can hold a maximum of 80,000 pounds.



5. To get a driver's license, an individual must be at least 16 years old.



6. The fire code states that no more than 50 persons are allowed in a building at the same time.



Extension

Define variables and write equations to represent each situation. Then, determine each solution.

1. Tiara is 4.75 inches taller than Lizzie. Emily is $3\frac{1}{4}$ inches shorter than Chris. When Chris is $62\frac{1}{2}$ inches tall, how tall are Tiara and Lizzie?

2. Alyssa is 4 years younger than $2\frac{1}{2}$ times Natalia's age. Kaya is six years older than half of Alyssa's age. When Natalia is 12, how old are Alyssa and Kaya?

Spaced Practice

1. Determine whether each situation represents an expression or an equation. Define variables and write an algebraic expression or equation to represent each situation.

   a. Three times as many books.

   b. Samantha has 5 fewer bracelets than Trung.

For each situation, examine the given expressions and/or solution strategies.

2. Josh's band made $500 one night. They had to subtract costs of $80 and then divide the remaining money among the band members. When there are 4 members in the band, which numeric expression correctly shows the amount that each member will make? Explain your answer using the rules for the order of operations.

Expression A	**Expression B**
$500 - 80 \div 4$	$(500 - 80) \div 4$

CC BY NC

3. Matthew's band hires a manager. The manager asks a local park whether they can hold a concert on one of the lawn areas. The lawn can have 20 rows of seats with 20 chairs in each row. The band charges $25 for each seat. The cost for advertising, the rental of the chairs, and the management fees totals $4000. When the band fills all of the seats, which solution shows the amount the band will make? Determine the error that was made in the incorrect solution.

Solution A	**Solution B**
$25 \times 20^2 - 4000$	$25 \times 20^2 - 4000$
$25 \times 400 - 4000$	$500^2 - 4000$
$10{,}000 - 4000$	$250{,}000 - 4000$
6000	$246{,}000$

4. Determine each unknown value.

a. $\frac{5}{6} = \frac{x}{30}$

b. $\frac{90}{x} = \frac{9}{2}$

Determine whether the expressions are equivalent.

5. $3x + 19$ and $3(x + 6) + x$

6. $10(\frac{x}{5} - 2)$ and $5x - 20 - 3x$

II. Solving One-Step Addition Equations

Topic Practice

A. Create a bar model to solve each addition equation.

1. $x + 12 = 18$



2. $40 = 10 + x$



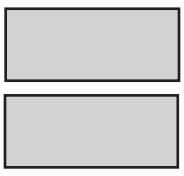
3. $7.5 + x = 13$



4. $48 = x + 23$



5. $\frac{3}{4} = \frac{1}{2} + x$



6. $x + 9.3 = 11.4$



CC BY NC

B. State the inverse operation needed to isolate the variable. Then, solve the equation and check your solution.

1. $d + 6 = 13$

2. $35 = t - 12$

3. $x - 14 = 7$

4. $x + 20 = 41$

5. $29 = 17 + m$

6. $c - 9 = 23$

C. Solve each equation.

1. $-4 = 2 + x$

2. $y + 2.3 = 5.6$

3. $-4 = p - 8.2$

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

5. $-5 = a - 5$

6. $\frac{4}{5} = d + \frac{3}{4}$

7. $m - 9.5 = -7.3$

8. $-1.35 + t = -2.57$

Extension

Solve each equation. Check each solution.

1. $34 = x - 17$

2. $a - 25 = -92$

3. $r - 3.4 = 13.1$

4. $24\frac{1}{2} = t = 5\frac{1}{4}$

Spaced Practice

Use the properties of equality to write two equations that have the given solution. Identify which property of equality was used.

1. $j = 3$

2. $8 = m$

Define variables and write an algebraic expression to represent each situation.

3. Mario has one fewer sibling than Andrew. Eduardo has three more siblings than Mario.

4. Alejandro has half as many comic books as Chris. Jorge has 4 more comic books than Alejandro.

Simplify each expression.

5. $\frac{2}{3}x + \frac{4}{5}x$

6. $\frac{1}{3}\left(\frac{2}{5}x\right)$

Consider the list {–2, –1, 0, 1, 2} as possible solutions for each inequality shown. Choose the solution(s) that make the inequality true.

4. $x + 3 \geq 2$

5. $\frac{x-2}{2} < \frac{1}{4}$

CC BY NC

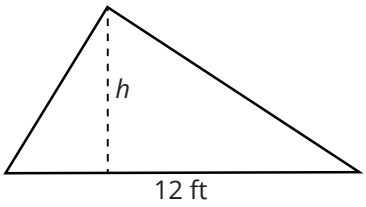
III. Solving One-Step Multiplication Equations

Topic Practice

A. Use models to determine the solution to each scenario.

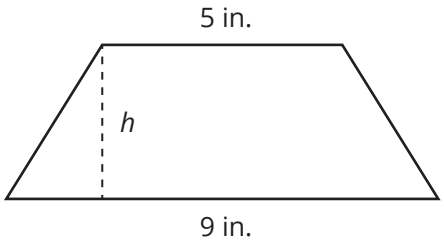
The area of a triangle is 48 square feet. The base of the triangle is 12 feet.

1. Write an equation to represent the area of the triangle in terms of its height.



2. Use a bar model to solve for the length of the height.

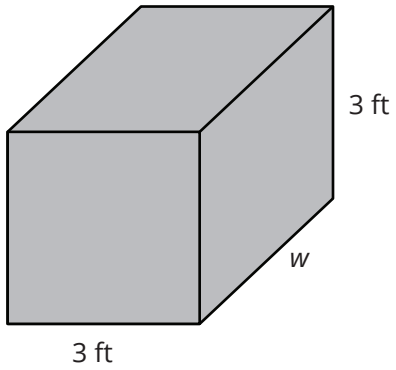
A trapezoid has bases that are 5 inches and 9 inches in length. The area of the trapezoid is 70 square inches.



3. Write an equation to represent the area of the trapezoid in terms of its height.

4. Use a bar model to solve for the length of the height.

The volume of a rectangular prism is 45 cubic feet. The length of the rectangular prism is 3 feet and the height is 3 feet.



5. Write an equation to represent the volume of the rectangular prism in terms of its width.

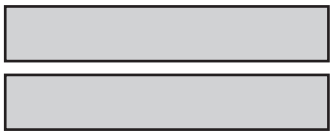
6. Use a bar model to solve for the length of the height.

B. Create a bar model to solve each multiplication equation.

1. $3x = 15$



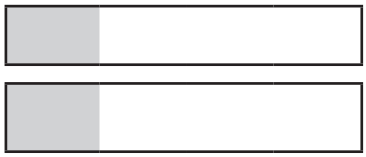
2. $10 = 4x$



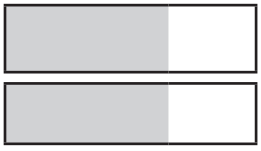
3. $\frac{x}{2} = 4$



4. $5 = \frac{x}{4}$



5. $\frac{3}{4}x = 3$



6. $6 = \frac{2}{3}x$



C. State the inverse operation needed to isolate the variable. Then, solve the equation and check your solution.

1. $\frac{x}{4} = 12$

2. $54 = 9p$

3. $13 = \frac{t}{7}$

4. $\frac{m}{5} = 11$

5. $8.5x = 51$

6. $6y = 42$

D. Solve each equation.

1. $-5p = 20$

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

3. $-12.6 = 2.1a$

4. $\frac{3}{5}t = 15$

5. $-7b = 1$

6. $\frac{s}{-3} = 10$

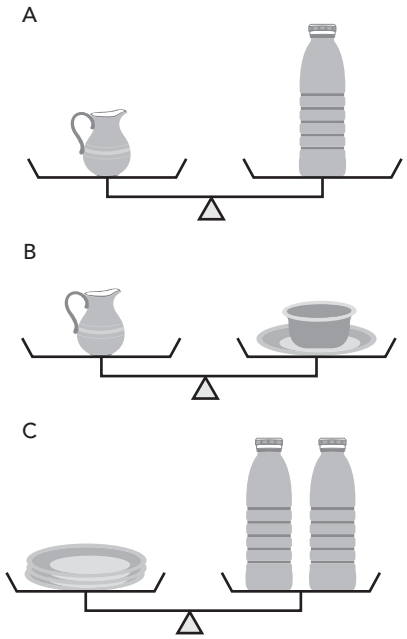
7. $-15.6 = 3.2x$

8. $-\frac{1}{4} = \frac{2}{3}m$

CC BY NC

Extension

Like bar models, balances are also used to model equation solving. Consider the balances shown.



On balance A, a water pitcher balances with a juice bottle. On balance B, the water pitcher balances a cereal bowl and plate. On balance C, three plates balance two juice bottles. How many cereal bowls will balance a water pitcher?

Spaced Practice

Solve each equation. Check your solution.

1. $2.6 + j = 7.1$

2. $\frac{21}{5} = b + \frac{3}{4}$

Rewrite each expression as the product of a constant and a sum of terms.

3. $2x + 5$

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

Determine the conversion.

5. 6 miles = _____ inches

6. 15,000 centimeters = _____ kilometers

CC BY NC

IV. Solving Equations to Solve Problems

Topic Practice

A. Define the variables in each given problem. Then, write an equation that models the problem situation.

1. A builder requires a certain number of bricks each time he builds a brick house. To make sure he has enough bricks, he always orders 50 additional bricks to account for any bricks that are broken during the construction.

   Define variables for the number of bricks required for a house and the number of bricks ordered. Write an equation that models the relationship between these variables.

2. On Paola's dairy farm, her cows produce an average of 3.8 gallons of milk per minute during milking time.

   Define variables for the number of gallons of milk produced and the number of minutes spent milking. Write an equation that models the relationship between these variables.

3. Jaylen and Jamal have a lemonade stand. They make a profit of $2.50 for each gallon of lemonade sold.

   Define variables for the total profit Jaylen and Jamal make from their lemonade stand and the number of gallons sold. Write an equation that models the relationship between these variables.

4. In the Kentucky Derby, the total weight of each jockey and their gear must be about 126 pounds.

   Define variables for the weight of a jockey and the weight of the jockey's gear. Write an equation that models the relationship between these variables.

5. A department store adds a $4.99 processing fee to the cost of any merchandise purchased through their website.

   Define variables for the total cost of an order and the cost of the merchandise ordered. Write an equation that models the relationship between these variables.

CC BY NC

6. An aluminum baseball bat factory produces 900 aluminum bats for every ton of aluminum they use.

   Define variables for the number of aluminum bats produced and the number of tons of aluminum used. Write an equation that models the relationship between these variables.

B. For each problem situation, define variables and write an equation. Use your equation to answer the given question.

1. A store offers customers a $9.99 discount off of every pair of shoes purchased. A customer selects shoes with an original price of $45.99. How much does the customer pay for the shoes?

2. The perimeter of a square is 54 inches. What is the side length of the square in inches?

3. A business subtracts $7.50 from each employee's gross weekly pay to cover the cost of their uniforms. An employee's weekly pay after the deduction for the cost of his uniform was $924.65. What was the employee's gross weekly pay before the deduction?

4. Five employees work on the receiving dock at a factory. They divide the number of crates they unload from each truck equally. A truck loaded with 45 crates arrives at the factory. How many crates does each employee unload from the truck?

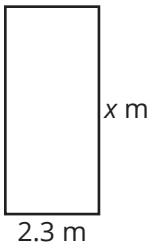
CC BY NC

5. On a windy January day, a weatherman in Texas subtracts 10 degrees from the actual air temperature (in degrees Fahrenheit) to determine the wind chill temperature at any given time. At 9:00 A.M., he determined the wind chill temperature to be −5° Fahrenheit. What was the actual air temperature at 9:00 a.m.?

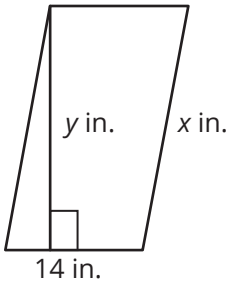
6. A farmer feeds grain to his 75 cows each day. One day the average amount of grain consumed by each cow was 55 pounds. What was the number of pounds of grain the farmer fed to all his cows that day?

C. Write an equation to represent the area, *A*, or volume, *V*, of each figure.

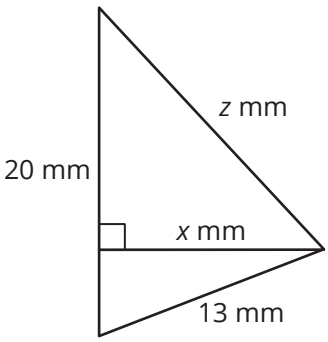
1.



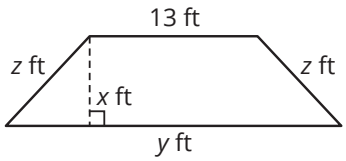
2.



3.



4.



5. The length of the base of a rectangular prism is 14 centimeters, the width is 8 centimeters, and the height is *x* centimeters. Write an equation to represent the volume, *V*, of the prism.

6. The length of the base of a rectangular prism is *b* units, the width is $\frac{1}{2}$ the length, and the height is 4 times the length. Write an equation to represent the volume, *V*, of the prism.

D. Write a real-world problem that could be solved using the given equation.

1. $200 = x + 58$

2. $60 = 12g$

3. $w - 20 = 125$

4. $\frac{x}{22} = 4$

5. $256 = 53 + z$

6. $3x = 18$

Extension

You read a report that says that only $\frac{7}{100}$ of all people who own car dealerships in the country are women.

1. There are about 20,000 people who own car dealerships in the country. How many of them are women?

2. In a group of 2000 people who own car dealerships attending a conference, about how many would you expect to be women?

3. How did you determine the number of female car dealers, given the total number of car dealers? Use complete sentences to explain your answer.

CC BY NC

4. Write an expression to represent the number of female car dealers, given the total number of car dealers.

5. Write an equation that you can use to determine the total number of car dealers in a certain city, given that the number of female car dealers in the city is 14.

6. Use the equation to determine the total number of car dealers in the city.

Spaced Practice

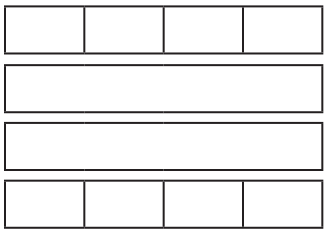
1. Rewrite each algebraic expression by applying the distributive property.

   a. $3.5(2x + 1)$

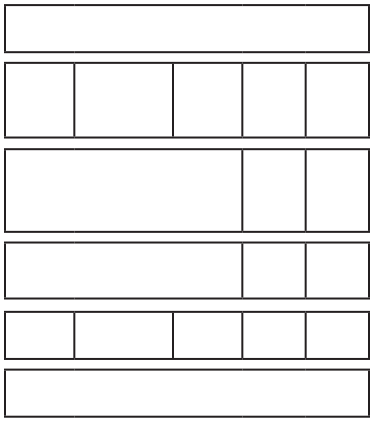
   b. $\frac{1}{2}(3 - 4a)$

2. Create a bar model to solve each equation.

   a. $4x = 30$



   b. $\frac{3}{5}x = 21$



3. Write a different division problem that has the same quotient as the one given. Explain your answer.

   a. $36.5 \div 0.005$

   b. $63.196 \div 14.8$

CC BY NC

V. Solving Inequalities with Inverse Operations

Topic Practice

A. Consider the list {−2, −1, 0, 1, 2, 3, 4, 5, 6, 7} as possible solutions for each inequality shown. Choose the solution(s) that make(s) the inequality true. Then, list three additional solutions to the inequality.

1. $x - 4 > -2$

2. $5x < 30$

3. $2x \geq -2$

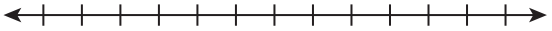
4. $8 \leq -4x$

5. $-3x \leq -15$

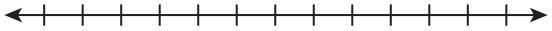
6. $2 < \frac{x}{3}$

B. Solve each inequality. Then, graph the solution set on the number line. Finally, write a real-world problem situation that could be modeled by the inequality.

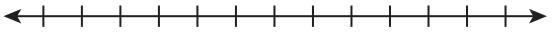
1. $x + 30 \geq 50$



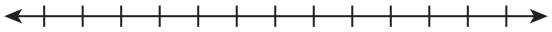
2. $x - 6 \leq 18$



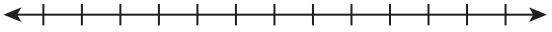
3. $x - 5 < 20$



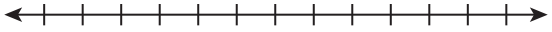
4. $x + 2 > 28$



5. $2x < 14$



6. $5x \geq 60$

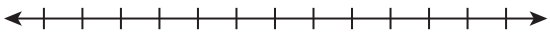


C. Write an inequality to represent each problem situation. Then, determine and represent the solution(s) on the number line.

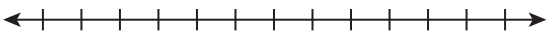
1. Mario needs to buy a book for school that costs $13. He also wants to get a book for his sister. He only has $27 to spend. Let b represent the amount he can spend on the book for his sister.



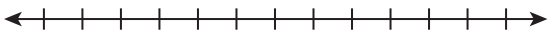
2. Trung rents a cart for her bike to carry wood to school for her science project. The cart can carry a maximum of 30 pounds. Each wood board weighs 3 pounds. Let w represent the number of wood boards she can carry.



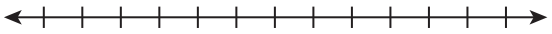
3. There must be less than 36 people on one bus. There are already 17 people on the bus. Let p represent the additional number of people that can ride the bus.



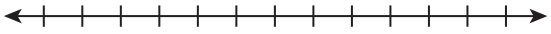
4. A family has a coupon for $5 off their total bill. The family has $40 to spend on dinner. Let m represent the cost of the meal they can order.



5. Andrew charges $6 to wash a car. Let c represent the number of cars Andrew washes. Andrew wants to make at least $300.

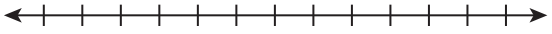


6. Elena, along with her 3 coworkers, evenly split the tips collected at the end of their shift. Their goal is to each take home at least $75 at the end of their shift. Let c represent the total tips collected at the end of the shift.

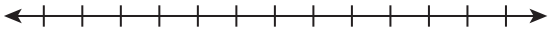


D. Solve each inequality and graph the solution set.

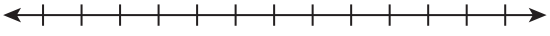
1. $6x < -42$



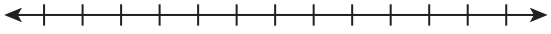
2. $-5 > \frac{x}{-2}$



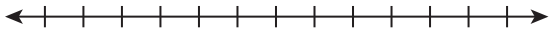
3. $-\frac{3}{4}x \leq 6$



4. $36 \geq 7.2x$



5. $33 > -5.5x$



6. $\frac{-1}{2}x < -6$



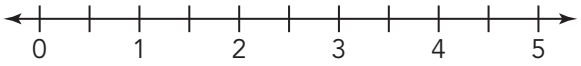
Extension

Solve each inequality and graph the solution set on a number line.

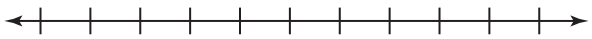
1. $7(4x + 9) - 13 \geq -87$



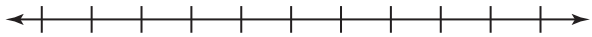
2. $0.25(3 - x) < 0.375$



3. $78 < -9x - 3(-56 + 12x)$



4. $0.20x - 0.08(x - 10) \leq 24.80$



Spaced Practice

Solve each equation.

1. $6x = 11$

2. $-3.2x = -4.48$

Rewrite each linear expression by factoring out the coefficient of the variable.

3. $-2x + 7$

4. $3x - 12$

Use properties to rewrite each expression with the fewest possible terms.

5. $\left(\frac{6}{7}x + 4\frac{1}{3}\right) + \left(-1\frac{1}{2}x - 9\right)$

6. $(10.7x - 19.2) - (81.6x - 33.6)$

Write a real-world problem situation that could be solved using the given equation.

7. $150 = x - 37$

8. $\frac{x}{12} = 5$

CC BY NC

A rectangular TV screen has an area of *A* square inches. The length of the TV screen is 48 inches.

9. Write an equation that represents w, the width of the TV screen in inches.

10. Determine the width of the TV when the area is 1,200 square inches.

Name _____ Date _____

I. Independent and Dependent Variables

Topic Practice

A. For each problem situation, define variables and write an equation. Then, identify the independent quantity and the dependent quantity.

1. Trung earns $3 for every box of chocolate sold as a fundraiser.

2. Ms. Patel calculates test scores by giving students 5 points for every correct answer.

3. A home goods store is offering a $200 discount on all appliance purchases.

CC BY NC

4. A rental company charges customers $35 for each hour they rent a boat.

5. A lawn care service charges $50 for each acre they mow.

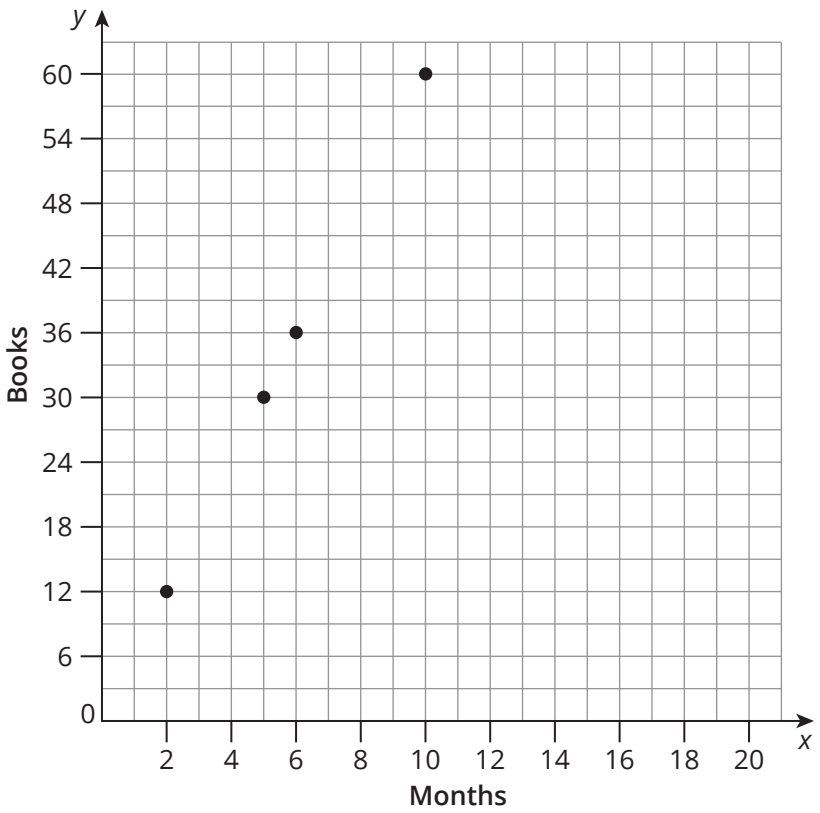
6. Mr. Davis adds 10 bonus points to each student's science test score to determine their final test score.

7. To determine the total weekly wages of his employees, Mr. Hernandez multiplies the total number of hours his employees work by $12.

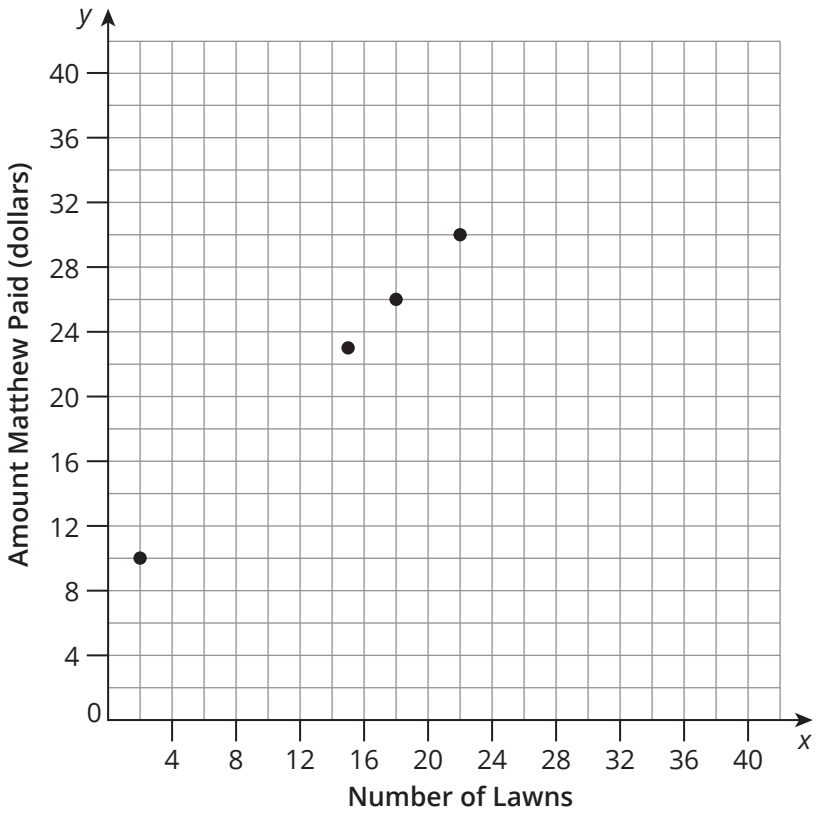
8. Jorge types 80 words per minute.

B. Use the given information to answer each set of questions.

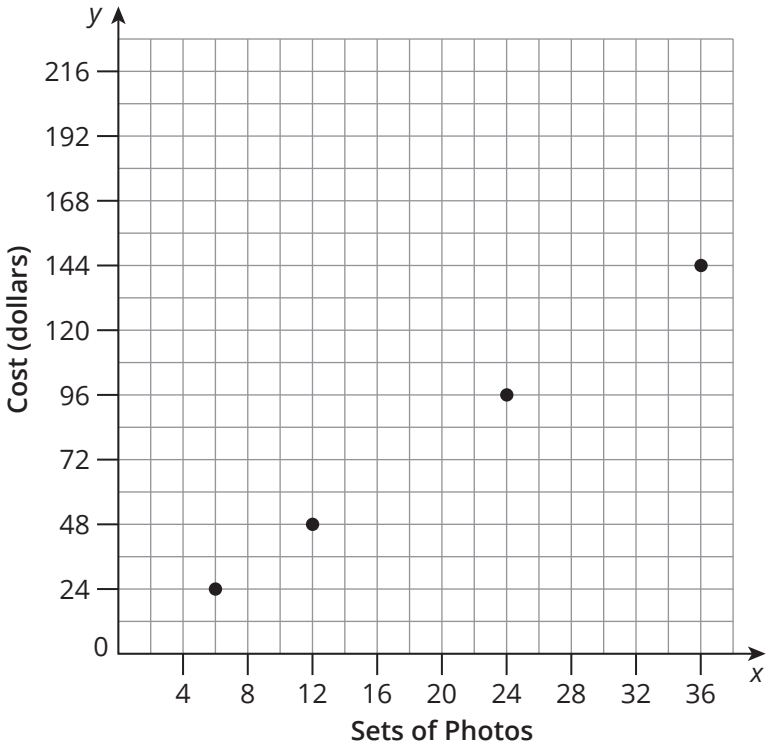
1. Each month, an elementary school library receives an average donation of 6 books. Determine which quantity represents the independent variable and which quantity represents the dependent variable. Then, list the independent values and the dependent values of the graphed points.



2. Matthew is paid $8 more than the number of lawns he mows each week. Determine which quantity represents the independent variable and which quantity represents the dependent variable. Then, list the independent values and the dependent values of the graphed points.



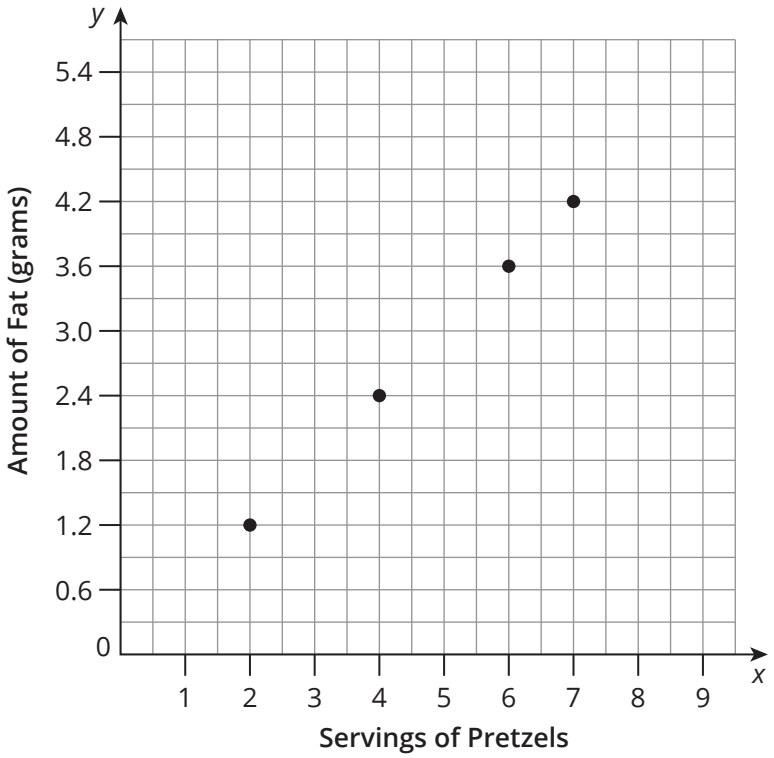
3. The print shop charges $4.00 for each set of printed photos. Determine which quantity represents the independent variable and which quantity represents the dependent variable. Then, list the independent values and the dependent values of the graphed points.



4. Jamal creates customized engraved pens. He charges $2.75 per pen plus a dollar for each engraved letter in the recipient's name. Complete the table to name the independent quantity, the dependent quantity, and each unit of measure. Then, list the independent values and the dependent values in the table.

	Independent Quantity	Dependent Quantity
Quantity Name		
Unit of Measure		
	3	5.75
	5	7.75
	6	8.75
	8	10.75

5. Lizzie is eating pretzels as a snack. Each serving of pretzels contains 0.6 gram of fat. Determine which quantity represents the independent variable and which quantity represents the dependent variable. Then, list the independent values and the dependent values of the graphed points.



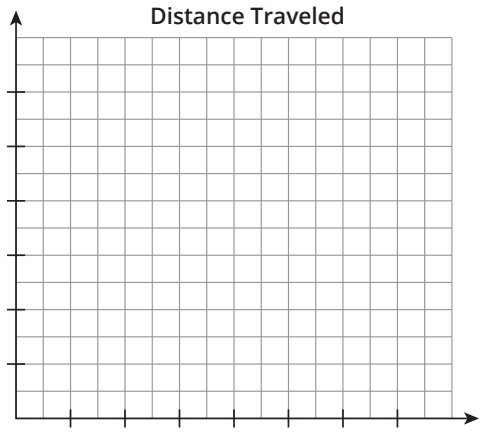
6. At the beginning of the summer, there are 25 rabbits living in a field. Each week for the rest of the summer, another rabbit moves in. Complete the table to name the independent quantity, the dependent quantity, and each unit of measure. Then, list the independent values and the dependent values in the table.

	Independent Quantity	Dependent Quantity
Quantity Name		
Unit of Measure		
	1	26
	6	31
	8	33
	11	36

C. Use the table to determine which quantity is the independent variable and which quantity is the dependent variable. Label the axes and graph the set of points. Write an equation to represent the relationship between variables.

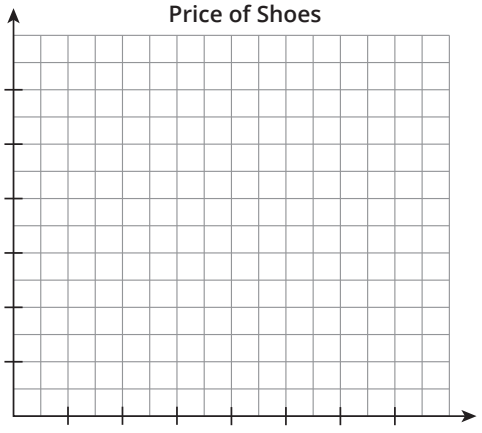
1.

Time (hours)	Distance Traveled (miles)
2	14
3	21
5	35
7	49
9	63



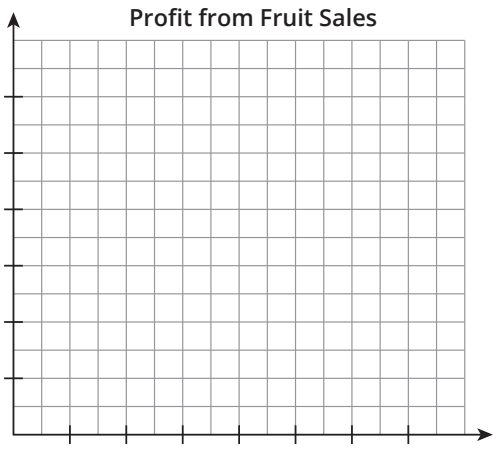
2.

Original Price ($)	Sale Price ($)
20	10
25	15
35	25
50	40
65	55



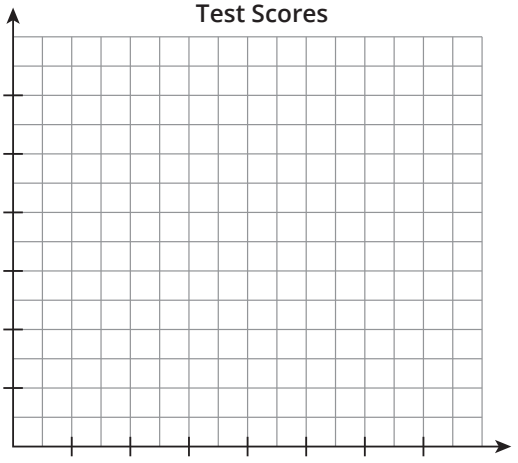
3.

Fruit Boxes Sold	Profit ($)
15	30
20	40
25	50
30	60
40	80



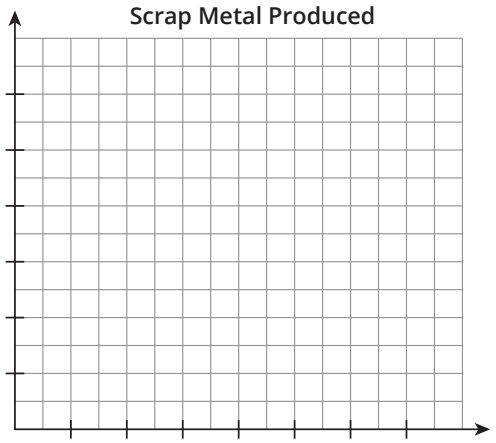
4.

Original Test Score	Test Score After Bonus
60	65
75	80
85	90
90	95
95	100



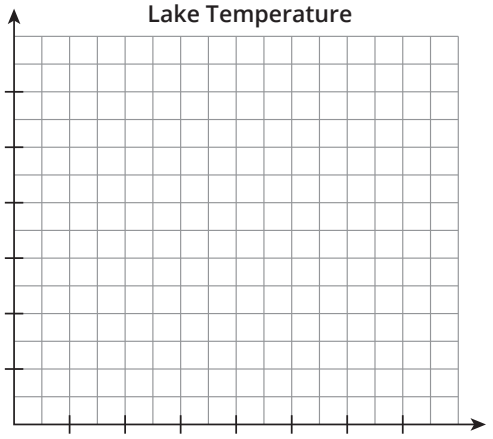
5.

Time (hours)	Scrap Metal Produced (tons)
2	9
3	13.50
5	22.50
8	36
10	45



6.

Water Depth (meters)	Lake Water Temperature (°F)
5	70
10	65
15	60
25	50
30	45



Extension

Create two different scenarios that use time as a varying quantity. In one scenario, use time as the independent quantity. In the other, use time as the dependent quantity. Write a question that someone could answer in each case. Create a graph for each situation.

Spaced Practice

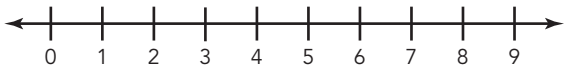
1. Solve each equation and state the inverse operation you used.

   a. $t + 4\frac{3}{4} = 8$

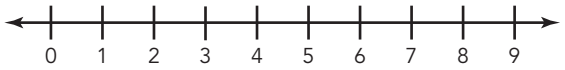
   b. $22 = \frac{11}{7}y$

2. Graph the solution set for each inequality.

   a. $x < 6$

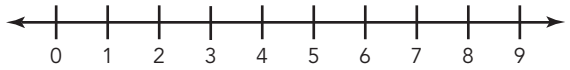
   b. $x \geq 7.5$

   c. $3\frac{1}{2} \geq x$

   d. $1.8 \leq x$

3. Write the two possible unit rates for each ratio.

   a. 8 cups of sugar for every 2 tablespoons of vanilla

   b. $3.56 for 24 ounces

II. Using Graphs to Solve Problems

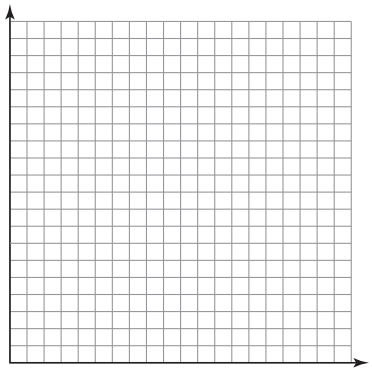
Topic Practice

A. For each problem situation:
a. Use the given information to write an equation.
b. Use the table and your equation to create a graph. Be sure to label your axes.
c. Solve your equation to answer the question.

1. Alyssa needs blue and brown ribbon to make a bow for a dress. According to her pattern, she needs 8.6 inches of brown ribbon. Let t represent the total amount of ribbon used, in inches. Let b represent the amount of blue ribbon used, in inches.

Amount of Blue Ribbon (inches)	Total Amount of Ribbon (inches)
4	12.6
10.1	18.7
12.4	21
14	22.6

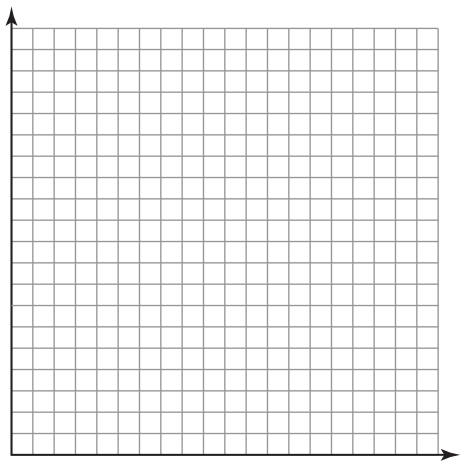
When Alyssa completes the dress, she finds that she has actually used 10.9 inches of blue ribbon. How much ribbon did Ada use altogether?



2. Natalia needs to read a novel as part of her homework.
Let t represent the time in minutes Natalia has been reading.
Let p represent the number of pages Natalia has read.

Number of Pages	Time (minutes)
5	17.5
12	42
20	70
30	105

Last night, Natalia spent 35 minutes reading *Tom Sawyer*. How many pages did she read?

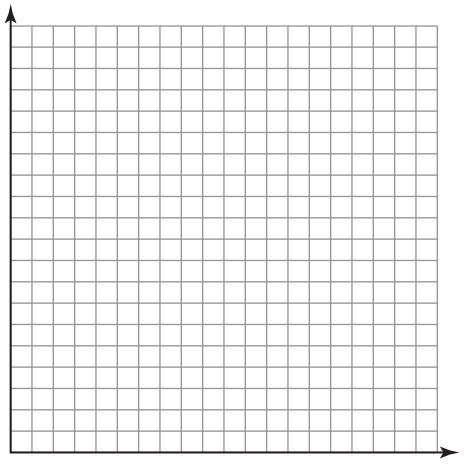


CC BY NC

3. Mario is knitting a scarf for his best friend. So far, the scarf is 9.9 inches long. Let l represent the length of the scarf Mario is knitting, in inches. Let h represent the time Mario has spent knitting, in hours.

Additional Time Knitting (hours)	Length of Scarf (inches)
15	24.9
17.8	27.7
20.3	30.2
24.6	34.5

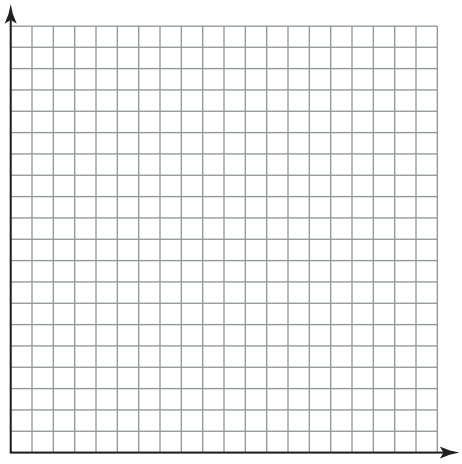
How many more hours will Mario need to spend knitting if he wants the scarf to be 36 inches long?



4. You are the production manager of a company. You are testing a new machine to determine how many items the machine can produce per hour. Let *i* represent the number of items produced. Let *h* represent the time the machine has been running, in hours.

Time the Machine Runs (hours)	Items Produced
1.5	36
2.5	60
5	120
7.25	174

How many hours did the machine run to produce 204 items?

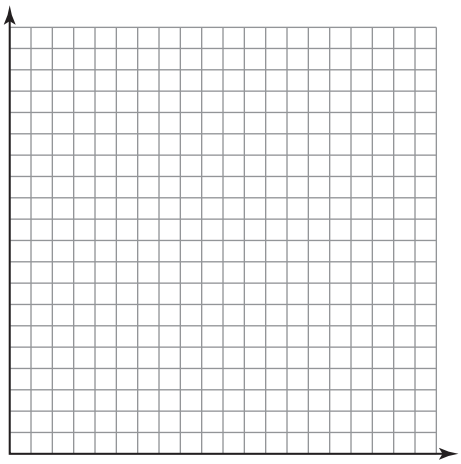


CC BY NC

5. Paola is grocery shopping. She has a coupon for her groceries. Let c represent the original price of the groceries. Let p represent the sale price of the groceries.

Original Price (Dollars)	Sale Price (Dollars)
50	45
100	95
120	115
150	145

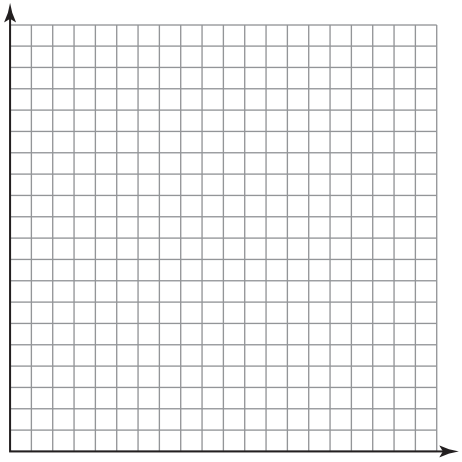
What was the original price of Paola's groceries when the sale price is $140?



6. Trung is grocery shopping and is purchasing onions. Let c represent the cost of the onions. Let w represent the weight of the onions, in pounds.

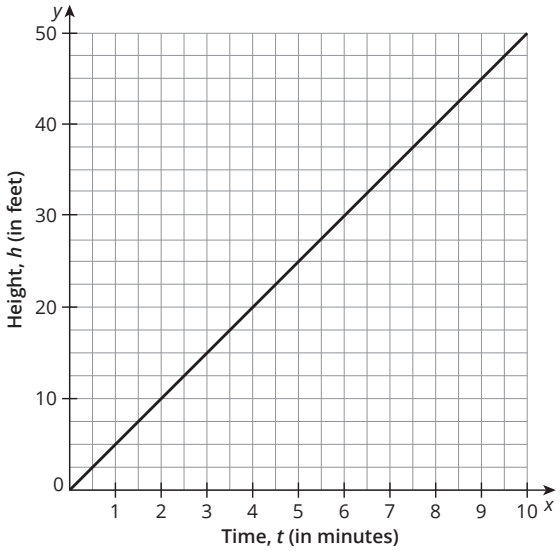
Onions (Pounds)	Cost (Dollars)
2	0.80
3	1.20
4	1.60
6	2.40

How many pounds of onions can Trung purchase for $1.40?



B. Write an equation to represent the given problem situation and given graph. Then, use the graph and your equation to answer the questions.

1. A mountain climber is ascending a mountain at a rate of 5 feet per minute.



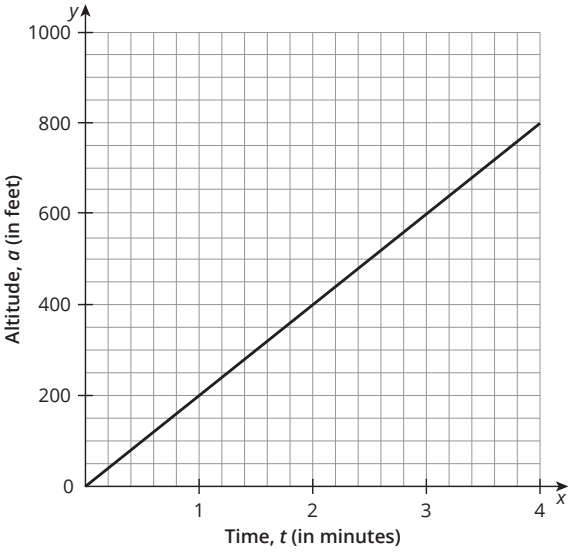
What is the height of the mountain climber after:

2 minutes?

6 minutes?

9 minutes?

2. A helium balloon is rising at a constant rate of 200 feet per minute.



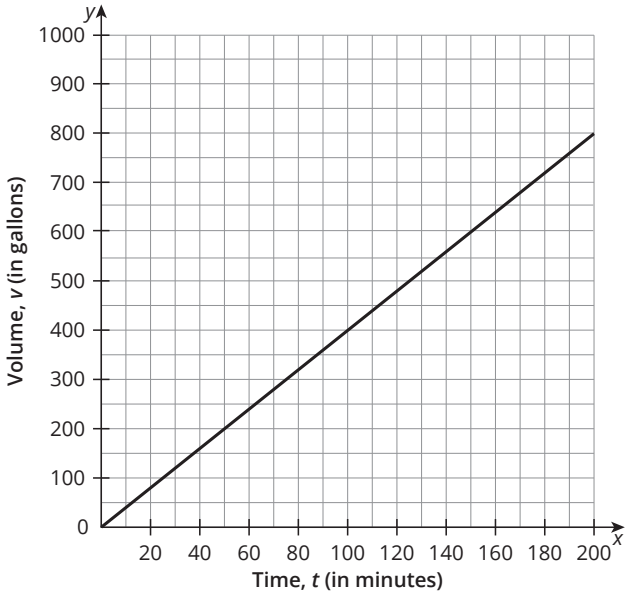
What is the altitude of the balloon after:

1 minute?

2 minutes?

4 minutes?

3. A backyard pool is being filled with water at a constant rate of 4 gallons per minute.



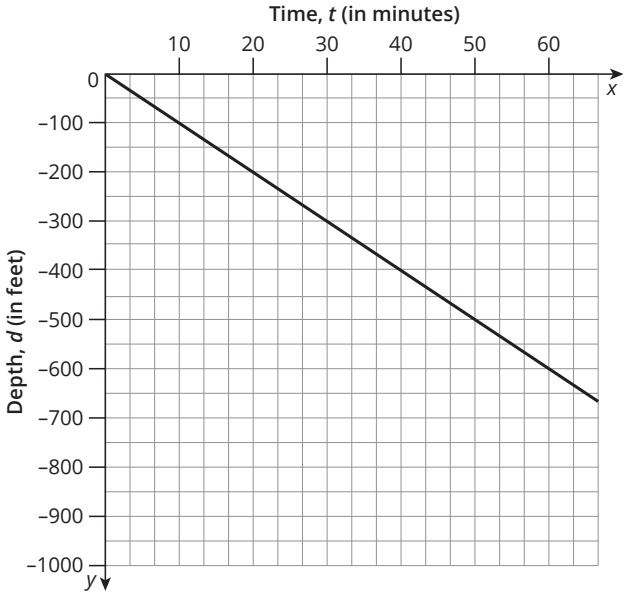
What is the volume of the pool after:

25 minutes?

50 minutes?

150 minutes?

4. A submarine is diving at a constant rate of 10 feet per minute.



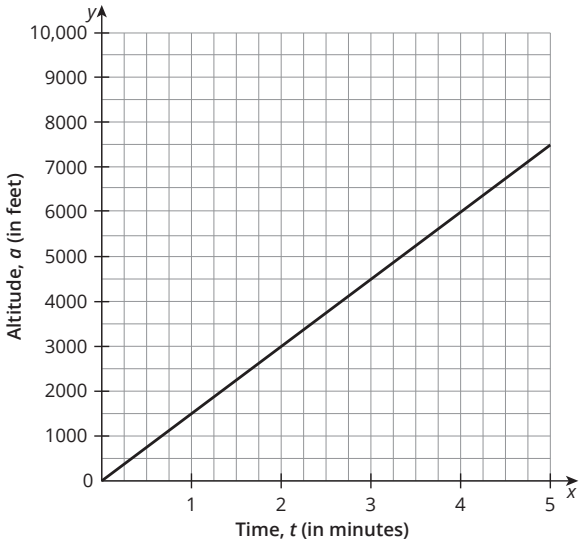
What is the depth of the submarine after:

10 minutes?

30 minutes?

1 hour?

5. An airplane is taking off and climbing at a constant rate of 1500 feet per minute.



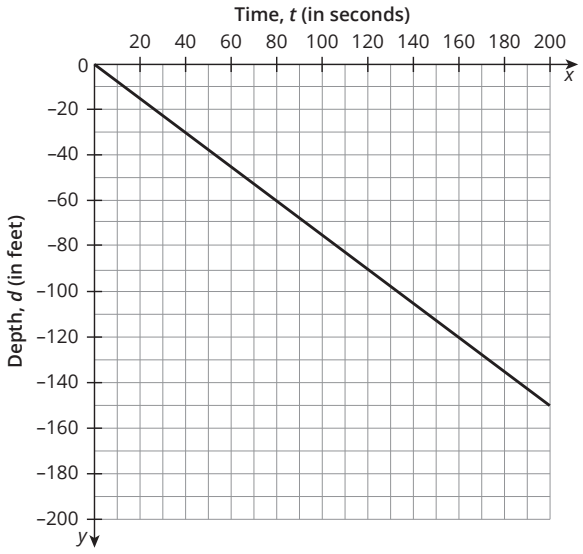
What is the altitude of the airplane after:

1 minute?

3 minutes?

5 minutes?

6. A free diver is diving at a constant rate of 0.75 feet per second.



What is the depth of the free diver after:

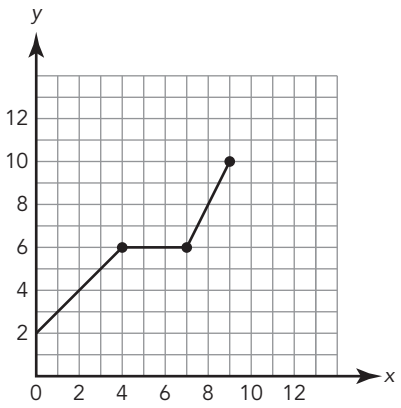
1 minute?

2 minutes?

3 minutes?

Extension

Write an equation to represent each of the three segments of the graph shown. List any restrictions for the possible *x*-values.



Spaced Practice

Solve for each unknown value.

1. The area of a triangle is 12.5 square feet, and the height is 6 feet. Determine the base of the triangle.

2. The area of a parallelogram is 74.8 square feet, and the base is 22 feet. Determine the height of the parallelogram.

CC BY NC

Determine the independent and dependent quantities in each scenario.

3. Elena is driving to her grandmother's house. She travels an average of 60 miles per hour.

4. On her way to work each morning, Samantha purchases a cup of coffee for each of her colleagues and pays $2.25 per cup at the coffee shop.

Use long division to determine each quotient.

5. 1968 ÷ 12

6. 2363 ÷ 139

III. Multiple Representations of Equations

A. Complete each table. Define variables and write an equation to solve each problem.

1. Ms. Ramirez had each student bring a set of watercolors for art class. Each set had 2 brushes in it. Complete the table.

Number of Students	Number of Brushes
15	
	14
	20

How many students turned in watercolors when Ms. Ramirez had 6 brushes?

2. The old incandescent bulbs in a school hallway burn out at a rate of one per week since the school year began. Each time an old light burns out, it gets replaced with a new hyphenate "energy-efficient" LED light. At the start of the school year, there were only 7 LED bulbs in the hallway. Complete the table.

Time (weeks)	LED Bulbs
2	
12	
	30

At the end of 36 weeks of school, how many LED bulbs were in the hallway?

3. You are a junior varsity player for a basketball team. Your coach allows you to play nineteen and a half minutes per game as part of your training for when you become a varsity player.

Games Played	Time Played (minutes)
10	
	78
	136.5

How many games have you played when you have played for 234 minutes?

4. Andrew, who has run 1.2 miles each day for months, decides to start training for a marathon. He runs an additional mile each day he trains, slowly building up to the marathon length of 26.2 miles.

Days Spent Training	Distance Andrew Runs (miles)
	6.2
7	
	16.2

When does Andrew first run the length of a marathon?

5. Jamal is crocheting granny squares for an afghan. His crochet teacher gets him started by making five squares. Jamal will make the rest. It takes him one hour to crochet each square.

Time Jamal Spends Crocheting (hours)	Number of Granny Squares
	13
24	
	47

If Jamal needs 160 granny squares for the afghan, how many hours will he spend crocheting to complete them?

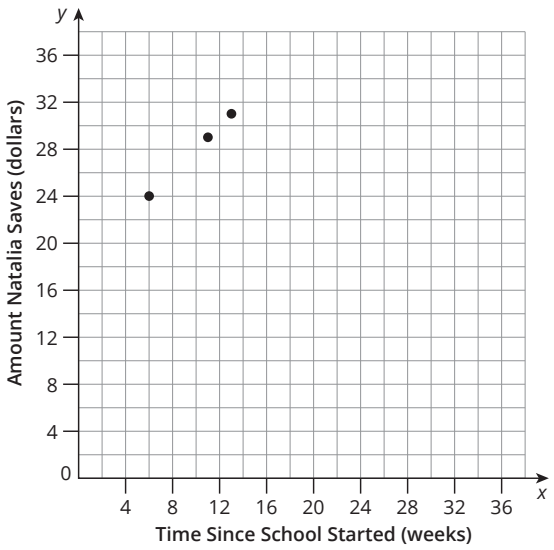
6. A toilet sends 7 gallons of water down the drain for every flush.

Number of Flushes	Water Drained (gallons)
	42
	63
12	

The toilet sent 147 gallons of water down the drain. How many flushes was that?

B. Use the graph to complete the table for each scenario. Then, define variables and write an equation to represent the scenario. Finally, answer the given question.

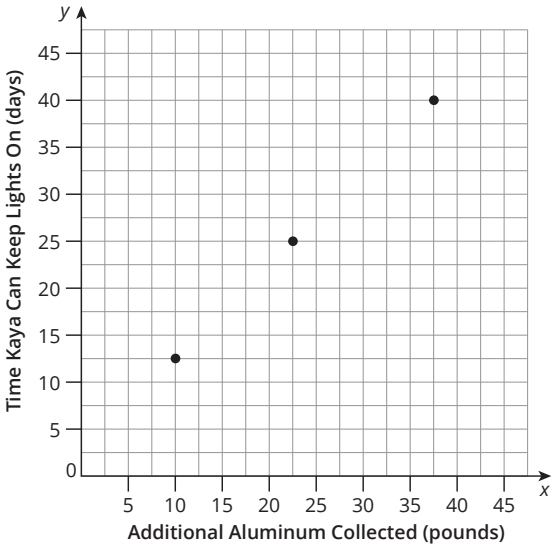
1. Natalia is saving to buy a sweater.



Time Since School Started (weeks)	Amount Natalia Saves (dollars)
6	
	29
	31

After 52 weeks, Natalia finally has enough to buy the sweater. How much does it cost?

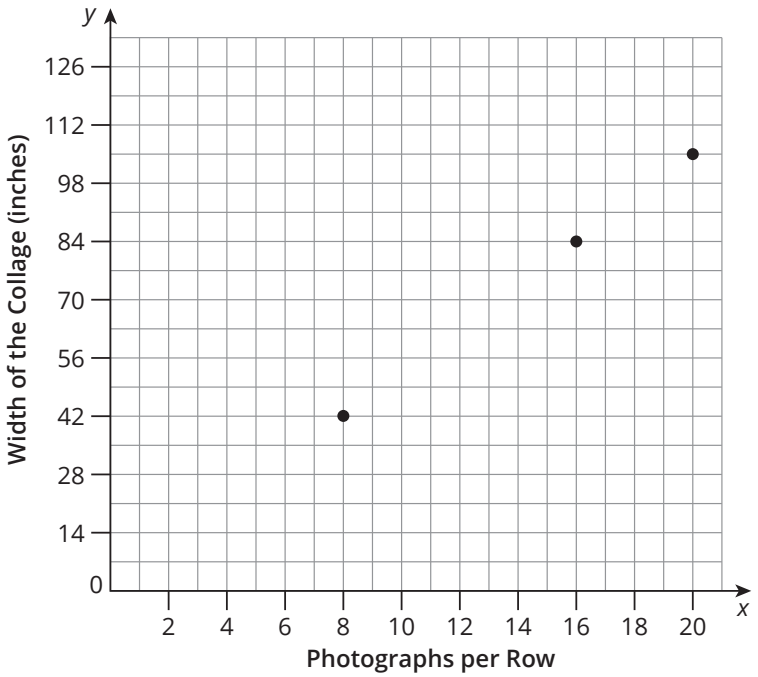
2. Kaya wants to keep her lights on all day, but she doesn't want to waste energy doing it. So she collects aluminum cans and recycles them to make up for the energy she uses.



Additional Aluminum Collected (pounds)	Time Kaya Can Keep Lights On (days)
22.5	
10	
	40

If Kaya is able to keep her lights on for 30 days, how much additional aluminum did she collect?

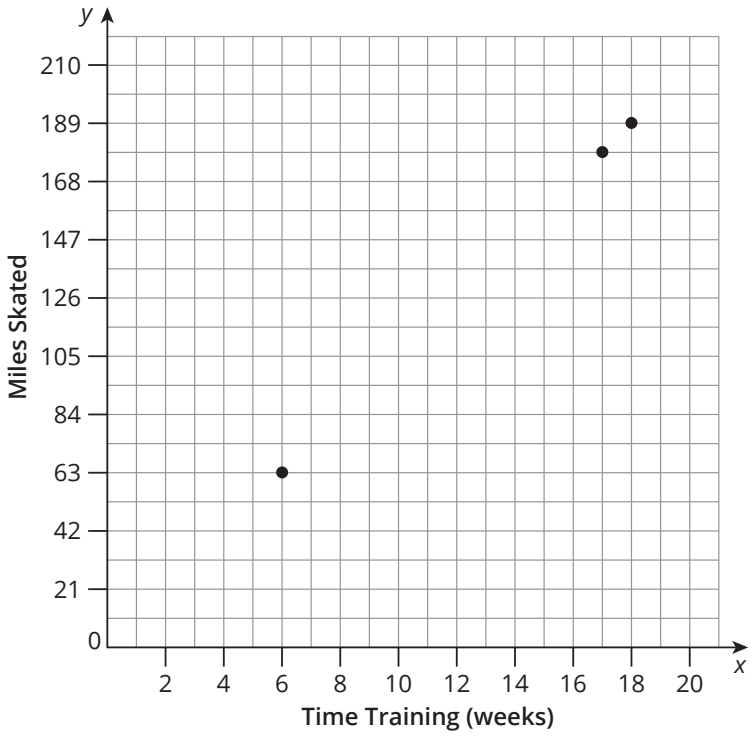
3. Mario is creating a collage of photographs to display at a wedding reception. He cuts the photographs so that they are all exactly the same size, and he plans to place them end-to-end in each row of the collage.



Photographs Per Row	Width of the Collage (inches)
	42
	105
16	

If Mario places 10 photographs in each row, what will the width of the collage be?

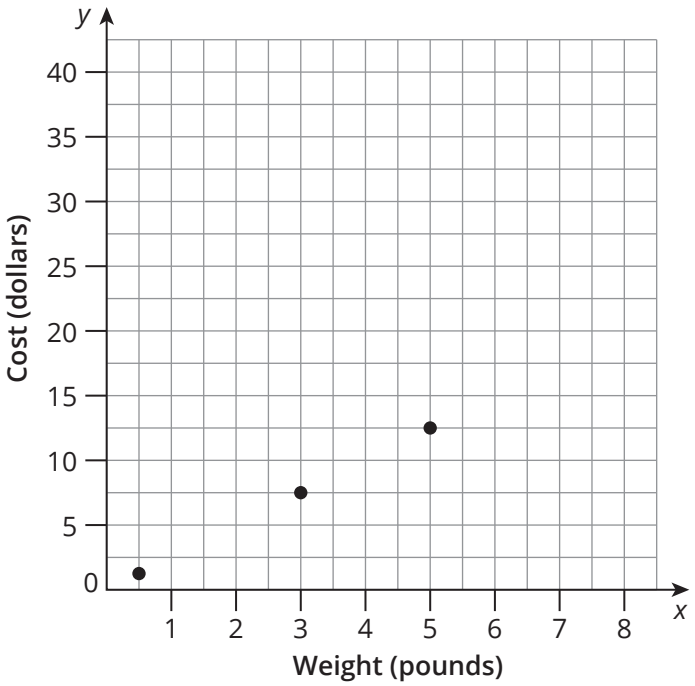
4. Samantha just joined her school's hockey team, and she is training to increase her stamina. She uses a pedometer to track the number of miles she skates each week during training. She averages 10.5 miles per week.



Time Training (weeks)	Miles Skated
18	
	63
	178.5

After 12 weeks, how many miles will Samantha have skated?

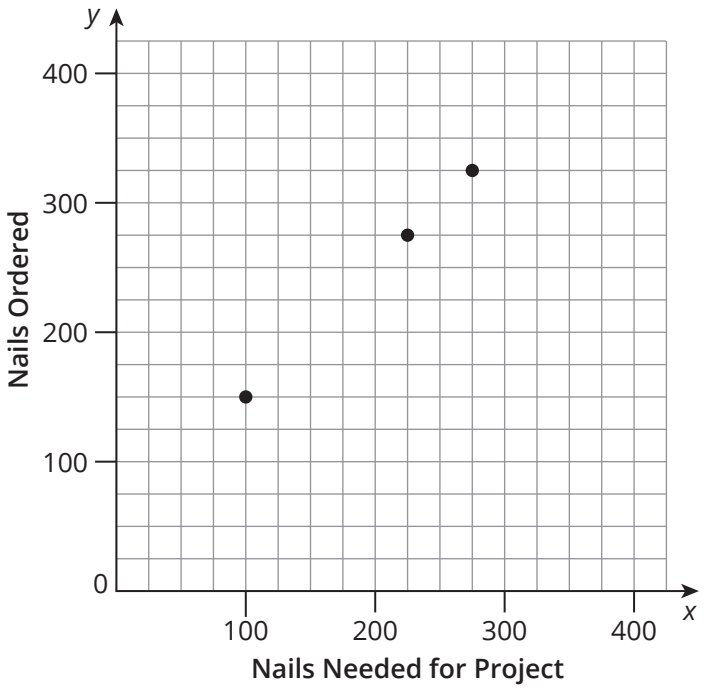
5. Andrew purchases trail mix for a school fundraiser.



Weight (pounds)	Cost (dollars)
	1.25
3	
5	

If Andrew spends $6.25 on trail mix, how many pounds of trail mix did he purchase?

6. A construction company orders more nails than they need to complete a project in case some nails are lost.



Nails Needed	Nails Ordered
100	
	325
225	

If the construction company orders 650 nails, how many nails does the project require?

Extension

A cryptarithm is a puzzle which replaces digits with letters. Your job is to use reasoning to determine what digits the letters stand for. When two letters are the same, they represent the same digit. When the letters are different, they represent different digits.

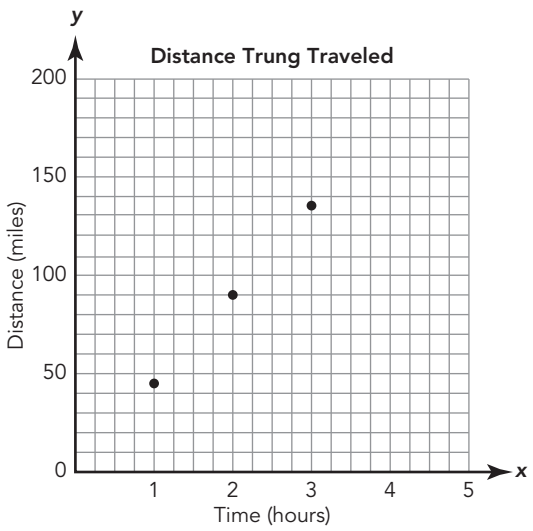
In this famous cryptarithm, the sum is correct. Can you solve it?

$$\begin{array}{cccccc} & S & E & N & D \\ + & M & O & R & E \\ \hline M & O & N & E & Y \end{array}$$

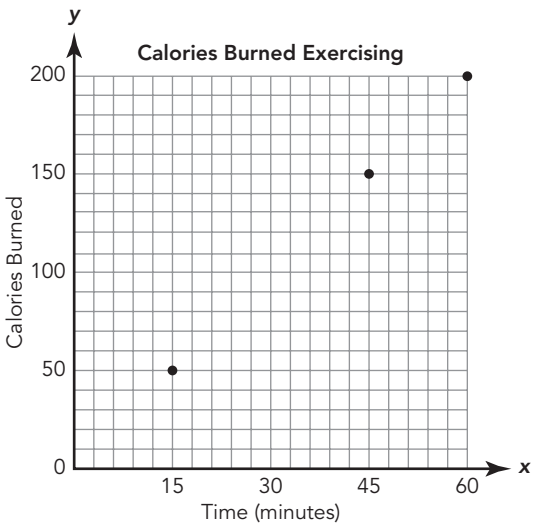
Spaced Practice

Use the graph to estimate each solution.

1. How long did it take Trung to travel 70 miles?



2. How long did it take to burn 100 calories?



Write each statement as an algebraic expression.

3. Five less than twice a number

4. Seven and one half more than a number

Solve each equation.

5. $20 = 6x$

6. $15.5 + p = 44$

CC BY NC

IV. Relating Distance, Rate, and Time

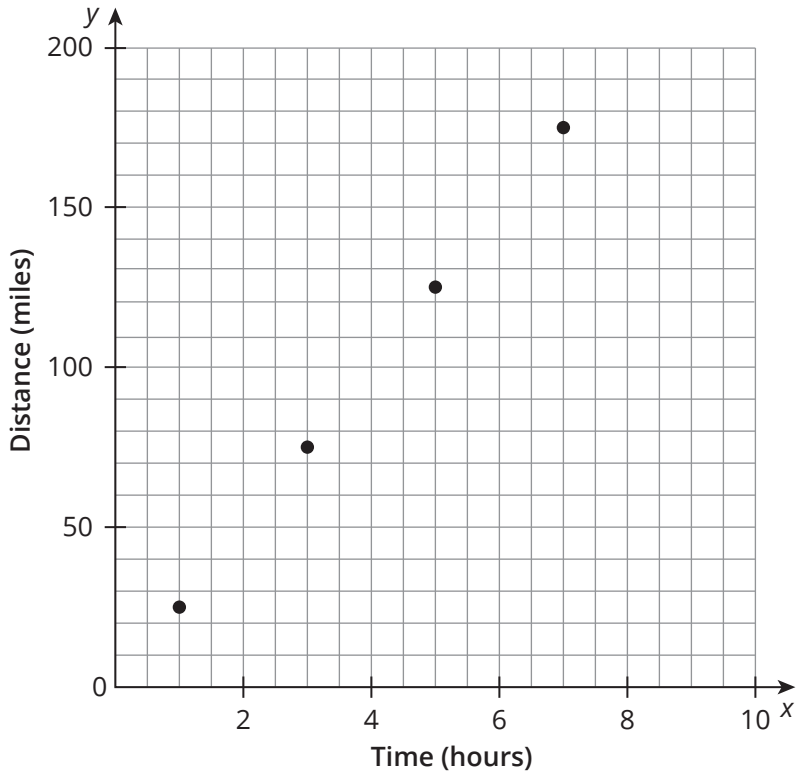
Topic Practice

A. Write a scenario to represent the relationship between the given quantities in each table or graph. Then, define variables and write an equation that shows the relationship between the two quantities.

1.

Time (hours)	Distance (Miles)
$1\frac{1}{2}$	4.5
$2\frac{1}{2}$	7.5
$4\frac{1}{4}$	12.75
$5\frac{1}{6}$	15.5

2.



CC BY NC

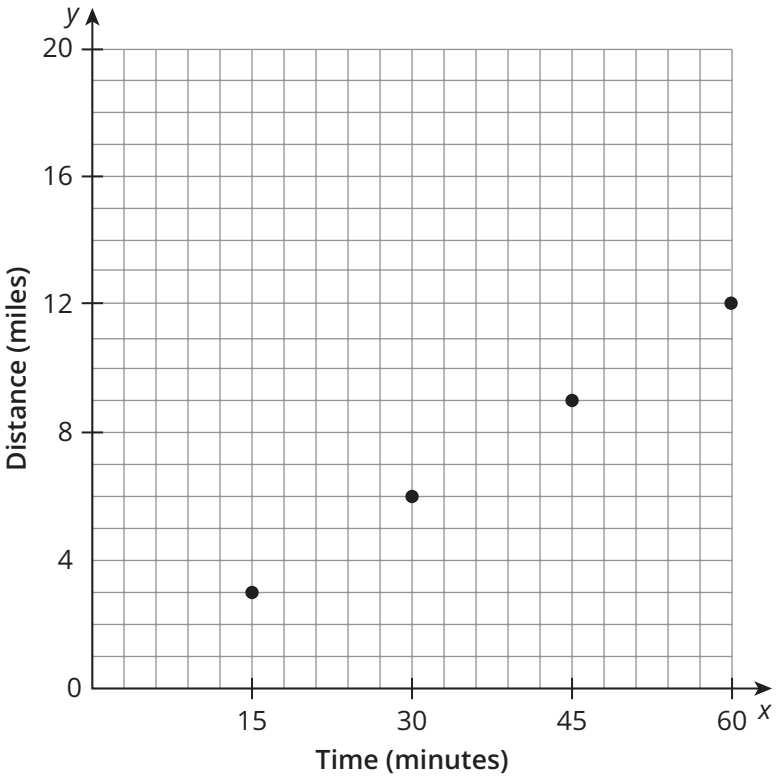
3.

Time (minutes)	Distance (kilometers)
15	0.6
30	1.2
45	1.8
50	2

4.

Time (hours)	Distance (miles)
$\frac{1}{4}$	$3\frac{3}{4}$
$\frac{3}{4}$	$11\frac{1}{4}$
$1\frac{1}{2}$	$22\frac{1}{2}$
$2\frac{1}{4}$	$33\frac{3}{4}$

5.

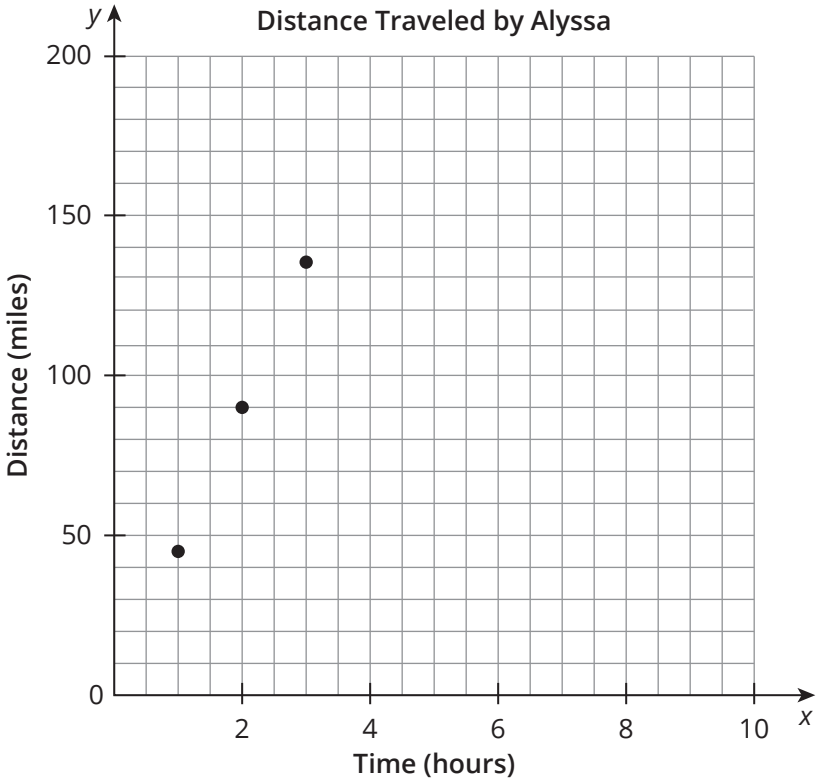


6.

Height (feet)	Time (minutes)
12	2
30	5
36	6
60	10

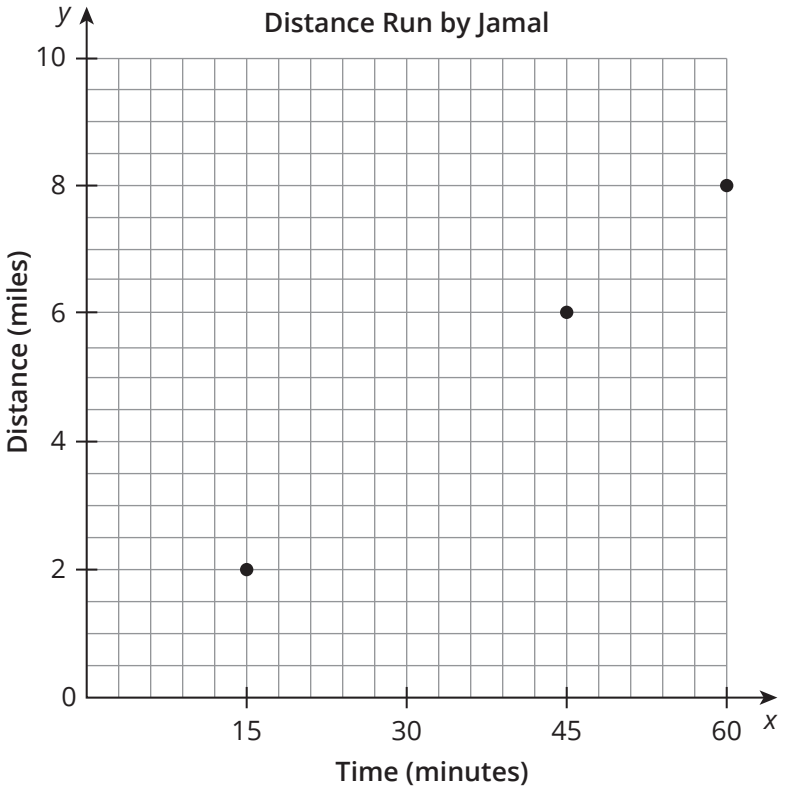
B. Use each graph to make a table. Then, define your variables and write an equation to represent the relationship between the two variables. Finally, use your equation to answer the question.

1. Alyssa is driving to the beach for a summer camping trip. How far has Shawna traveled after 4 hours?



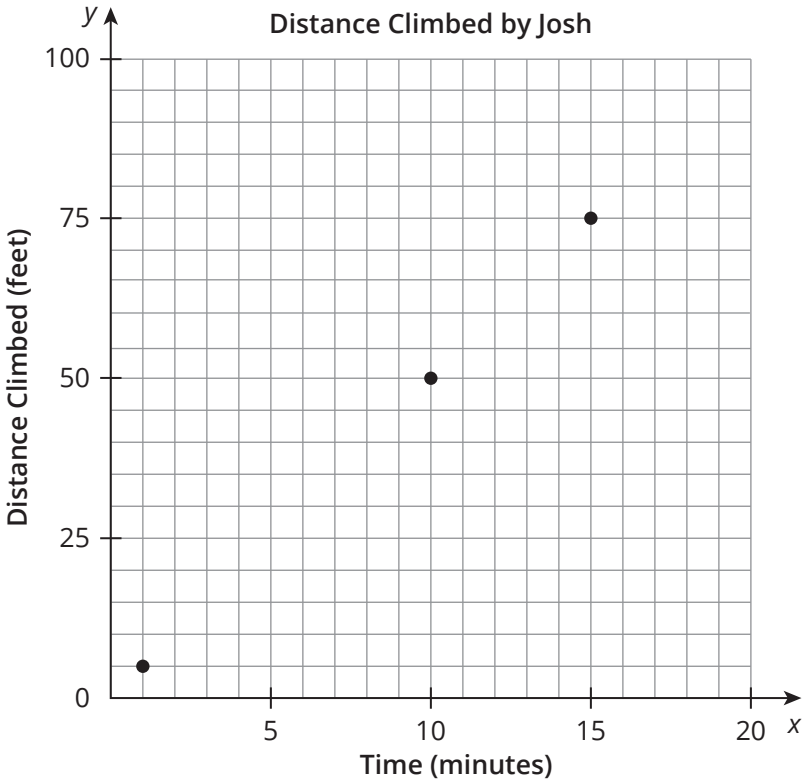
Time (hours)	Distance (miles)

2. Jamal is running at a constant rate. How long did it take Jamal to run 4 miles?



Time (minutes)	Distance (miles)

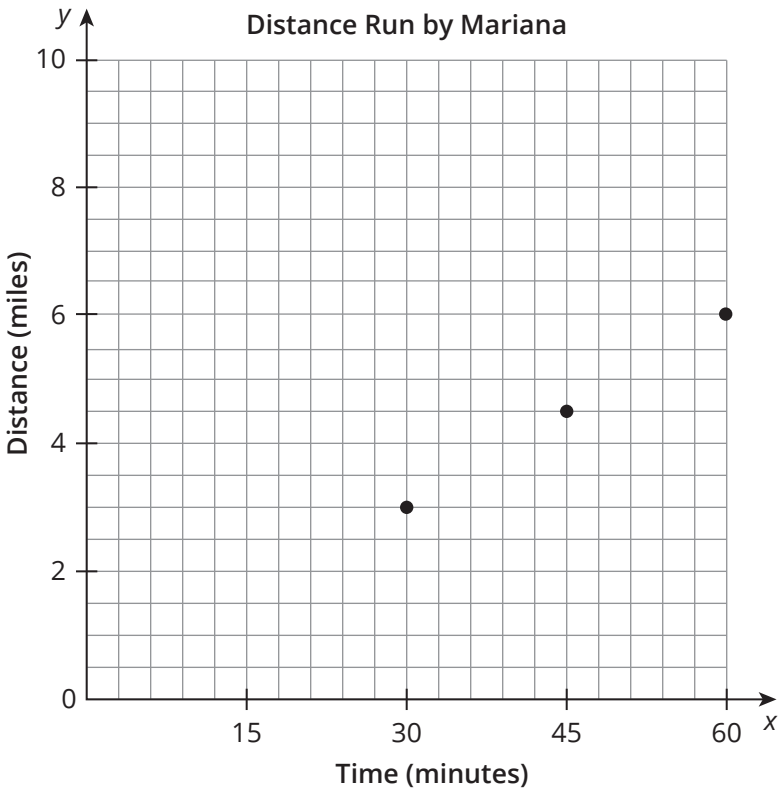
3. Josh is climbing a challenging section of a mountain. How far did Josh climb after 5 minutes?



Time (minutes)	Distance (feet)

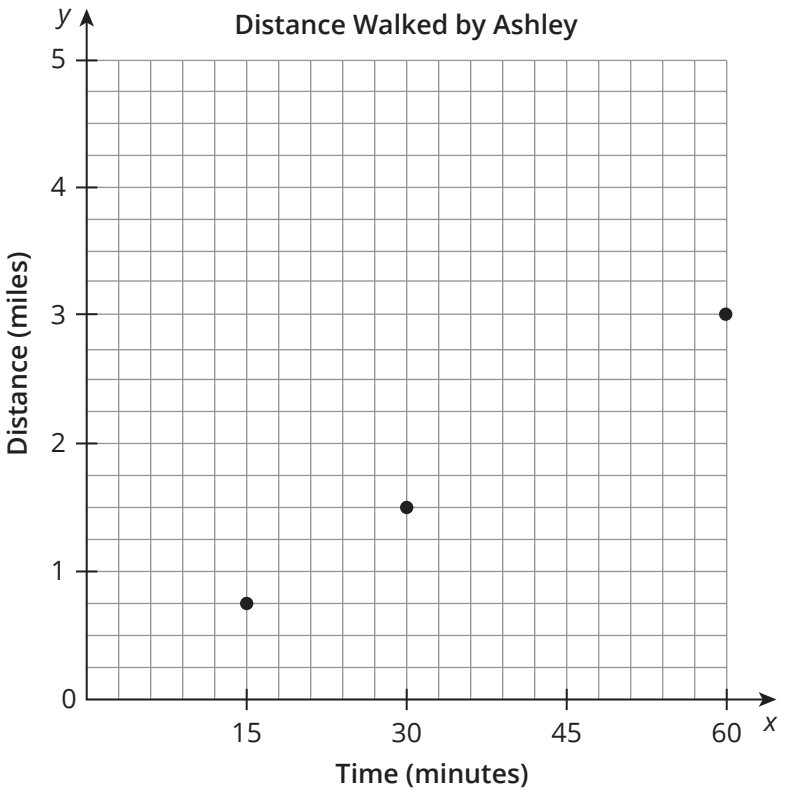
CC BY NC

4. Mariana is running around a park. How far will Mariana run after 90 minutes?



Time (minutes)	Distance (miles)

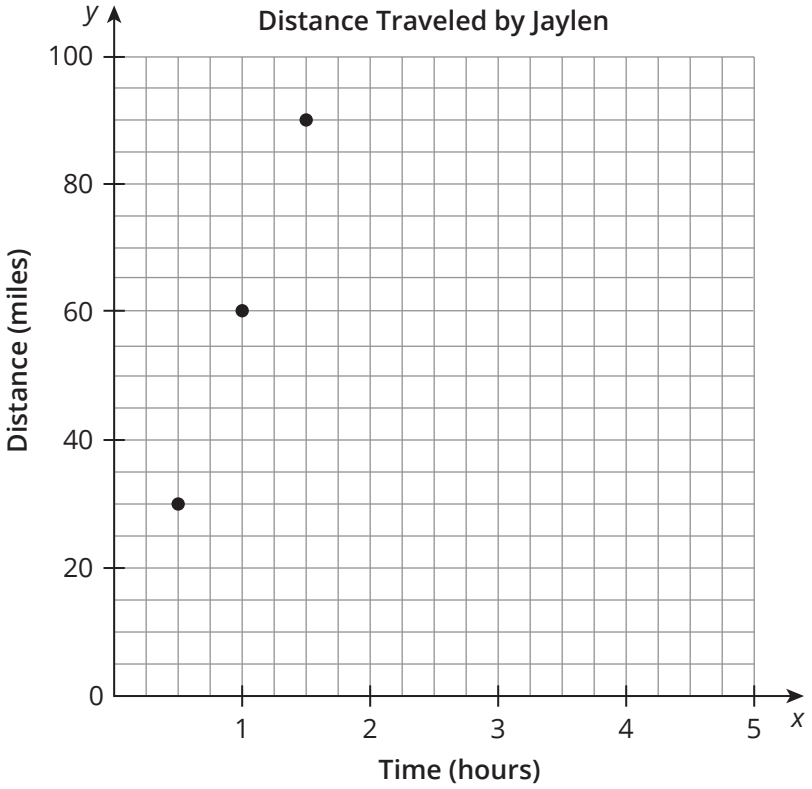
5. Ashley is walking around a park. How long will it take Ashley to walk 4.5 miles?



Time (minutes)	Distance (miles)

CC BY NC

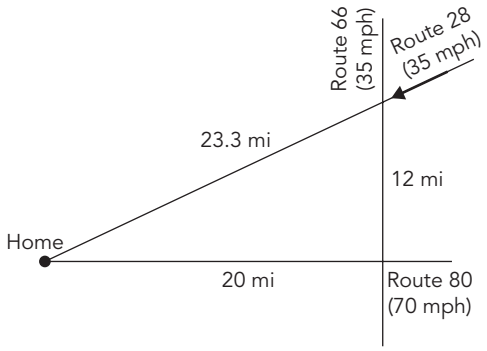
6. Jaylen is driving to summer camp. How long will it take Jaylen to make the 240-mile trip?



Time (hours)	Distance (miles)

Extension

1. Elena and her friend are traveling home from New Jersey on Route 28. Alison thinks that taking Route 66 to Route 80 is a faster way home. Alison's friend says that staying on Route 28 is shorter, so they will make it home faster. Who's correct? Which path is faster? By how much?



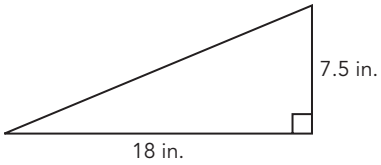
Spaced Practice

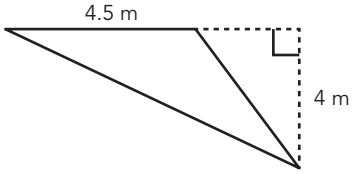
Determine each answer using the given formula.

1. The formula $P = 4s$ is used to calculate the perimeter, P, of a square with side length s. Calculate the length of a side of a square if its perimeter is 34.56 inches.

2. The formula $P = a + b + c$ is used to calculate the perimeter, P, of a triangle with side lengths a, b, and c. Calculate the unknown side length for a triangle with a perimeter of 52.81 inches and two sides measuring 16.32 inches each.

Calculate the area of each triangle.

3. 

4. 

V. Problem Solving on the Coordinate Plane

Topic Practice

A. For each problem situation:

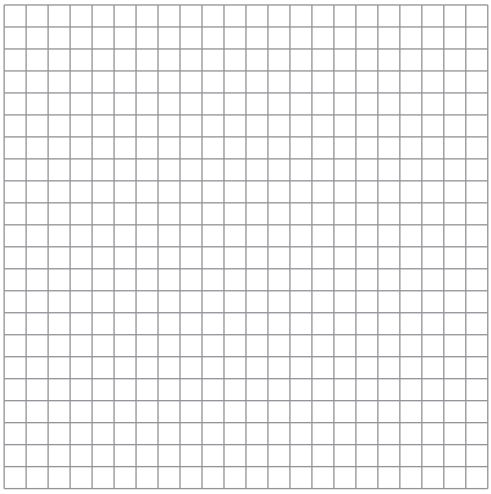
a. Complete the graph.

b. Define the independent and dependent variables.

1. Lizzie works for a greeting card company that makes birthday cards from recycled materials. On the cards, you can make the monkey climb a tree. The height of the monkey in the leaves (or below the leaves) of the tree represents how many years older (or younger) than 10 the person is.

Level of Monkey	Person's Age (years)
5	15
0	10
−5	5

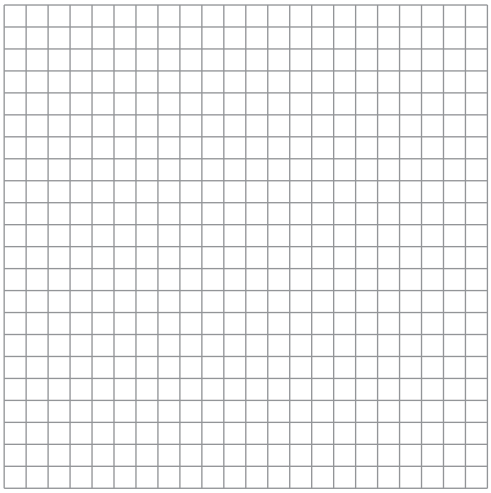
How old is the person when the monkey is 8 levels below the leaves?



2. Natalia is participating in a long-distance bike race to raise money for her favorite charity and just passed the first flag in the race. Consider the time and distance before Natalia passed the first flag to be negative values.

Time (hours)	Distance From First Flag (miles)
2	28
5	70
−1	−14

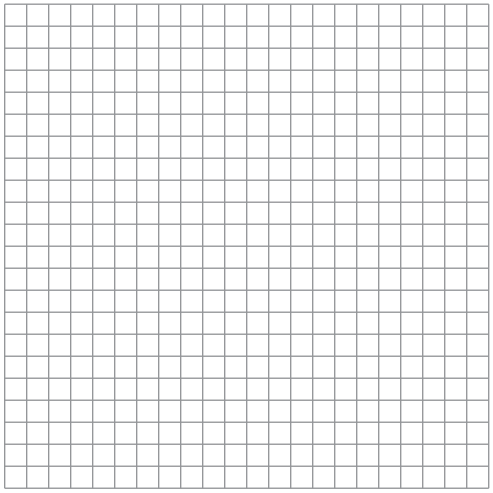
How far from the first flag was Natalia 4 hours ago?



3. Each month, the local library receives books. Consider the number of months before now as a negative amount.

Time (months)	Change in Number of Books
3	36
8	96
−2	−24

When did the library have 48 fewer books than it does now?

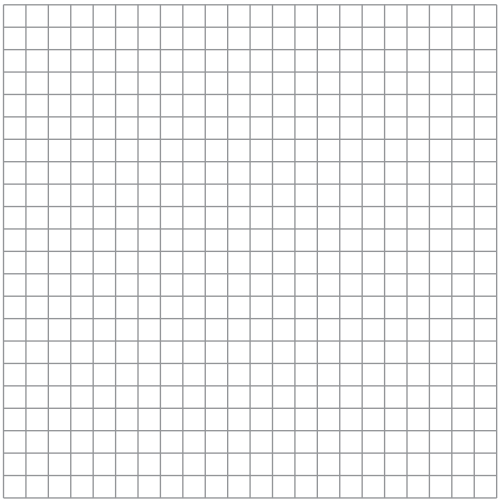


CC BY NC

4. Jorge has $400 in his savings account at the beginning of the summer. He got a babysitting job and is dreaming of all the money he will make this summer. His plan is to deposit all of the money he earns into his savings account and not withdraw any.

Amount Jorge Could Make	Savings Account Balance
200	600
350	750
500	900

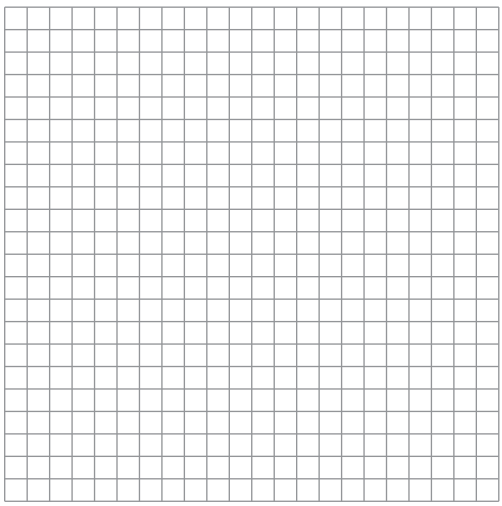
After the summer is over, Jorge actually ends up having $700 in his account. How much did he earn over the summer?



5. Samantha and her friends are playing putt-putt golf. She laughs because her results did not resemble her real golf game. To figure out the score on a hole, take the value for par, which was 4 strokes for each hole, and then add the number of strokes above (or below) par.

Strokes Above or Below Par	Score
3	7
8	12
–3	1

Samantha's score was three on the 18th hole. How many strokes above or below par did she take?

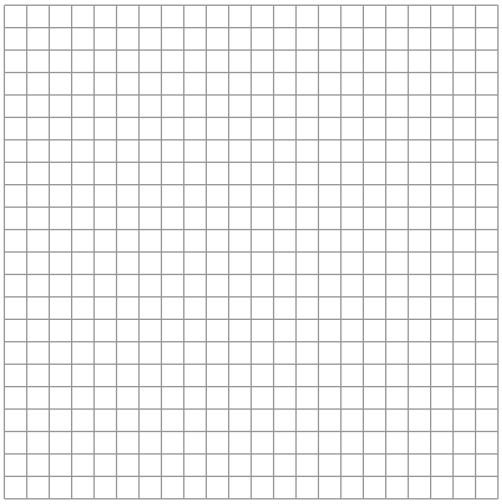


CC BY NC

6. An ice cream factory packages one pint of ice cream every minute. Consider time in the past and fewer pints of ice cream to be negative values.

Time (minutes)	Number of Ice Cream Pints Packaged
7	56
13	104
−5	−40

How many fewer pints of ice cream were there twelve minutes ago?



B. Using the problem situations, tables, and graphs from Problem Set A:

a. Write an equation to represent the relationship between the two variables.

b. Use the equation to answer the question for each scenario. Check your answer on the graph to make sure it makes sense.

1. How old is the person if the monkey is 8 levels below the leaves?

2. How far from the first flag was Natalia 4 hours ago?

3. When did the library have 48 fewer books than it does now?

CC BY NC

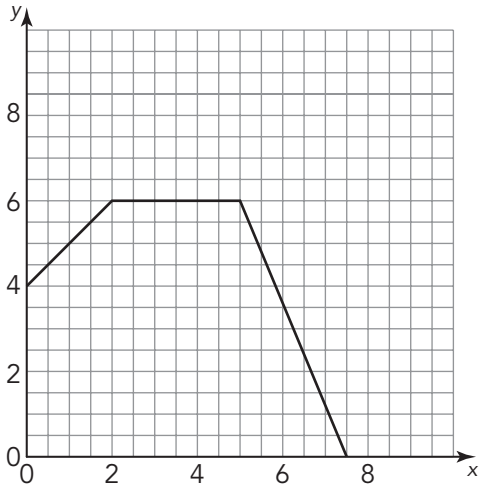
4. After the summer is over, Jorge actually ends up having $700 in his account. How much did he earn over the summer?

5. Samantha's score was three on the 18th hole. How many strokes above or below par did she take?

6. How many fewer pints of ice cream were there twelve minutes ago?

Extension

Tell a story to describe the graph.



Spaced Practice

1. The vertices of a polygon are given. Plot the points on a coordinate plane and connect the points in the order they are listed. Then determine the area of the polygon.

   (−4, −1), (−3, −2), (10, −2), (3, 0), (0, 4), (−2, 3)

2. Create a scenario to fit each numeric expression.

   a. $|-3 + 21|$

CC BY NC

b. $|8 - 3|$

3. Trung buys a variety box of cereal bars. The box contains 5 blueberry bars, 3 strawberry bars, and 2 apple bars. Write the ratio that represents each relationship in words, in colon form, and in fractional form.

   a. strawberry bars to blueberry bars

   b. apple bars to blueberry bars

c. strawberry bars to total bars

d. apple bars to total bars

e. blueberry bars to total bars

f. apple bars to strawberry bars

CC BY NC

Write an equation to represent the relationship between the variables shown in the table.

4.

Time (hours)	Distance Traveled (miles)
2	104
4	208
6	312
8	416
10	520

5.

Original Price ($)	Sale Price ($)
50	35
100	85
150	135
200	185
250	235

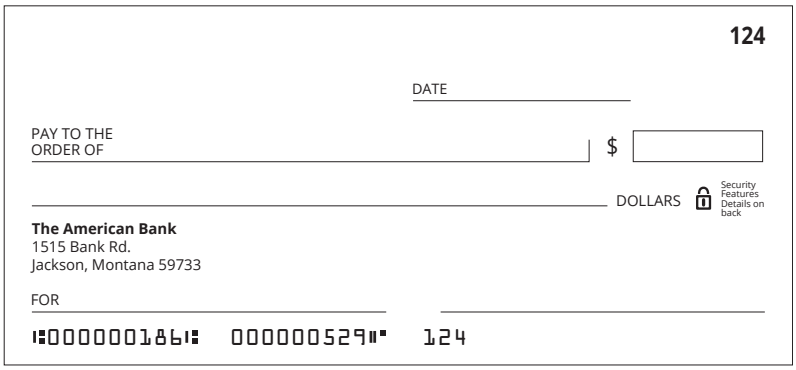
Name _____ Date _____

I. Checking Accounts

Topic Practice

A. Use the information given in each problem to write a check. Then, complete the check register.

1. Jaylen Ramirez, of 75 Main Street in Jackson, Montana 59736, wrote a check to Yummy Bakery on April 9, 2021. He paid $23.45 for a dozen cupcakes.


124

DATE

PAY TO THE ORDER OF $

DOLLARS Security Features Details on back

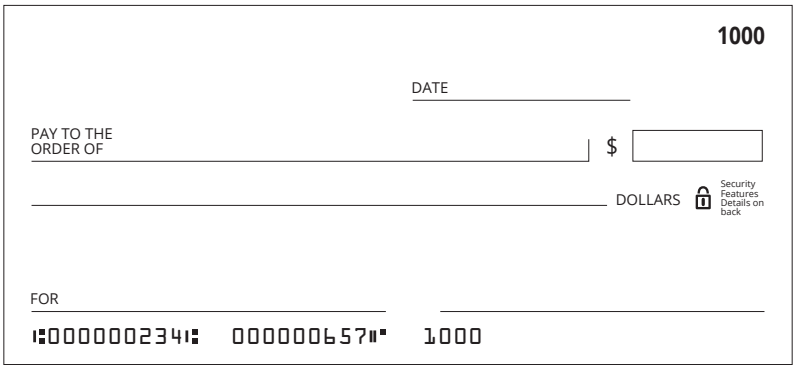
The American Bank
1515 Bank Rd.
Jackson, Montana 59733

FOR

⑈000000186⑈ 000000529⑈ 124

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			750.00
124		Ethel's Bakery			

2. The Toy Stop received a check from their customer, Kaya Patel. Kaya lives at 175 N. Culver Drive, in San Francisco, California 94101. Kaya bought a toy kitchen for $456.75 on September 15th, 2021.


1000

DATE

PAY TO THE ORDER OF $

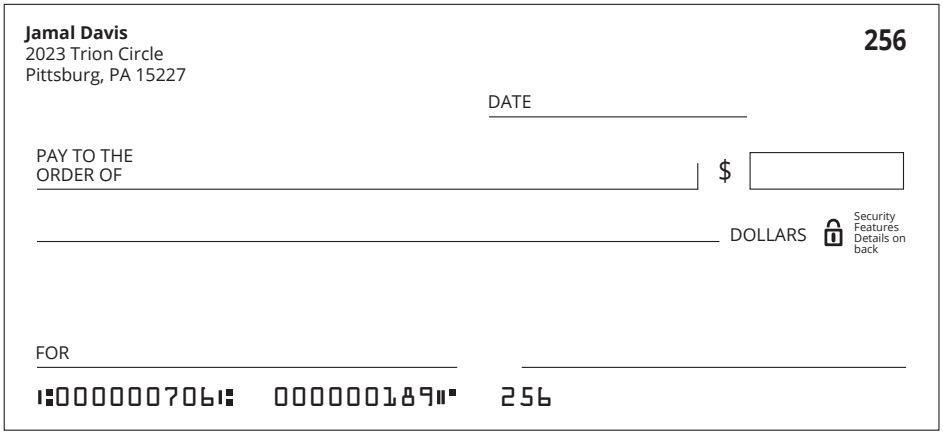
DOLLARS Security Features Details on back

FOR

⑈000000234⑈ 000000657⑈ 1000

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			643.81
1000					

3. Jamal Davis recently purchased a new mountain bike for $499.98. He wrote a check to pay for the purchase. He wrote the check on June 17, 2021, to Matthew's Bike and Sports Shop.


Jamal Davis
2023 Trion Circle
Pittsburg, PA 15227

256

DATE

PAY TO THE ORDER OF $

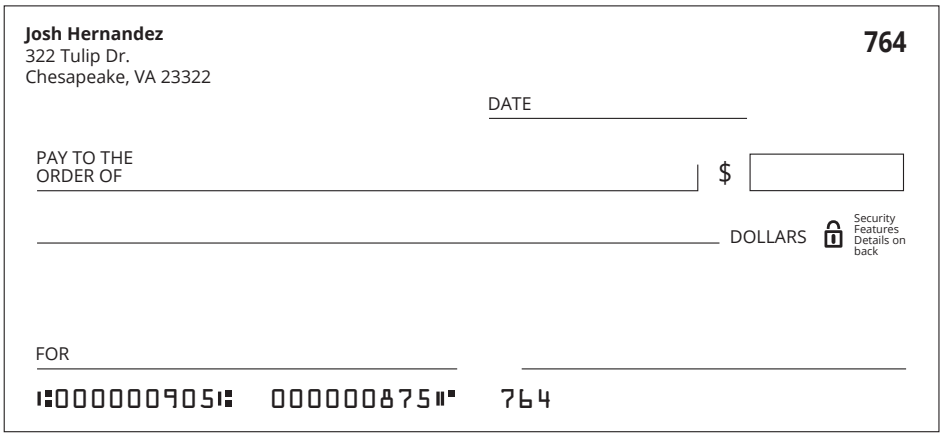
DOLLARS Security Features Details on back

FOR

⑆000000706⑆ 000000189⑈ 256

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			1127.48

4. Josh Hernandez wrote a check on Monday, January 21, 2021, for his purchases at Home Supplies and More. He bought a new shower head for $84.53 and bathroom towels for $18.75.


Josh Hernandez
322 Tulip Dr.
Chesapeake, VA 23322

764

DATE

PAY TO THE ORDER OF $

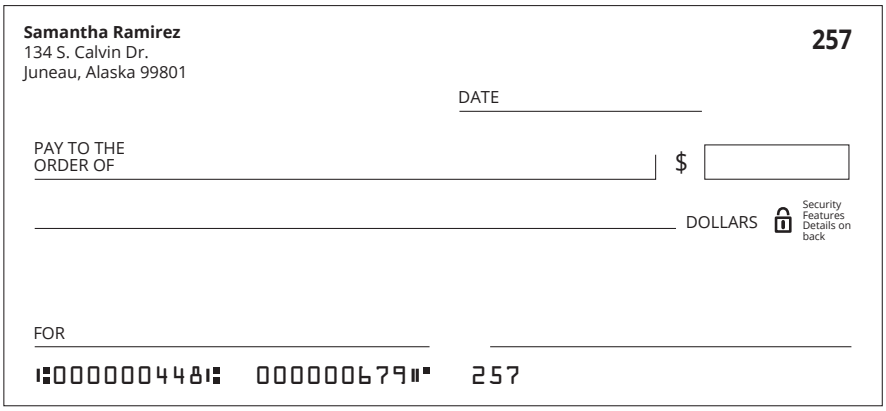
DOLLARS Security Features Details on back

FOR

⑆000000905⑆ 000000875⑈ 764

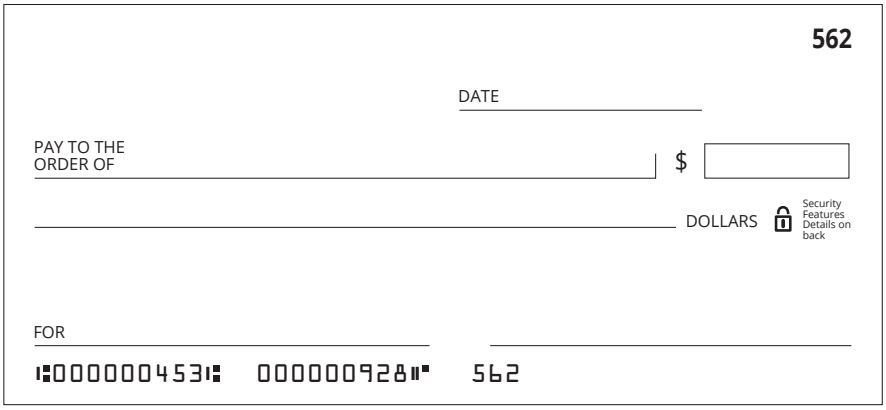
Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			209.16

5. The Food Pantry received a check from Samantha Ramirez for her most recent grocery store purchase. On November 18, 2020, she purchased an oven-roasted chicken for $6.99, a 12-pack of bottled water for $3.98, and two bags of frozen vegetables for $5.00.



Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			42.65

6. Paola Patel, of 153 N. 18th Street, Chicago, Illinois 60601, wrote a check on March 3, 2021, to her favorite bookstore, The Top Shelf. She bought 3 copies of her favorite book to give to her friends as gifts. Each book cost $15.99.



Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
		Beginning Balance			501.30

B. Analyze each account and determine the final balance.

1.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
	8/1	Direct Deposit	$2625.00		$2625.00
127	8/1	Rent payment		$80.00	
	8/1	Movie Theater withdrawal		$23.75	
128	8/4	Plumber payment		$65.00	
	8/5	Transfer from Savings	$200.00		

2.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
564	9/12	TV Direct		$72.50	$327.50
565	9/14	Patel Optical		$150.00	
566	9/14	Goods for Your Home		$152.35	
	9/14	Craft Market		$62.02	
	9/14	Overdraft Fee		$45.00	
	9/15	Transfer from Savings	$200.00		
567	9/15	All Electric Co		$45.35	
	9/16	Direct Deposit	$1456.28		
	9/18	ATM Withdrawal		$200.00	
	9/25	ATM deposit	$500.00		

3.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
165	5/31	Mortgage payment		$1500.00	$2578.92
	6/1	The Market on Market St.		$75.47	
	6/1	My Beau Boutique		$46.92	
	6/4	Online Purchase		$217.85	
	6/7	Sports and More Purchase		$548.96	
	6/7	Transfer from Savings	$1200.00		

4.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
	10/1	Direct Deposit	$1450.00		$1450.00
255	10/1	Rent Payment		$95.65	
256	10/1	PowerPlay Electric		$76.14	
257	10/1	Clean Springs Water		$52.12	
	10/3	ATM deposit	$18.32		
258	10/4	Mario's Jewelers		$387.99	
	10/5	Andrew's Diner		$17.56	
	10/7	ATM deposit	$200.00		

5.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
	2/9	3 Chocolates Store		$95.30	$652.20
	2/9	Hearts Cards		$18.45	
	2/11	The Crystal Cut		$362.58	
	2/14	Ruth's Florist		$25.00	
	2/14	Sauté Restaurant		$205.18	
	2/14	Big Screen Theater		$145.64	
	2/14	Overdraft Fee		$35.00	
	2/15	Direct Deposit	$2156.46		
239	2/15	Rent payment		$800.00	
	2/18	Return-The Crystal Cut	$362.58		

6.

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
	11/1	ATM deposit	$2450.00		$2606.25
195	11/3	Working Appliances		$356.25	
	11/8	ATM withdrawal		$50.00	
	11/8	Cherry Pie Desserts		$12.35	
196	11/10	Pick Me Toys		$224.96	
	11/15	ATM deposit	$2450.00		

Check	Date	Transaction Description	Deposit (dollars)	Withdrawal (dollars)	Balance (dollars)
	11/15	Transfer to Savings		$200.00	
197	11/15	Mortgage Payment		$2856.95	
	11/17	Dinner Diner		$62.15	
198	11/18	Car Care Repair		$212.02	

C. Use the given information to answer each question.

1. Determine the amount of money earned over the course of one year for an account with an average balance of $500 that pays 4% APY.

2. Determine the APY for an account with an average monthly balance of $800 that earned $10 this year.

3. Determine the amount of money earned over the course of one year for an account with an average balance of $1250 that pays 2.5% APY.

4. Determine the APY for an account with an average monthly balance of $400 that earned $9 this year.

5. Determine the amount of money earned over the course of one year for an account with an average balance of $250, a 0% APY, and a $15 fee every month.

6. Determine the APY for an account with an average monthly balance of $1050 that earned $57.75 this year.

7. Determine the APY for an account with an average monthly balance of $200 that earned $6.50 this year.

8. Determine the amount of money earned over the course of one year for an account with an average balance of $750, a 1.5% APY, and a $10 fee every month.

D. Use the three checking account descriptions to answer each question.

Big Money Bank	One Nation Bank	Dollar Sense Bank
• 4.5% APY • $1.50/month fee • $800 minimum average balance (additional fees assessed for lower balances)	• 2.25% APY • $1.00/month fee • $600 minimum average balance (additional fees assessed for lower balances)	• 1% APY • No monthly fees • No minimum average balance

1. Elena is able to keep $750 in her checking account each month of the year. Which bank would be the best choice for Elena? Explain your reasoning.

CC BY NC

2. Mariana has an average checking account balance of $800. Which bank should she choose to earn the most money over the year?

3. Trung has an average of $600 in his account. He knows that he should not use Big Money Bank because he does not have the average monthly minimum. However, he thinks that One Nation Bank will be his best choice because it has a higher APY than Dollar Sense. His friend Mariana disagrees and says that Dollar Sense Bank is the best because there are no fees. Who is correct?

4. Jamal just got a new job and plans to keep about $800 in his checking account each month for one year. Which bank should he use? Explain your reasoning.

5. Eduardo has a checking account at One Nation Bank. He has an average balance of $700. How much does his account earn each year?

CC BY NC

6. Chris has an average account balance of $1250. He currently uses One Nation Bank for his checking bank but is thinking Big Money Bank might be the better choice. Should he change banks? Explain your reasoning.

Extension

Suppose Ashley is interested in opening a checking account and estimates that she will be able to keep about $6000 in her account throughout the year. Create names and advertisements for two different banks at which Ashley would be qualified for a checking account, and which would both result in her earning $15.00 after APY and/or monthly fees.

Spaced Practice

1. Create a bar model to solve each addition equation.

   a. $x + 12 = 18$

   b. $40 = 10 + x$

2. Create a bar model to solve each multiplication equation.

   a. $3x = 15$

   b. $\frac{3}{4}x = 3$

CC BY NC

II. Debit Cards vs. Credit Cards

Topic Practice

A. Identify whether each statement is describing a debit card, a credit card, or both. Explain your reasoning.

1. This card allows you to purchase gas at the gas station.

2. This card is issued by a financial institution when an individual applies.

3. This card is protected by a Personal Identification Number.

4. This card can be used to make purchases online.

5. This card allows an individual to delay payment for an item.

6. This card makes it easier to recover funds due to fraud or theft.

B. Use the given information about credit cards from the local financial institutions to answer each question.

Credit Choice	Lender One
• 1.5% cash back on all purchases	• 3% cash back on all purchases
• $25 annual fee	• $50 annual fee
• $5000 spending limit	• $5000 spending limit

1. How much cash back will a customer get by using a Credit Choice card for $3000 of purchases in a year?

2. How much cash back will a customer get by using a Lender One card for $5000 of purchases in a year?

CC BY NC

3. A customer is planning to spend $3500 on home renovations this year. Which card should the customer use to get the most cash back?

4. Jorge would like to purchase a new tablet that retails for $459. He has $1250 in his bank account. He is trying to determine whether he should use the debit card he has from Texas Central Bank, or one of the two credit cards listed previously. Which card should Jorge use to make his purchase? Explain your reasoning.

Texas Central Bank

- 1.25% APY
- No annual fee
- $500 minimum balance

5. Tiara would like to purchase a new cello that costs $2275. She has $1500 in a checking account at Texas Central Bank. She is trying to determine whether she should use her debit card or one of the two credit cards listed previously. Which card should Tiara use to make her purchase? Explain your reasoning.

6. Lizzie keeps an average of $2500 in her checking account at Texas Central Bank. One of her friends recommended that she switch her checking account to Money Tree Bank. What are the advantages and disadvantages of switching her account?

Money Tree
• 2.5% APY • $25 annual fee • $2500 minimum balance

CC BY NC

C. Use the given information to answer each question.

1. Suppose Matthew uses his credit card to charge $1200 on a vacation but does not make his monthly payments. As a result, he will end up paying an extra 15% interest. How much interest will Matthew avoid paying for using his debit card instead of his credit card?

2. Suppose Lizzie buys $2800 worth of furniture on her Credit Choice card. She is unable to make her monthly payment and is billed 20% interest. How much interest will Lizzie avoid paying for using her debit card instead of her Credit Choice card?

3. Josh puts a $5000 down payment for a new car on his Credit Choice card. He does not make his monthly payment and is billed 20% interest. What's the total payment amount, including the interest?

4. Mario decides to purchase a $500 television.

   Option A: Mario uses a debit card to make payments for a financing program and will make twelve monthly payments of $50.

   Option B: Mario has $625 in his checking account. The bank has an overdraft fee of $35.

   Which option would you recommend to Mario? Explain your reasoning.

CC BY NC

5. Alyssa decides to buy an $800 couch.

   Option A: Alyssa uses her debit card to make payments for a financing program and will make eighteen monthly payments of $65.

   Option B: Alyssa has $250 in her checking account. Her checking account charges an overdraft fee of $35.

   Which option would you recommend to Alyssa? Explain your reasoning.

6. Samantha is planning a vacation that will cost $3000.

   Option A: Samantha uses a debit card to make payments for a financing program to pay for her vacation. She makes monthly payments of $150 for $2\frac{1}{2}$ years.

   Option B: Samantha has $3012.45 in her checking account. The bank charges a $40 overdraft fee.

   Which option would you recommend to Samantha? Explain your reasoning.

CC BY NC

D. Determine the interest rate to the nearest percent.

1. Mario paid $459.99 for a cell phone using his credit card. He made monthly payments and ended up paying a total of $567.00 for the phone.

2. Andrew used his credit card to pay for $512.82 worth of gifts for his family. He made monthly payments and ended up paying a total of $601.72 for the gifts.

3. Natalia used her credit card to pay for $725 worth of vacation travel expenses. She made monthly payments and ended up paying a total of $880 for the vacation travel expenses.

4. Kaya used her credit card to pay $398.72 for a new computer. She made monthly payments and ended up paying a total of $445.85 for the computer.

5. Alejandro used his credit card to pay $856.98 for a new television. He made monthly payments and ended up paying a total of $935 for the television.

6. Trung used his credit card to pay for a clothing shopping spree that totaled $368.73. He made monthly payments and ended up paying a total of $435.18 for the shopping spree.

E. Determine whether a credit card, debit card, or both is appropriate for each situation. Explain your reasoning.

1. Eduardo has $50 in his checking account on May 11th. He gets paid $984.40 on May 15th. Eduardo would like to attend a concert on May 12th, and the ticket will cost $129.

2. Samantha is planning to go out to dinner with four friends on January 17th. Each friend would like to have a separate check to pay for their meal and tip the server.

CC BY NC

3. Chris wants to purchase a video game system that is discounted to $265.29 before the holiday season. He has $476 in his checking account.

4. Paola is planning a vacation for March. She has about $375 in her checking account. She has to pay a $350 deposit up front to reserve a room at the resort.

5. Jorge is saving to purchase a new television that will be on sale for $999 on November 10th. He currently has $785 in his checking account, and he will be paid $1050 on November 1st.

6. Jaylen has $3045 in his checking account on April 12th. His accountant predicts he will have to pay at least $1000 in taxes by the end of April.

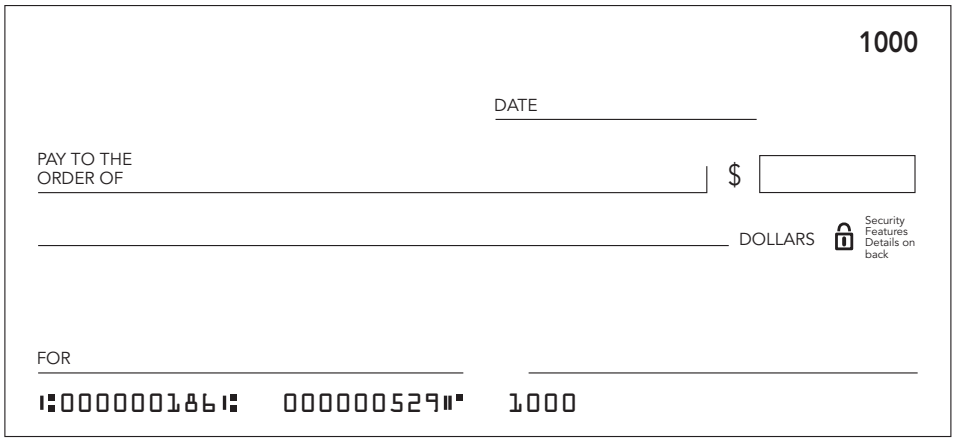
Extension

Research current credit card interest rates associated with your local bank. Suppose you made a $500 purchase using a credit card with that interest rate and paid minimum monthly payments of $25. How long would it take you to pay off the credit card balance?

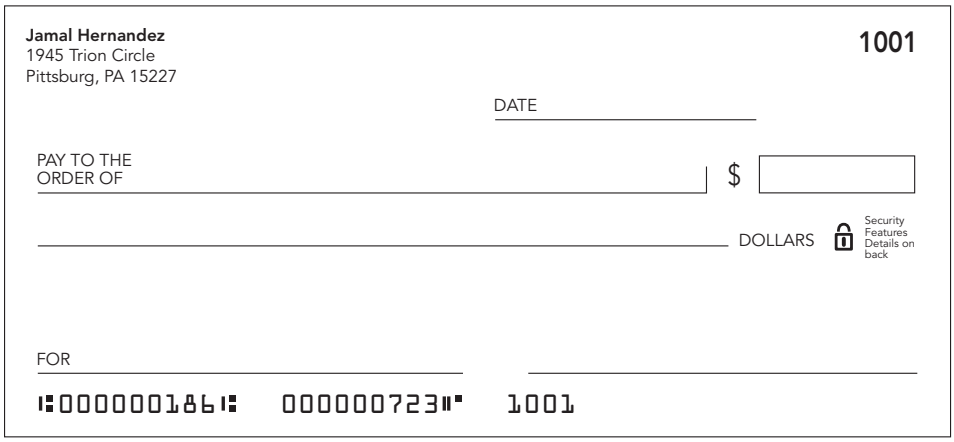
Spaced Practice

Complete the checks based on the given information.

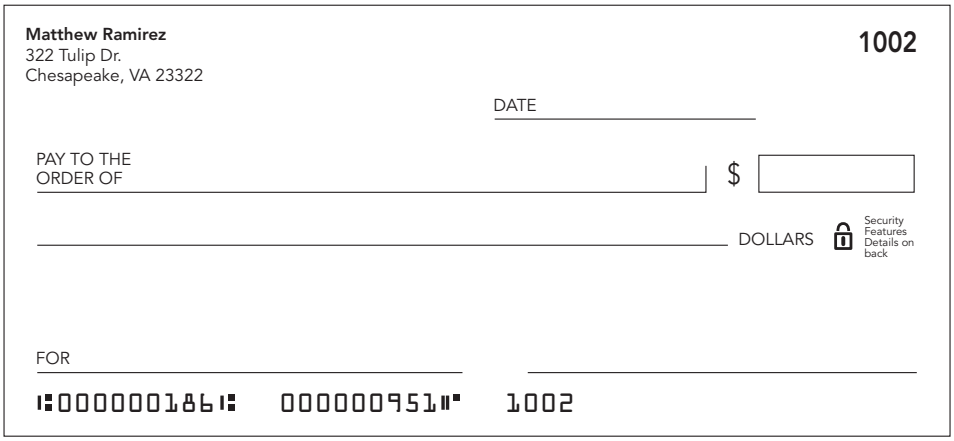
1. The Sewing Square received a check from their customer Elena Davis. Elena lives at 162 N. Calder Drive in San Francisco, California 94101. Elena bought a sewing machine for $245.75 on September 15th, 2020.



2. Jamal Hernandez recently purchased a new mountain bike for $399.98. He wrote a check to pay for the purchase. He wrote the check on June 13, 2020 to Josh's Bike and Sports Shop.



3. Matthew Ramirez wrote a check on Monday, January 21, 2020 for his purchases at Home Supplies Plus. He bought a new shower head for $83.56 and a towel rack for $18.75.



III. Understanding Credit Reports

Topic Practice

A. Identify whether each piece of information is included in a credit report.

1. Car loan
2. Number of debit cards
3. House value
4. Missed payments on a loan
5. Medical history
6. Birthday
7. Number of credit cards
8. Bank account balance

B. State whether each statement is true or false. Explain your reasoning.

1. Mario received a credit score of 750. This is not a good score.
2. Andrew wants to see a copy of his credit report. He can obtain a free copy of his report once a year.

CC BY NC

3. Alejandro has a good credit score because, even though he has a credit card, he uses it only for emergencies. He also always pays off the charges on time and never misses a payment.

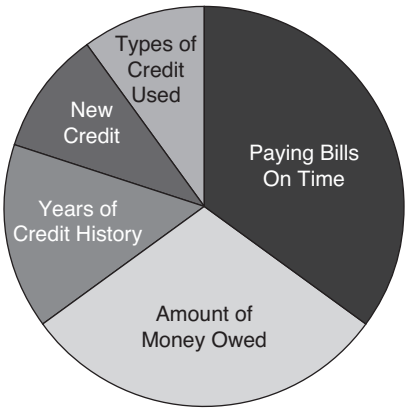
4. Ashley is taking out a loan to open a new business. She has made smart financial decisions in the past and has paid off other loans and bills on time. She should get a lower interest rate on her loan.

5. Tiara uses her credit card only for necessary purchases and does not often have a lot of charges on it. She has a good credit score because she pays off her bill, even when many of her payments are late.

6. Lizzie is behind in credit card payments on several of her credit cards. She is not worried because she will receive a large sales bonus in a couple of months and can catch back up on payments. Then, the bad credit will be removed from her credit report once she catches up.

C. Use the circle graph shown to tell whether each person's claim is correct or incorrect. Explain your reasoning.

Card Credit Factors



1. Your uncle is talking to you about his credit score. He believes that his many years of credit use is more important than the fact that he often makes late payments on his bills.

2. Eduardo states that payment history and amount of money owed are the two most important factors when determining your credit score.

3. Chris is very careful to pay his bills on time every month because he believes paying your bills on time is 50% of the reason he has a good credit score.

4. Alyssa owes $150,000 in loans and her mortgage. She also opened one new credit card this past year. She believes the money she owes is more important to her credit score than her new credit cards.

CC BY NC

5. Each month Natalia makes payments on her car loan, mortgage, and school loans. She believes that her mortgage is the most important in terms of her credit score.

6. Kaya says she has the perfect credit strategy. Each time she reaches the credit limit on one card, she gets a new credit card.

D. Use the given information to answer the questions.

Samantha is hoping to get a loan to buy a car. The bank first needs to run a credit report to determine whether she is high-risk or low risk. Emily's financial history is as follows:

- She has worked as a nurse for over five years and makes enough to pay her bills each month.
- She keeps track of how often she uses her debit card and keeps an accurate record of her account balance each month.
- She regularly makes cash donations to local charities.
- She has a loan for her house. She makes the minimum payment each month on time and has never missed a payment.
- She has a motorcycle. She paid for the motorcycle with cash that she received from an inheritance.
- She has 4 credit cards open. She uses one only for emergencies, one only for travel, one for groceries and other needs, and one only for gas. She is usually able to pay off the cards each month, but some months she may only be able to make the minimum payment. She then pays it off the next month.
- She is single.

1. Identify the information in Samantha's financial history that will be considered while determining her credit score.

2. Identify the information in Samantha's financial history that will not be considered while determining her credit score.

3. Do you think the bank will give Samantha her loan? Would you consider her high-risk or low-risk? Explain your reasoning.

CC BY NC

Paola is hoping to get a loan to start a new business. The bank first needs to run a credit report to determine whether she is high-risk or low-risk. Paola's financial history is as follows:

- She has a steady job as an insurance agent.
- She is married and has two children. Her husband also has a job.
- She has a car loan. She always makes the payment, but every $2 - 3$ months she makes her payment late.
- She has a house loan. She makes the minimum payment for her loan each month and has only missed one payment in the last year.
- She likes to shop. She has 10 credit cards open and many of them are store specific credit cards. She makes the minimum payments for the cards each month, but sometimes she forgets a card and makes the payment late.
- In the last year, she has received 3 overdraft fees from her bank.
- She uses a debit card to purchase groceries and gas.

4. Identify the information in Paola's financial history that will be considered while determining her credit score.

5. Identify the information in Paola's financial history that will not be considered while determining her credit score.

6. Do you think the bank will give Paola the loan? Would you consider her high-risk or low-risk? Explain your reasoning.

CC BY NC

Extension

Research the average FICO credit score for people in your city and look up the price of the car you would purchase today. Using the table, determine the amount of interest you would pay on your car of choice using the average credit score for your area. The given rates are based on a 5-year loan with simple interest.

Average Interest Rates by FICO Score

Credit Score	Interest Rate
500-589	15.24%
590-619	14.06%
620-659	9.72%
660-689	7.02%
690-719	4.95%
720-850	3.60%

Spaced Practice

Determine the interest rate to the nearest percent.

1. Jorge paid $279.99 for a drum set using his credit card. He made monthly payments and ended up paying a total of $345.00 for the drum set.

2. Jaylen used his credit card to pay for $325.79 worth of gifts for his family. He made monthly payments and ended up paying a total of $398.12 for the gifts.

3. Elena used her credit card to pay for $655 worth of vacation travel expenses. She made monthly payments and ended up paying a total of $725 for the vacation travel expenses.

CC BY NC

IV. Career Exploration

Topic Practice

A. Use the information in the table to calculate the new salary in each problem situation.

Education Level Earned	Financial Benefit
Master's Degree	A person with a master's degree earns approximately 30% more annually than a person with only an undergraduate degree.
Undergraduate Degree	A person with an undergraduate degree earns 84% more over a lifetime than a person with just a high school diploma.
High School Graduate	A high school graduate earns $250,000 more over a lifetime than a person who does not earn their high school diploma.

1. Jamal currently makes $35,000 annually with an undergraduate degree. His boss recommends he go back to school and get a master's degree. How much can he expect to earn after he gets his master's degree?

2. Matthew, who did not earn a high school diploma, can expect to earn about $898,500 after a lifetime of work. Suppose Matthew has his high school diploma. How much would he earn in his lifetime?

3. Over her lifetime, Mariana will earn $1.6 million with a high school diploma. Suppose Mariana has an undergraduate degree. How much more could she earn in her lifetime?

4. Chris knows that when he gets his master's degree he will make about $112,000 a year. How much does he currently make with his undergraduate degree?

CC BY NC

5. Ashley will earn $975,000 over the course of her lifetime with her high school diploma. Suppose Ashley has a master degree. How much more could she earn in her lifetime?

6. Over the course of her lifetime, Tiara earned $989,000 as a person who did not earn their high school diploma. How much more could she have made over her lifetime with a master's degree?

B. Answer each question using the information given.

Lizzie entered the workforce at age 23 as an elementary school teacher.

- Ages 18–22: took out $15,000 loans for each year of college
- Average Salary

  Ages 23–26: $38,000

  Age 27–31: $39,520

  Age 32–38: $41,496

1. What was Lizzie's total income from the ages of 23 to 26?

2. What was Lizzie's total income until she was 23 years old?

3. What was Lizzie's total income from the ages of 27 to 31?

4. Determine the percent increase in Lizzie's salary from ages 27 to 31 to ages 32 to 38.

CC BY NC

5. At the age of 39, Lizzie received her master's degree and is offered a 12% increase in her salary. What would her salary be after this increase?

6. Lizzie turns down a raise and leaves her job, at the age of 39, for a different position. What is her total income for her time as an elementary school teacher, including the cost of her education?

C. Use the given information to answer the following questions.

Samantha	Jorge	Jaylen	Alyssa
• Graduated high school at age 18 and entered the work force as a retail worker • Ages 18–22 earned $22,500 per year • Ages 23–25 earned $24,000 per year • Ages 26–30 earned $26,500 per year • At age 30 went to a trade school and took out loans totaling $12,000 • Ages 32–35 earned $45,000 per year as a welder	• Entered college at age 18 • Took out loans totaling $50,000 • Earned undergraduate degree at age 23 • Entered the work force at age 24 as a graphic designer • Ages 24–26 earned $42,500 per year • Ages 27–30 earned $47,000 per year • At age 30 earned his master's degree, paid for by his employer • Ages 31–35 earned $50,000 per year	• Entered college at age 18 • Took out loans for college totaling $55,000 • Earned undergraduate degree at 23 • Entered graduate school at age 23 • Took out loans for graduate school totaling $32,000 • Earned his master's degree at age 27 • Entered the workforce at age 27 as a librarian • Ages 27–30 earned $59,300 per year • Ages 31–32 earned $63,300 per year • Ages 33–35 earned $68,000 per year	• Entered college at age 18 • Went to a community college for two years and then transferred to a state university and took out loans totaling $14,250 • Earned undergraduate degree at 23 • Entered work force at age 24 as an elementary school teacher • Ages 24–26 earned $43,000 per year • Ages 27–30 earned $47,250 per year • At age 30 earned her master's degree, paid for by her employer • Ages 31–35 earned $52,250 per year

1. Determine how much Samantha has made since entering the workforce.

2. Determine how much Jorge has made since entering the workforce.

3. Determine how much Jaylen has made since entering the workforce.

4. Determine how much Alyssa has made since entering the workforce.

5. Which person do you think made the best decision in terms of their education and career?

6. At 35, Samantha's employer offers her a scholarship to help obtain her undergraduate degree. The scholarship will require her to take out a small loan for $6250. The employer then agrees to pay her 15% more for the next five years. Do you think Samantha should get her undergraduate degree? Why or why not?

CC BY NC

Extension

Research the career that you are most interested in right now. Determine the level of education required, starting salary, and opportunities for advancement. With the knowledge that you have about this career choice and the new information from your research, create a list of the pros and cons of going into your chosen field.

Spaced Practice

Name the two quantities that are changing in each situation and determine which quantity is the dependent quantity and which is the independent quantity.

1. Natalia earns $2 for every box of fruit sold as a fundraiser.

2. Ms. Patel calculates quiz scores by giving students 4 points for every correct answer.

3. A car lot is offering a $2500 discount on all new car purchases.

4. A rental car company charges customers $40 for each day they rent a car.

5. A lawn care service charges $50 for each acre they mow.

6. Mr. Davis adds 10 bonus points to each student's science test score to determine their final test score.

Identify whether each piece of information is included in a credit report.

7. maiden name

8. family members

CC BY NC

V. Paying for College

Topic Practice

A. Identify each described method of paying for college as a grant, scholarship, work-study program, student loan, or savings. Explain your reasoning.

1. Kaya receives money from her college to play on their soccer team.

2. Matthew works at the Registrar's Office at his college. In exchange for his time worked, he receives money toward his education.

3. Trung volunteered at her local hospital. Because of this, the hospital gave her money to attend the college of her choice.

4. Josh plans to attend the college that his parents and other family members graduated from. His family has been depositing money into an account for Josh every month since he was born, so he may use it for college.

5. Mariana researches some information online and finds that, as a high school student who graduated early and worked part-time during school, she can receive money from the government to pay for her college education.

6. Ashley has decided to attend her local college, but does not have money for college. She applied for financial aid and qualified to borrow money for college. But after she starts her career after college, she will have to pay back the money with interest.

B. Use the information about the two colleges shown to answer each question.

Mario is interested in two schools near his hometown. He currently plays basketball and has a 3.8 grade point average. He receives the financial aid information shown.

Alabama A&M University
Tuition: $15,155
Athletic Scholarship: $4300 each year
Work-study: $1000 each year

University of North Alabama
Tuition: $17,175
Academic Scholarship: 35% off tuition each year
Work-study: $1550 each year

1. How much financial aid does Alabama A&M University offer?

2. What would Mario's tuition be at Alabama A&M University after receiving both the athletic scholarship and the work-study program?

3. How much financial aid does the University of North Alabama offer?

4. What would Mario's tuition be at the University of North Alabama after receiving only the academic scholarship?

5. What would Mario's tuition be at the University of North Alabama after receiving both the academic scholarship and the work-study program?

6. Which school is the better financial option for Mario for receiving all of the financial aid offered?

CC BY NC

C. Natalia lives in Michigan and is graduating high school in a few years. She is looking into options for college. Her top three choices are the University of Michigan, the University of Georgia, and the College for Creative Studies. Use the information provided about each college to answer the questions.

University of Michigan	University of Georgia	College for Creative Studies (Detroit, MI)
Tuition for residents: $14,500 per year	Tuition for residents: $19,375	Tuition for residents: $55,000
Tuition for non-residents: $22,375 per year	Tuition for non-residents: $28,750	Tuition for non-residents: $72,500
Academic Scholarship: 25% off tuition each year	Academic Scholarship: 35% off tuition each year	Academic Scholarship: 40% off tuition each year
Work-study: $2000 each year	Work-study: $2500 each year	Work-study: $3500 each year

1. What would Natalia's tuition be at the University of Michigan after receiving both the academic scholarship and the work-study program?

2. What would Natalia's tuition be at the University of Georgia after receiving both the academic scholarship and the work-study program?

3. What would Natalia's tuition be at the College for Creative Studies after receiving both the academic scholarship and the work-study program?

4. Over the course of four years, how much money would Natalia save by attending the University of Michigan instead of the College for Creative Studies?

5. Natalia has the option of attending a local community college for 2 years for $6,250 a year and then transferring to the University of Michigan for the next two years. How much total tuition will Natalia pay over the course of four years for taking this option and receiving both the academic scholarship and the work-study program at the University of Michigan for the last two years?

6. Over the course of four years, how much money would Natalia save by attending the community college first instead of attending the University of Michigan for all four years?

CC BY NC

D. For each school, determine the percentage of the tuition that residents pay compared to non-residents.

1. At Fort Lewis College in Colorado, residents pay $20,494 and non-residents pay $31,766.

2. At the University of North Florida, residents pay $20,518 and non-residents pay $34,288.

3. At the University of Alaska Anchorage, residents pay $17,256 and non-residents pay $29,706.

4. At Oregon State University, residents pay $18,702 and non-residents pay $32,886.

5. At Chicago State University, Illinois residents pay $28,102 and non-residents pay $36,382.

6. At Fairmont State University in West Virginia, residents pay $16,773 and non-residents pay $22,677.

Extension

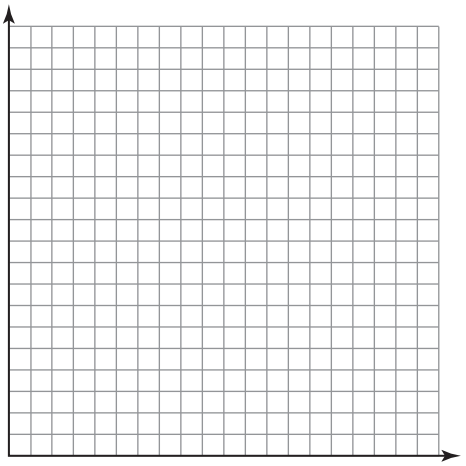
Research three colleges or vocational schools that you are interested in potentially attending after high school. At least one of the schools must be out-of-state. Compare their tuitions based on either in-state or out-of-state status, along with the average financial aid packages that are offered to students. Determine the yearly cost for you to attend each school.

Spaced Practice

Complete each graph. Then, use the graph to solve the equation.

1. Each month, the school library receives an average donation of 6 books. The equation $b = 6m$ describes the number of books the library has received, b, after a certain number of months, m.

Months	Books
2	12
5	30
6	36
10	60

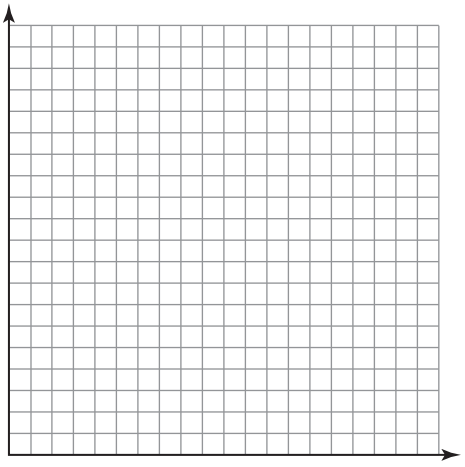


In how many months will the library have 96 books?

CC BY NC

2. Andrew is paid $8 more than the number of chores he does each week. The equation $a = c + 8$ describes the amount Andrew is paid, a, after completing a certain number of chores, c.

Chores	Amount Paid ($)
2	10
15	23
18	26
30	38



How much is Andrew paid if he does 40 chores?

Use the feature descriptions to answer each question.

Bank A	Bank B
• Free checking • 2.75% APY • $15 overdraft fee • $0.15 fee per debit card transaction	• Free checking • 2.85% APY • $35 overdraft fee • 0.25% per debit card transaction

3. Alejandro wants to open a checking account that comes with a debit card. He plans to keep an average balance of $500, write about 10 check per month, and use up to 15 debit card transactions per month. Which bank would be the best choice for Alejandro? Explain your reasoning.

4. Lizzie wants to open a checking account that comes with a debit card. She plans to keep an average balance of $2500, write about 25 checks per month, and only use the debit card in an emergency. Which bank would be the best choice for Lizzie? Explain your reasoning.

Answer each question using the information given.

Elena

- Gradated high school at age 18
- Took out loans for college totaling $60,000
- Earned undergraduate degree at age 22
- Entered work force at age 23
- Ages 23 – 25 earned $47,500 per year
- Ages 26 – 30 earned $51,950 per year
- Ages 31 – 35 earned $56,705 per year

5. Determine how much Elena has made over the course of her career so far.

6. At 35, Elena decides to get her master's degree. Her employer will cover 75% of the $23,000 in tuition for her graduate program. After earning her master's degree, Elena's employer will pay her 18% more for the next 3 years. Do you think it is a good idea for Elena to get her master's degree?

GRADE 6

MODULE 5

Describing Variability of Quantities

TOPIC 1: The Statistical Process

I. Understanding the Statistical Process 413
II. Analyzing Numerical Data Displays 424
III. Using Histograms to Display Data 444

TOPIC 2: Numerical Summaries of Data

I. Analyzing Data Using Measures of Center 457
II. Displaying the Five-Number Summary 470
III. Collecting, Displaying, and Analyzing Data 477

CC BY NC

Name _____ Date _____

I. Understanding the Statistical Process

Topic Practice

A. Explain whether each given question yields data with variability in order to determine whether it is a statistical question. When the question does not yield data with variability, rewrite it to make it a statistical question.

1. How many people in a 6th grade class like to watch television?

2. Is chocolate your favorite flavor of ice cream?

3. Do you usually go to bed before 10:00 PM on school nights?

CC BY NC

4. How many of the students in a school were born in their current state of residence?

5. How much did you weigh when you were born?

6. Who is the fastest runner in a 6th grade class?

B. Determine whether each set of given data are categorical or quantitative.

1. The basketball teams records the number of points scored during each game of the season.

2. Each student in your class lists their favorite sport.

3. Each student in your class lists their favorite type of music.

4. Each student in your class lists the number of video games they own.

5. Omar lists the different types of animals that he observes on his nature walk.

6. Each student in your class lists the distance they travel to school each day to the nearest tenth of a mile.

C. Write two statistical questions about each given topic that someone could answer by conducting a survey or experiment.

1. Dance

CC BY NC

2. Breakfast

3. Music

4. Books

5. States in the U.S.

6. Pets

D. Determine whether a survey, observational study, or an experiment would be the best way to answer each given statistical question.

1. How many sixth-grade students in a school bring a water bottle?

2. Do students in schools throughout Texas prefer jalepeño peppers or serano peppers?

3. Which students in your school can jump highest?

4. How many students in a class prefer writing using pens instead of pencils?

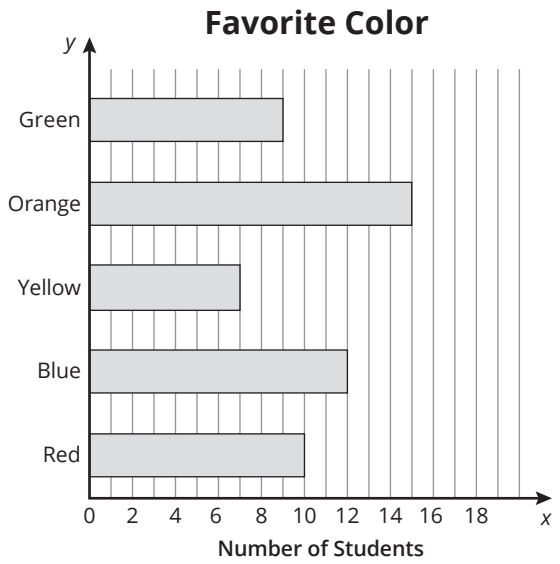
5. Which students in your school can run the 100-yard dash the fastest?

6. Do in America prefer soda or juice?

CC BY NC

E. Analyze the given graphs to solve each problem.

James is interested in the favorite color of students in the sixth grade. He completed a survey. His results are shown in the bar graph.



1. How many sixth-grade students did James survey?

2. What is the mode for the survey results?

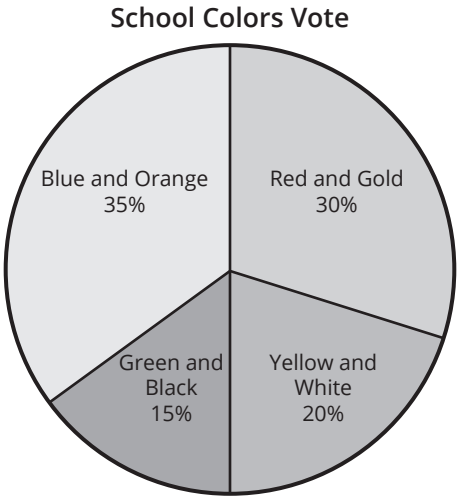
3. Use the graph to complete the relative frequency table. Round decimals to the nearest thousandths.

Color	Frequency (f)	Relative Frequency
Green		
Orange		
Yellow		
Blue		
Red		

4. The sixth-grade students are going to choose a color for sixth-grade t-shirts. Which color should they choose? Explain your reasoning.

CC BY NC

The circle graph shows the results of the vote for the new school colors.



5. If 500 students voted, how many students voted for red and gold?

6. Create a bar graph to display the information from the circle graph in terms of actual number of votes per color combination when the survey included 500 total students. Be sure to label your graph and add a title.

7. What should be the new school colors based on your graphs?

Extension

In 1945, George Polya published a book about mathematical problem solving. He outlined a four-step process for problem solving:

1. Understand the Problem
2. Devise a Plan
3. Carry out the Plan
4. Look Back

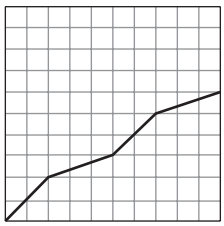
Research the four steps and explain how the four-component statistical problem-solving process is similar to and different from Polya's four steps for mathematical problem solving.

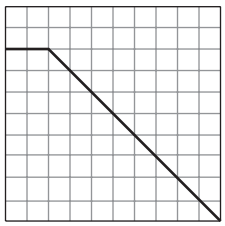
CC BY NC

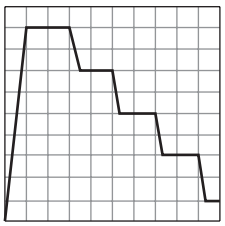
Spaced Practice

1. Choose the graph that best represents the scenario. Explain your reasoning.

   Catalina fills a mug with tea. Every few minutes, Catalina takes a drink from the mug.

A. 

B. 

C. 

Determine whether each statement represents addititive reasoning or multiplicative reasoning.

2. A litter of kittens has 2 males and twice as many females.

3. It snowed 6 inches last weekend and 3 more inches the weekend before.

4. Use absolute value equations to justify each answer.

   a. Determine the distance between the horizontal lines on a coordinate plane that that contain points A (7, 5) and B (−4, −8).

b. Determine the distance between the vertical lines on a coordinate plane that contain points *A* (7, 5) and *B* (−4, −8).

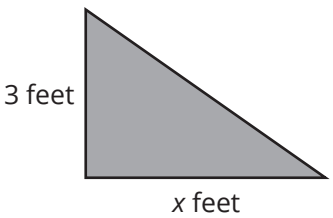
5. Insert a $>$, $<$, or $=$ symbol to make each number sentence true.

a. $-9\frac{1}{8}$ _____ −9.4

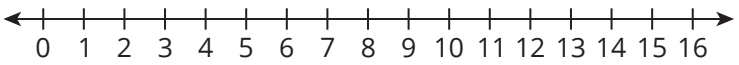
b. 0.006 _____ 1%

6. The area of a triangle is at least 21 square feet.

a. Write an inequality to model the area of the triangle.



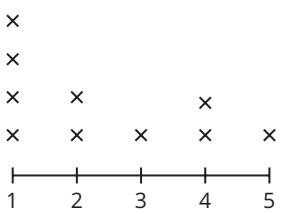
b. Solve the inequality to determine the possible lengths for the base of the triangle. Then, graph the solution set on a number line.



II. Analyzing Numerical Data Displays

Topic Practice

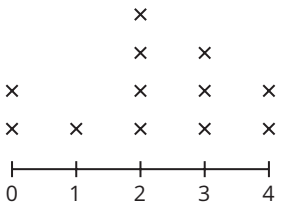
A. Answer the questions about each dot plot.

1. 

a. What is the mode of the data?

b. What is the range of the data?

c. List the values in order from least to greatest.

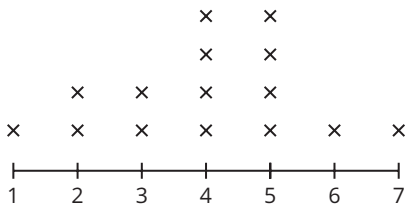
2. 

a. What is the mode of the data?

b. What is the range of the data?

c. List the values in order from least to greatest.

3.

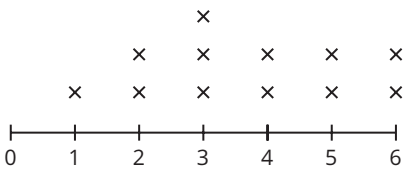


a. What is the mode of the data?

b. What is the range of the data?

c. List the values in order from least to greatest.

4.

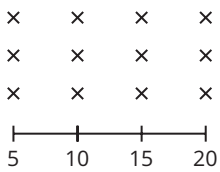


a. What is the mode of the data?

b. What is the range of the data?

c. List the values in order from least to greatest.

5.

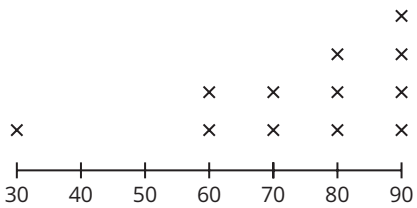


a. What is the mode of the data?

b. What is the range of the data?

c. List the values in order from least to greatest.

6.



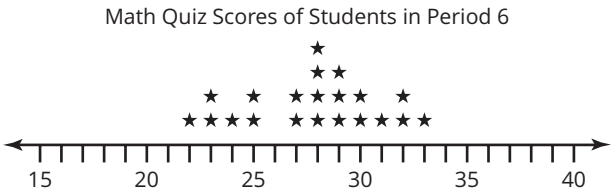
a. What is the mode of the data?

b. What is the range of the data?

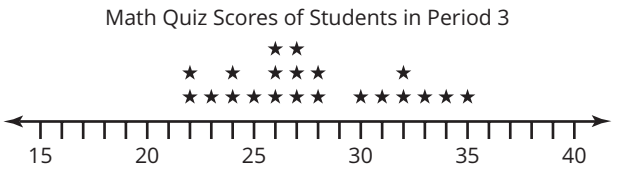
c. List the values in order from least to greatest.

B. Classify each display as symmetric, skewed left, or skewed right.

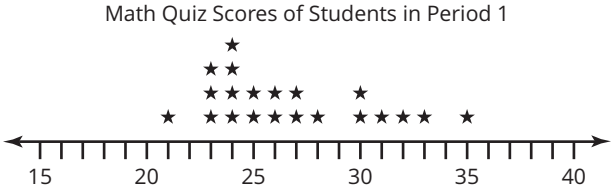
1.



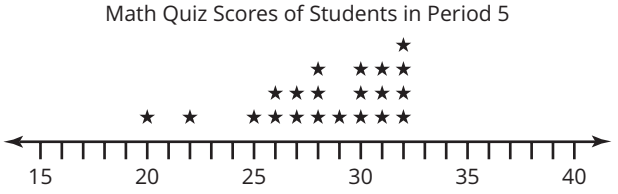
2.



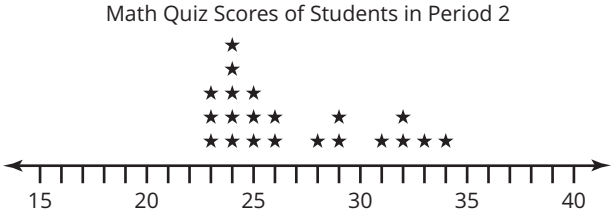
3.



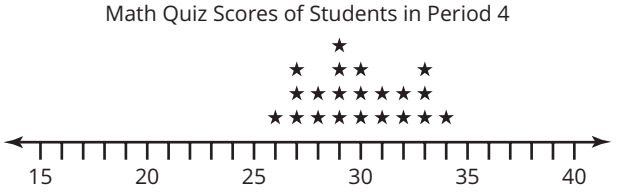
4.



5.

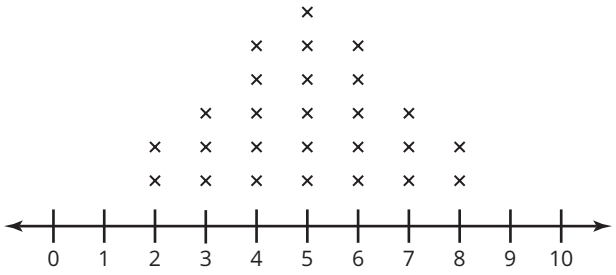


6.

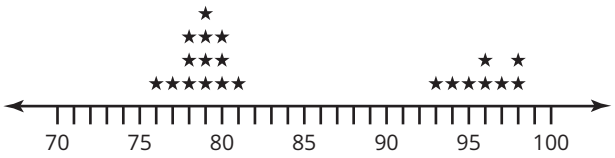


C. Identify any clusters, gaps, or outliers for each dot plot.

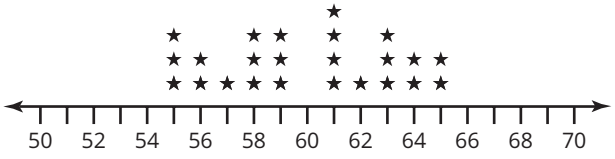
1.



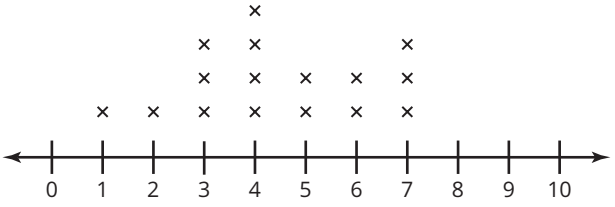
2.



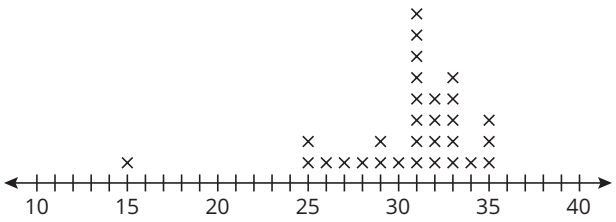
3.



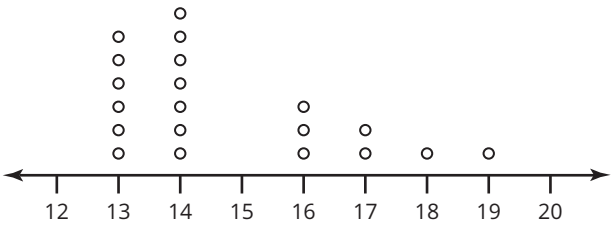
4.



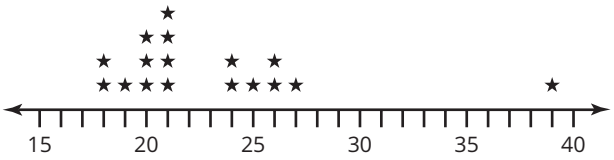
5.



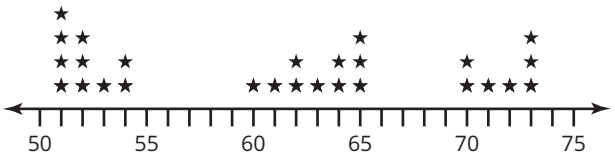
6.



7.



8.



D. Answer the questions about each stem-and-leaf plot.

1.

0	25
1	1146
2	02
3	4

Key: 9|9 = 9.9

a. The entry 3|4 represents what data value?

b. List the values located in the 1 stem in order from least to greatest.

c. What is the mode of the data?

d. What is the range of the data?

2.

1	68
2	
3	033
4	16
5	45
6	7
7	1

Key: 9|9 = 99

a. The entry 4|6 represents what data value?

b. List the values located in the 3 stem in order from least to greatest.

c. What is the mode of the data?

d. What is the range of the data?

3.

1	889
2	01444789
3	236889
4	056

Key: 9|9 = 99

a. The entry 2|8 represents what data value?

b. List the values located in the 1 stem in order from least to greatest.

c. What is the mode of the data?

d. What is the range of the data?

4.

0	235567889
1	00024566
2	012558
3	05

Key: 9|9 = 9.9

a. The entry 0|5 represents what data value?

b. List the values located in the 2 stem in order from least to greatest.

c. What is the mode of the data?

d. What is the range of the data?

CC BY NC

5.

1	14779
2	0224
3	3
4	0344
5	125689

Key: 9|9 = 9.9

a. The entry 2|0 represents what data value?

b. List the values located in the 5 stem in order from least to greatest.

c. What is the mode of the data?

d. What is the range of the data?

6.

0	889
1	4777
2	01136
3	
4	2

Key: 9|9 = 99

a. The entry 0|9 represents what data value?

b. List the values located in the 2 stem in order from least to greatest.

c. What is the mode of the data?

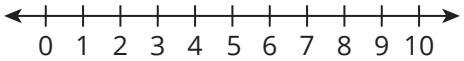
d. What is the range of the data?

E. Create the graphical representation indicated in each problem. Then, describe the shape of the data distribution.

1. The data set gives the number of sand dollars that 13 different people found at the beach in one hour:

   3, 1, 2, 3, 4, 4, 5, 4, 6, 10, 8, 5, 4

   a. Create a dot plot to display the number of sand dollars collected. Be sure to name your dot plot.

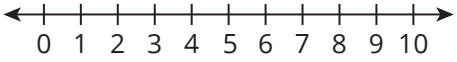


   b. Describe the shape of the distribution of the data.

2. The data set gives the number of speeding tickets that 12 people received:

   7, 0, 1, 0, 2, 0, 1, 1, 0, 2, 4, 3

   a. Create a dot plot to display the number of speeding tickets received. Be sure to name your dot plot.



   b. Describe the distribution of the data.

3. The data show the ages of 15 people who enter a baseball game:

   39, 13, 8, 9, 42, 14, 11, 7, 32, 5, 9, 10, 26, 18, 21

   a. Create a stem-and-leaf plot to display the ages of people who enter the baseball game. Be sure to name your stem-and-leaf plot and provide a key.

   b. Describe the distribution of the data.

4. The data show the ages of 13 people who rent a car in one week:

   25, 41, 65, 57, 54, 28, 33, 40, 51, 41, 62, 42, 49

   a. Create a stem-and-leaf plot to display the ages of people renting a car. Be sure to name your stem-and-leaf plot and provide a key.

   b. Describe the distribution of the data.

CC BY NC

5. The data show the length of hair, in inches, that 22 people had cut off during their most recent hair cut.

   3.6, 5.0, 1.3, 0.5, 3.2, 2.6, 1.9, 4.6, 3.8, 2.7, 1.2, 3.6, 4.3, 2.3, 3.1, 5.2, 1.6, 2.0, 4.1, 2.2, 4.2, 1.9

   a. Create a stem-and-leaf plot to display the inches of hair cut during the most recent hair cut. Be sure to name your stem-and-leaf plot and provide a key.

   b. Describe the distribution of the data.

6. The data below give the ages of people entering a movie theater on a Tuesday night:

   55, 21, 30, 38, 48, 50, 49, 58, 9, 35, 37, 48, 49, 25, 53, 29, 56, 52, 41, 33, 56, 43

   a. Create a stem-and-leaf plot to display the ages of people entering the movie. Be sure to name your stem-and-leaf plot and provide a key.

   b. Describe the distribution of the data.

CC BY NC

F. Use the given graphical representations to answer the following questions.

You can see the number of points scored during each academic team meet during the season in the stem-and-leaf plot shown below:

Points Scored

3	0 5 5 5
4	0 0 5 5 5 5
5	0 0 0 5 5 5
6	0 0 0 5 5 5 5
7	0 0 5
8	
9	
10	
11	0

Key: 3|0 = 30 points

1. How many meets did the academic team have during the season?

2. Do any of the scores represent an outlier? If so, which one(s).

3. What is the most common number of points the academic team scored during the season?

4. How many times did the team score fewer than 50 points?

The diving scores from a high diving competition are shown in the stem-and-leaf plot below.

High Dive Score

4	6 8
5	1 3 9 9
6	0 1 1 2 5 6 7 8 9
7	0 0 2 3 3 6 6 7 8 9
8	0 1 1 2 3 5
9	1 2

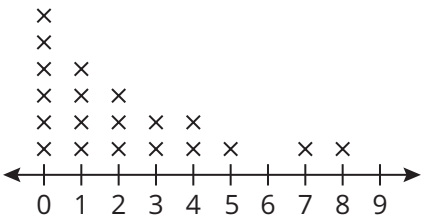
Key: 4|6 = 4.6

5. How many dives were scored?

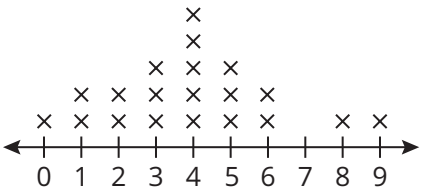
6. What is the highest score that a dive received?

7. Did more than half of the dives receive scores of 7.0 or greater?

Two dot plots are shown. The first dot plot shows the number of free throws twenty students made out of ten attempts before one week of basketball practice. The second dot plot shows the number of free throws the same twenty students made out of ten attempts after one week of basketball practice.



Number of Free Throws Made Before One Week of Practice



Number of Free Throws Made After One Week of Practice

8. Describe the distribution of the data in each dot plot and describe any clusters or gaps that exist.

9. What is the most common number of free throws made before one week of practice? After one week of practice?

10. How many students made less than 5 free throw attempts out of ten before one week of practice? After one week of practice?

11. Describe what you think the distribution would look like after 6 weeks of practice.

Extension

Another type of display used to compare two data sets is a side-by-side or back-to-back stem-and-leaf plot.

1. Describe the distribution of each data set.
2. Then, use the key and the plot to list the numerical data values in each data set.

Data Set 1								Data Set 2						
					8	6	4							
				9	3	1	5	9						
9	8	6	5	1	1	0	6	2	7					
				7	3	2	7	0	0	3	6	6	8	9
					5	3	8	0	1	1	2			
					2	1	9							

Key: 1|5|9 = 5.1 and 5.9

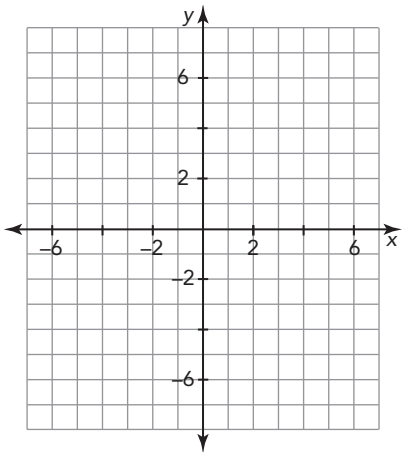
Spaced Practice

1. Write a statistical question about each situation.

   a. Vacation destinations

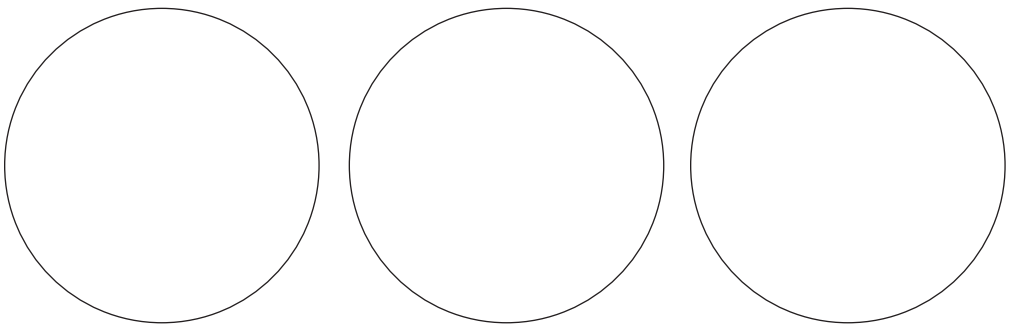
   b. Books

2. Plot and identify 4 points on a coordinate plane that are vertices of a parallelogram. Include points in more than one quadrant. Draw the parallelogram. Write absolute value statements for the length of the base and height of your parallelogram. Then, determine the area of the parallelogram.



Place each number below in the correct circle in the diagram provided.

Positive Integer | Negative Integer | Not an Integer



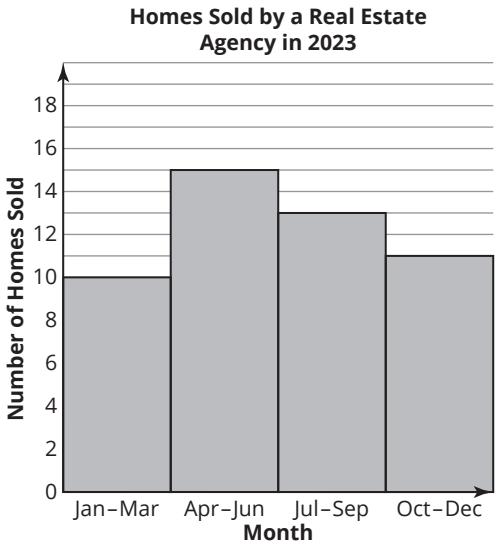
3. 21
4. $\frac{6}{7}$
5. −4.08
6. 5.4
7. −71
8. 18

III. Using Histograms to Display Data

Topic Practice

A. Analyze the given histogram to solve each problem.

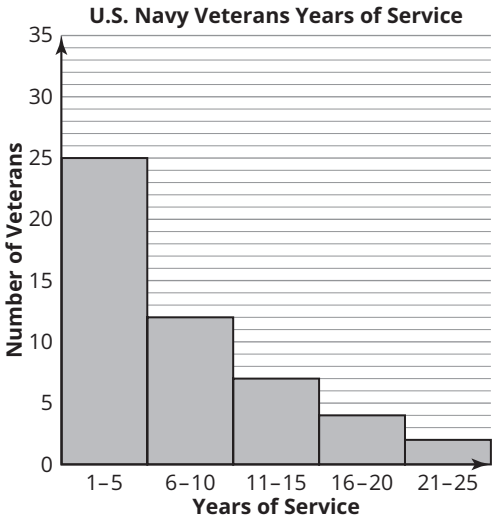
1. The histogram displays the number of homes sold by a real estate agency in 2023.



a. During which 3-month interval did the real estate agency sell the most homes, and how many homes did they sell during that interval?

b. How many homes did the real estate agency sell in 2023?

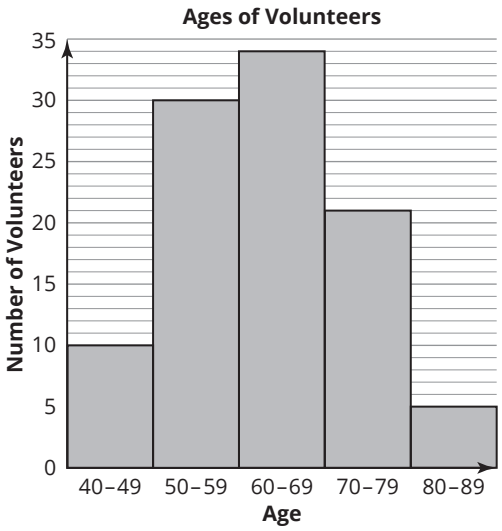
2. The histogram displays the number of years of service for a sample of U.S. Navy veterans.



a. How many veterans in the sample had more than 15 years of service?

b. How many veterans are represented by the histogram?

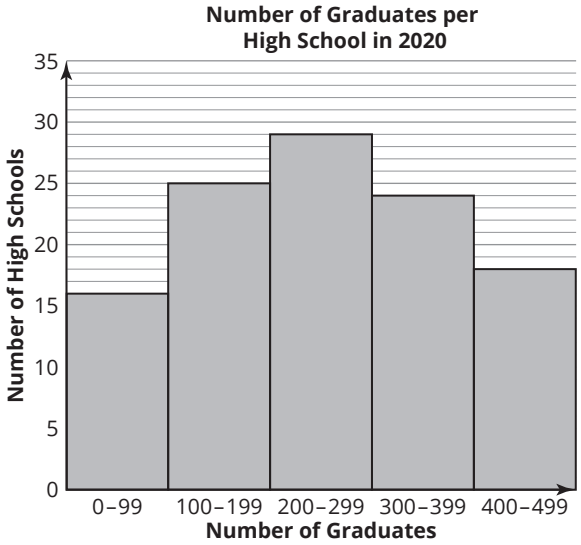
3. The histogram displays the ages of election volunteers in a city.



a. How many volunteers are in their sixties?

b. How many volunteers are younger than 60?

4. The histogram displays the number of graduates from various high schools in 2020.

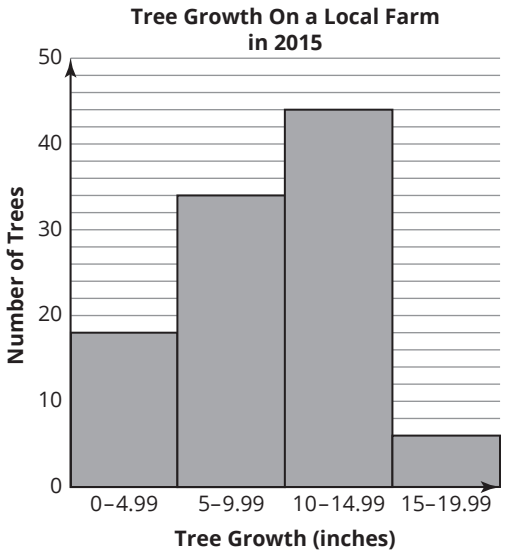


a. How many high schools represented in the histogram had 300 or more graduates in 2020?

b. How many high schools are represented in the histogram?

CC BY NC

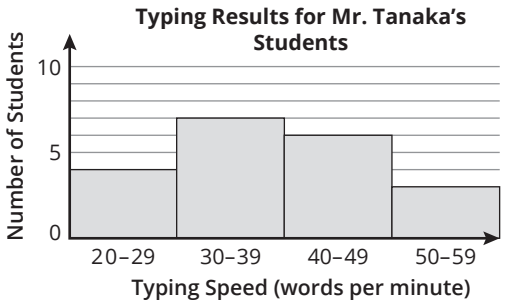
5. The histogram displays the tree growth in one year for a sample of trees measured at a local farm.



a. How many trees measured grew 10 or more inches over the year?

b. How many trees are represented on the histogram?

6. The histogram displays the typing results of students in Mr. Tanaka's typing class.



a. How many students represented in the histogram have a typing speed less than 40 words per minute?

b. How many students are represented in the histogram?

B. Create a histogram based on the data in each frequency table. Be sure to label your graph and add a title.

1.

Number of Books Read by Members of the Novel Idea Book Club	
Number of Books Read	Frequency (*f*)
0–9	7
10–19	13
20–29	9
30–39	2

2.

Test Scores for Mr. Brown's Math Test	
Test Score	Frequency (*f*)
61–70	4
71–80	7
81–90	9
91–100	8

CC BY NC

3.

Strep Throat Cases Reported by Doctors' Offices	
Number of Cases of Strep Throat	Frequency (*f*)
0–9	7
10–19	5
20–29	6
30–39	13
40–49	4

4.

Greatest Number of Points Scored in a Single Game Last Season by 25 Basketball Teams	
Greatest Number of Points Scored	Frequency (*f*)
70–79	6
80–89	10
90–99	5
100–109	4

5.

Number of Employees at Dallas Restaurants	
Number of Employees	Frequency (f)
10–19	3
20–29	11
30–39	5
40–49	3

6.

Number of Roller Coasters at 19 Theme Parks	
Number of Roller Coasters	Frequency (f)
7–9	6
10–12	4
13–15	7
16–18	2

CC BY NC

C. The tables from the previous problem set have been extended to display relative frequency. Complete each table by determining the relative frequencies. Round decimals to the nearest thousandth, if necessary.

1.

Number of Books Read by the Members of the Novel Idea Book Club		
Number of Books Read	Frequency (*f*)	Relative Frequency
0–9	7	
10–19	13	
20–29	9	
30–39	2	

2.

Test Scores for Mr. Brown's Math Test		
Test Score	Frequency (*f*)	Relative Frequency
61–70	4	
71–80	7	
81–90	9	
91–100	8	

3.

Strep Throat Cases Reported by Doctors' Offices		
Number of Cases of Strep Throat	Frequency (*f*)	Relative Frequency
0–9	7	
10–19	5	
20–29	6	
30–39	13	
40–49	4	

4.

Greatest Number of Points Scored in a Single Game Last Season by the Top 25 Mens' College Basketball Teams		
Greatest Number of Points	Frequency (*f*)	Relative Frequency
70–79	6	
80–89	10	
90–99	5	
100–109	4	

CC BY NC

5.

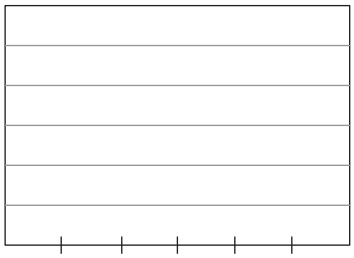
Number of Employees at Dallas Restaurants		
Number of Employees	Frequency (*f*)	Relative Frequency
10–19	3	
20–29	11	
30–39	5	
40–49	3	

6.

Number of Roller Coasters at Major Theme Parks		
Number of Roller Coasters	Frequency (*f*)	Relative Frequency
7–9	6	
10–12	4	
13–15	7	
16–18	2	

Extension

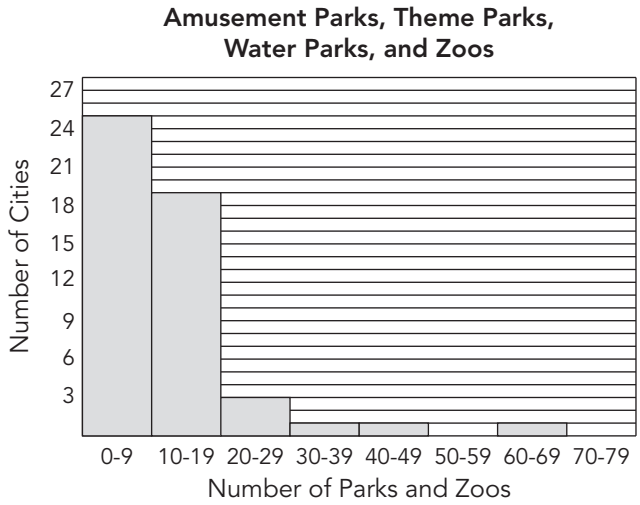
Lauren claims that she can turn any stem-and-leaf plot into a histogram. Is she correct? Provide an example or a counterexample.



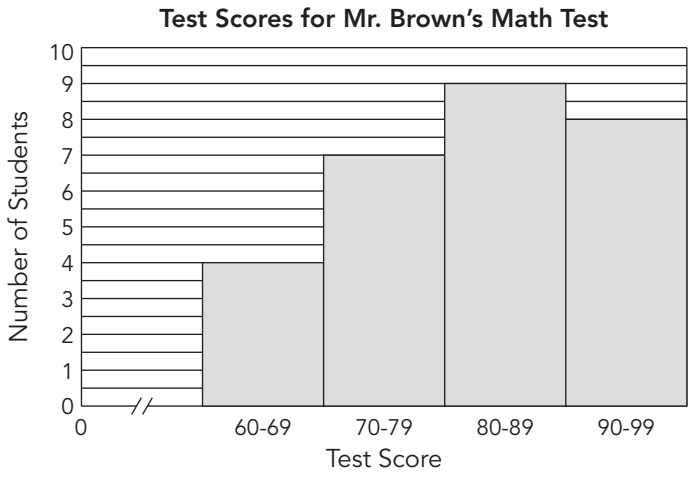
Spaced Practice

1. Describe the shape of each histogram.

a.



b.



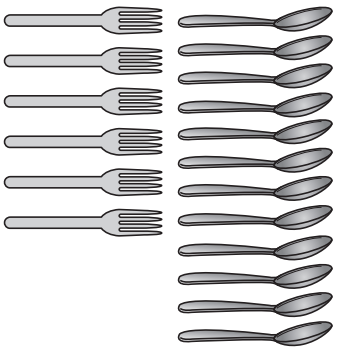
2. Identify the equivalent ratios.

Each model shows a ratio of forks to spoons. Which models show the same ratio?

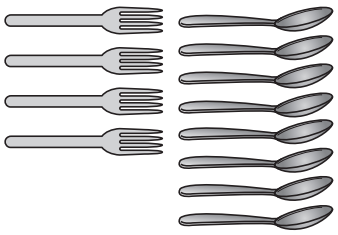
Model 1



Model 2



Model 3



3. Determine the absolute value of each number.

   a. $|-4.2|$

   b. $\left|11\frac{7}{8}\right|$

Identify each described method of paying for college as a grant, scholarship, work-study program, student loan, or savings. Explain your reasoning.

4. Trung has been depositing money into an account every month for the past five years. He plans to use that money for college.

5. Ashley studied consistently throughout high school. Because of her grades, the college she will be attending gave her money.

CC BY NC

State whether each statement is true or false. Explain your reasoning.

6. Paola wants to get a car loan to purchase a new car. The lender can use Paola's credit report to determine if Paola has a history of borrowing money and paying it back on time.

7. Josh wants to get a mortgage to purchase a home. He can use his credit report to prove his salary is enough to cover the mortgage.

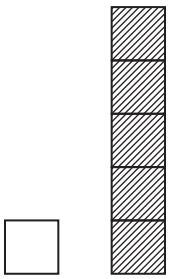
Name _____ Date _____

I. Analyzing Data Using Measures of Center

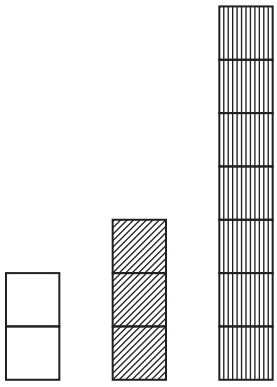
Topic Practice

A. Use cube stacks to determine the balance point, or center, for each data set. Move the cubes in the sketch and use words to describe your steps.

1. 1, 5

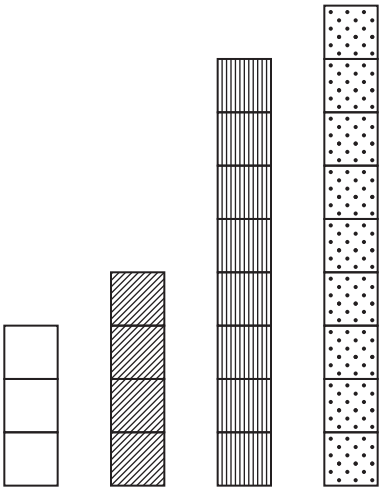


2. 2, 3, 7

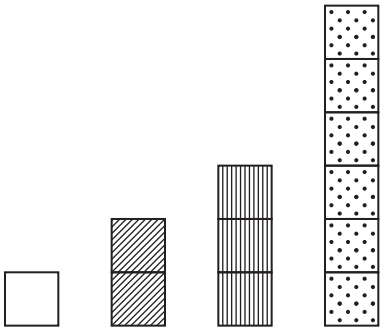


CC BY NC

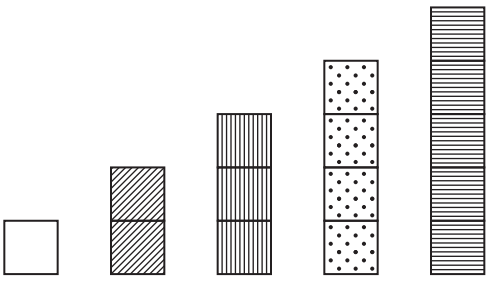
3. 3, 4, 8, 9



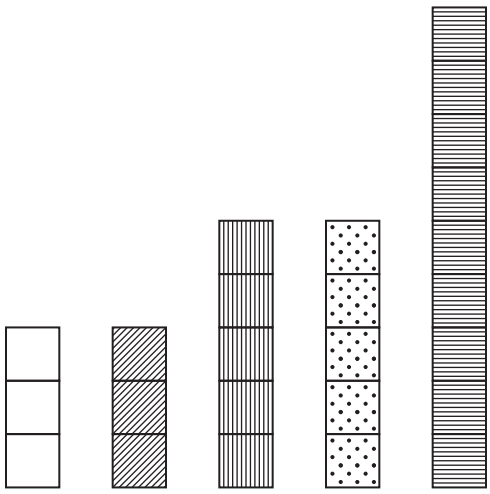
4. 1, 2, 3, 6



5. 1, 2, 3, 4, 5

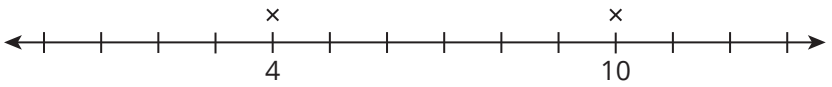


6. 3, 3, 5, 5, 9

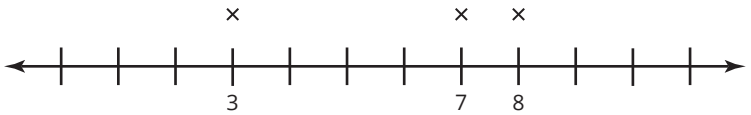


B. Use a number line to determine the balance point, or center, for each data set. Sketch and describe your steps.

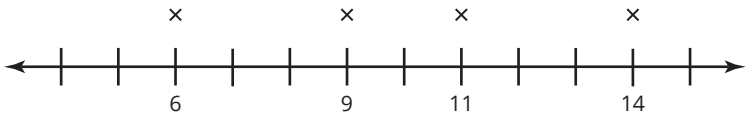
1. 4, 10



2. 3, 7, 8

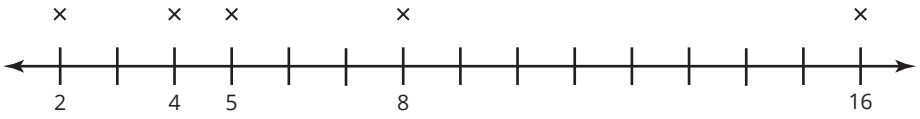


3. 6, 9, 11, 14

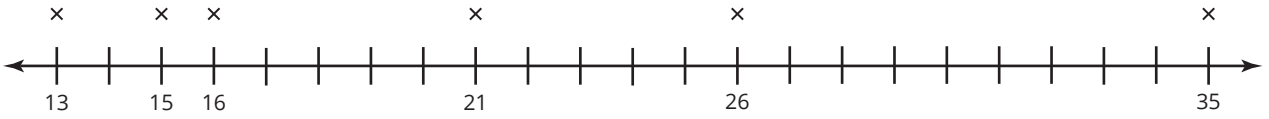


CC BY NC

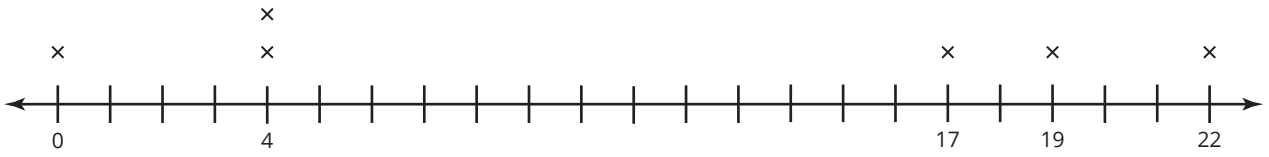
4. 2, 4, 5, 8, 16



5. 13, 35, 15, 21, 16, 26



6. 0, 4, 4, 17, 19, 22



C. Determine the mean, median, and mode for each data set. Indicate whether there is no mode or more than one mode.

1. The table shows the number of customers who visited a new restaurant during the first 6 days that it was open.

Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Customers	128	38	48	97	67	114

CC BY NC

2. The table shows the number of wins for several teams in a softball league.

Team	Tigers	Lions	Bears	Cougars	Panthers
Wins	19	11	3	17	19

3. The table shows the life expectancy, in years, for several countries.

Country	Senegal	Tanzania	Italy	Rwanda	Japan	Zambia
Life Expectancy (years)	68.2	60.9	82.9	63.5	83.1	57.0

4. The table shows the cost of living index for several countries.

Country	Turkey	Kenya	Brazil	Cambodia	Sri Lanka	Singapore
Cost of Living Index	81	62	56	59	54	98

5. The table shows the number of state parks for several states in the United States.

State	Maryland	California	Texas	New York	Kentucky
State Parks	68	280	89	215	45

6. The table shows the time, in minutes, Antonio spent exercising on each of the first 6 days this month.

Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Time Exercising (minutes)	0	49	6	49	26	53

7. The table shows the height, in inches, of several students in a school.

Student	Omar	Juliana	James	Ricardo	Jackson	Atalina	Lauren
Height (inches)	55	68	60	68	63	72	55

CC BY NC

8. The table shows the list price, in dollars, of one share of a stock on the first day of each of the first six months that it was listed.

Month	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Price (dollars)	15	2	13	20	23	20

D. Determine the measure of central tendency that was used to describe each data set.

1. The table shows the total number of medals won by several countries at the 2020 Summer Olympics.

Country	Syria	Ghana	Finland	South Africa	Mexico	India	United States
Medals	1	1	2	3	4	7	112

Which measure of center is represented by 18.6 medals won?

2. The table shows the distance, in light years, of several stars from our sun.

Star Name	Bernard's Star	Ross 248	Tau Ceti	L 143-23	G 054-023
Distance to our sun (light years)	5.98	10.32	11.8	14.66	15.94

Which measure of center is represented by 11.8 light years from our sun?

3. The table shows the number of Nobel Prize winners for several countries.

Country	Tibet	Bulgaria	Ethiopia	Argentina	Finland	Switzerland
Nobel Prize Winners	1	1	1	5	5	25

Which measure of center is represented by 3 Nobel Prize winners?

4. The table shows the number of electoral votes for several states in the United States for the year 2012.

State	Oklahoma	Connecticut	Louisiana	Colorado	Minnesota	Virginia
Medals	7	7	8	9	10	13

Which measure of center is represented by 7 electoral votes?

CC BY NC

5. The table shows the total area, in square miles, of several cities in the United States.

City	Mobile, Alabama	Adak, Alaska	Sierra Vista, Arizona	Columbus, Georgia	Fort Worth, Texas	Suffolk, Virginia
Land Area (sq mi)	180.1	127.3	153.5	221	349.2	400.0

Which measure of center is represented by an area of 238.5 square miles?

6. The table shows the standing heart rate, in beats per minute, of several students.

Student	Jane	Molly	Caitlin	Paige	Oscar	Ada	Vivianne
Heart Rate (beats per minute)	67	72	76	81	83	83	98

Which measure of center is represented by a standing heart rate of 83 beats per minute?

Extension

1. Create a data set in which the mean is greater than the median.

2. Create a data set in which the mean is less than the median.

Spaced Practice

1. Describe the shape of the distribution of the data shown.

a.

Stem	Leaf
1	4
2	0 1
3	2 2 9
4	1 4 5 6 7
5	3 5 7 7

Key: 1|4 means 14.

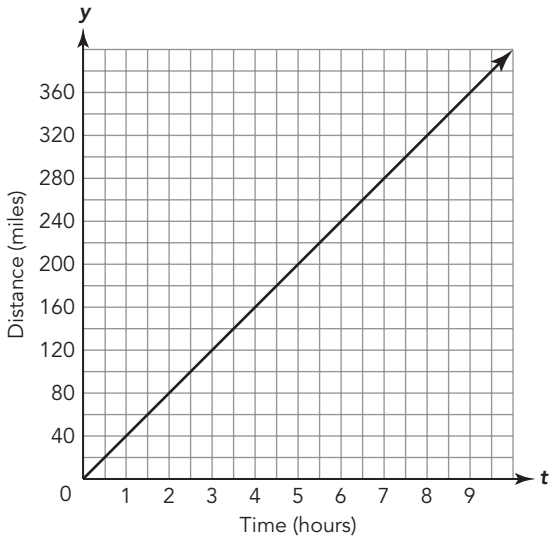
CC BY NC

b.

Stem	Leaf
4	1
5	3 7 8
6	0 1 4 4
7	1 3 4 7
8	0 9 9
9	6

Key: 4|1 means 4.1.

2. The graph represents the total distance traveled in miles. Use the graph to answer each question.



a. Write an equation to represent the graph. Define each variable.

b. When you know the total distance traveled, how can you use the graph to determine the number of hours? How many hours did it take to travel 120 miles?

3. Evaluate each expression.

a. $\frac{(8 + 2)^2}{2}$

b. $10 + 5^2 - 3 \cdot 2^2$

CC BY NC

II. Displaying the Five-Number Summary

Topic Practice

A. Determine the minimum, median, Q1, Q3, maximum, and the interquartile range (IQR) for each given data set.

1. The data set is 0, 3, 5, 6, 8, 12, 12, and 15.

2. The data set is 5, 5, 6, 10, 13, 16, 16, 18, and 20.

3. The data set is 20, 25, 25, 30, 40, 45, and 60.

4. The data set is 18, 2, 10, 5, 22, 9, 15, 10, and 3.

5. The data set is 52, 33, 24, 68, 70, 39, 50, 32, 41, and 62.

6. The data set is 5, 12, 15, 18, 19, 19, and 25.

7. The data set is 14, 15, 21, 21, 23, 23, 33, and 38.

8. The data set is 5, 7, 4, 2, 5, 6, and 3.

9. The data set is 100, 110, 130, 135, 140, 140, 150, and 190.

10. The data set is 375, 350, 300, 525, and 425.

CC BY NC

B. Construct a box plot for each data set.

1. The data set is 0, 4, 6, 10, 12, 15, 19, and 20.

2. The data set is 10, 15, 15, 16, 18, 20, 28, and 35.

3. The data set is 0, 10, 10, 20, 20, 25, 25, and 30.

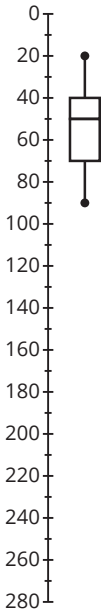
4. The data set is 50, 60, 60, 70, 75, 90, and 100.

5. The data set is 10, 20, 25, 30, and 40.

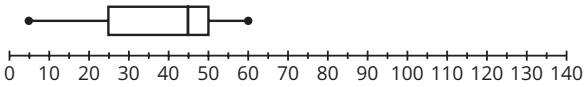
6. The data set is 0, 18, 9, 1, 2, 14, 3, 5, 8, 1, and 24.

C. Determine the range, the median, Q1, Q3, and the interquartile range (IQR) for each given box plot.

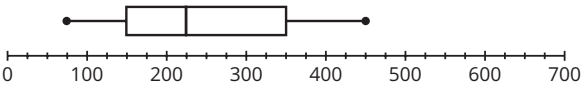
1.



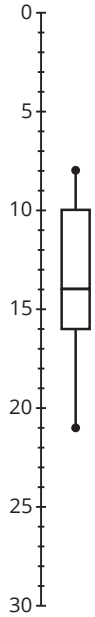
2.



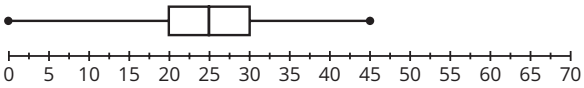
3.



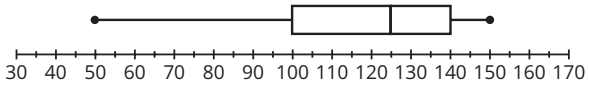
4.



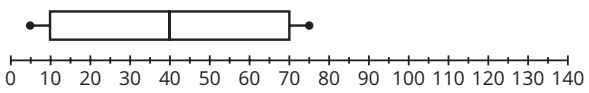
5.



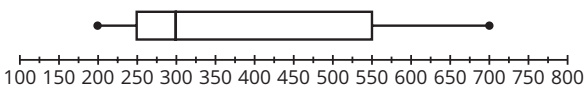
6.



7.



8.



Extension

An arithmetic sequence is formed by adding (or subtracting) the same number over and over.

For example, 2, 5, 8, 11, 14, 17, . . . is an arithmetic sequence formed by adding 3 over and over after choosing a starting number.

1. Create box plots using different arithmetic sequences as data.

2. How are the plots similar?

3. What do you notice about the IQR of each plot?

Spaced Practice

1. Determine the mean, median, mode, and range of the set of data. Round your answers to the nearest hundredth, if necessary.

   a. 14, 19, 8, 22, 11, 19, 4, 18, 12, 10, 21

   b. 55, 24, 73, 108, 39, 46, 72, 100, 92, 32

2. Construct a dot plot for each.

   a. Display the number of items purchased by a number of randomly chosen customers at a toy store. The data are 2, 4, 3, 7, 12, 3, 1, 5, 6, 3, 4, 2, 4, 3, 7, 14, 10, 3, 5, and 9. Describe the distribution.

   b. Display the scores on a recent math quiz. The data are 12, 14, 8, 13, 12, 14, 5, 13, 14, 3, 15, 15, 10, 13, 12, 0, 14, 11, 14, 13, and 10. Describe the distribution.

CC BY NC

3. Determine each product.

a. $\frac{3}{8} \cdot \frac{4}{5}$

b. $\frac{1}{2} \cdot \frac{2}{1}$

Complete each table by determining the relative frequencies. Round decimals to the nearest thousandth, if necessary.

4.

Number of Pitches Thrown by Members of a Baseball Team		
Number of Pitches Thrown	Frequency (f)	Relative Frequency
20–29	3	
30–39	8	
40–49	7	
50–59	2	

5.

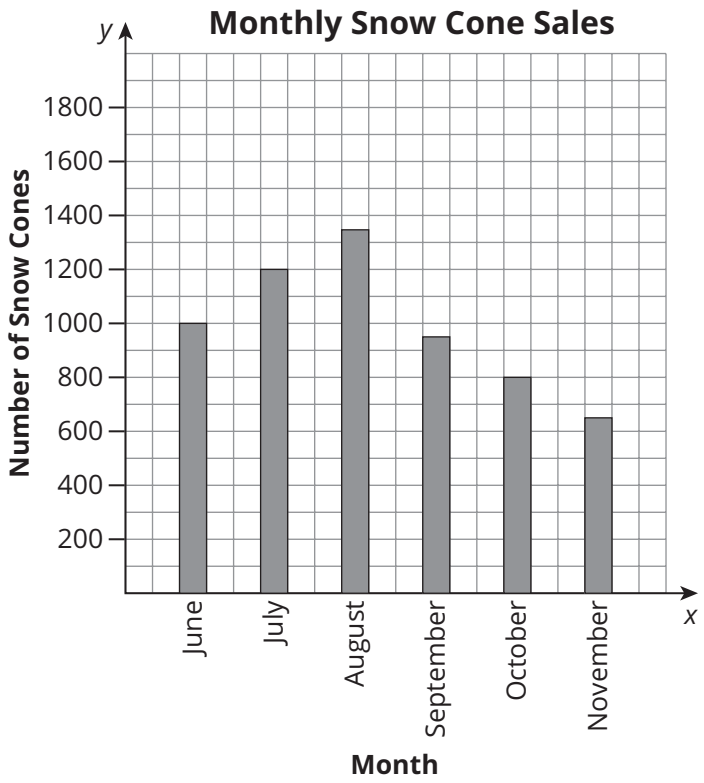
Number of Books of Different Genres in a Lending Library		
Genre	Frequency (f)	Relative Frequency
Historical Fiction	13	
Graphic Novel	28	
Non-Fiction	6	
Fantasy	41	

III. Collecting, Displaying, and Analyzing Data

Topic Practice

A. Analyze the given graph to answer each problem.

1. The bar graph shows the number of snow cones sold each month at a local food truck.

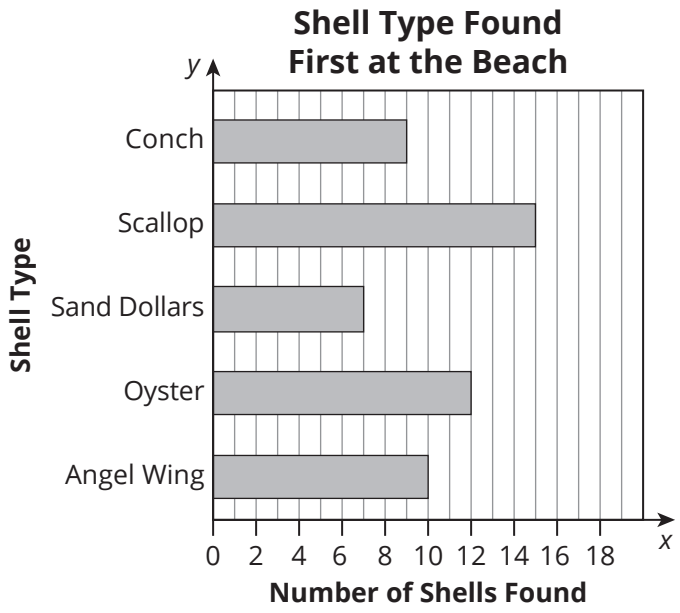


   a. In which of the six months did the food truck sell the fewest snow cones? How many did they sell in that month?

b. Identify the mode and describe what it means for the problem situation.

c. How many total snow cones did the food truck sell during the six-month period represented in the graph?

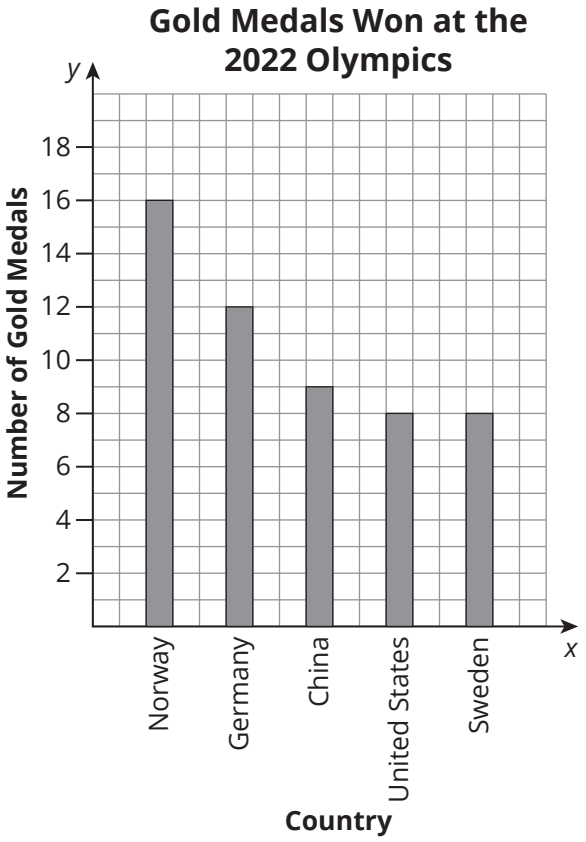
2. On a recent trip to a beach in southern Alabama, Alejandra was interested in the different kinds of shells that could be seen on the beach. She surveyed beach goers to see what the first type of shell they saw at the beach was. The results are shown in the bar graph below.



a. Identify the mode and describe what it means for the problem situation.

b. How many beach goers did Sylvia survey?

3. The bar graph represents the number of gold medals won by 5 countries at the 2022 Winter Olympics.

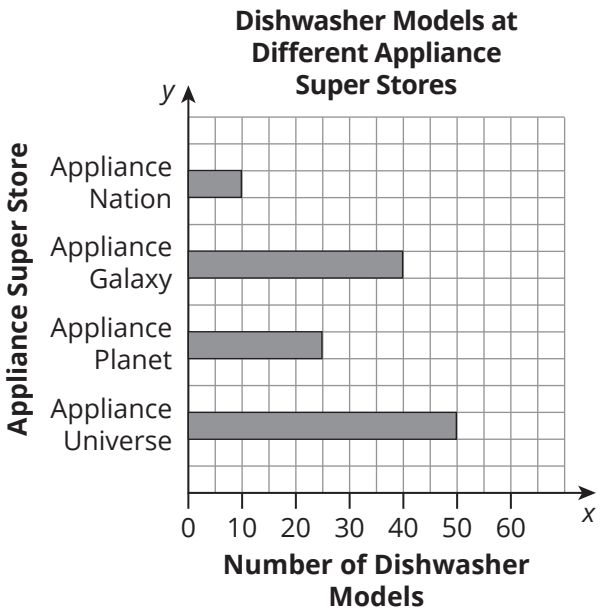


a. Identify the mode and describe what it means for the problem situation.

b. How many more gold medals did Norway win than the United States at the 2022 Winter Olympics?

c. How many gold medals did Germany win at the 2022 Winter Olympics?

4. The bar graph represents the number of different dishwasher models available at each appliance super store.

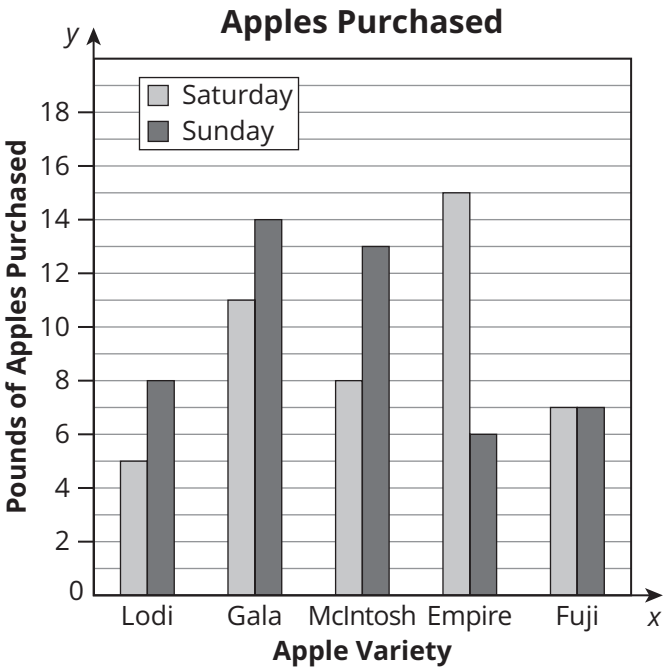


a. Which appliance super store has 25 different dishwasher models?

b. Determine the difference between the number of models at the store with the greatest number of dishwasher models available and the store with the least.

CC BY NC

5. The double bar graph shows the pounds of different apple varieties purchased at an apple orchard on Saturday and Sunday.

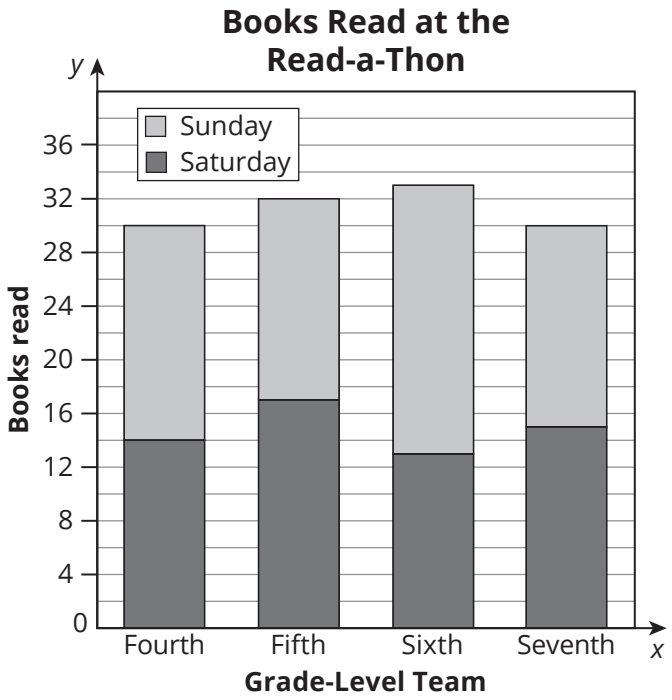


a. Which variety showed the greatest difference in sales over the two days?

b. Which was the best selling apple variety over the two day period? How many pounds of that variety of apple were sold?

c. What was the difference in Saturday's and Sunday's sales for the worst selling apple variety?

6. Students in four grade-level teams participated in a Read-a-Thon to raise money for a charity. The number of books read by students in each grade-level team on Saturday and Sunday are displayed in the stacked bar graph.

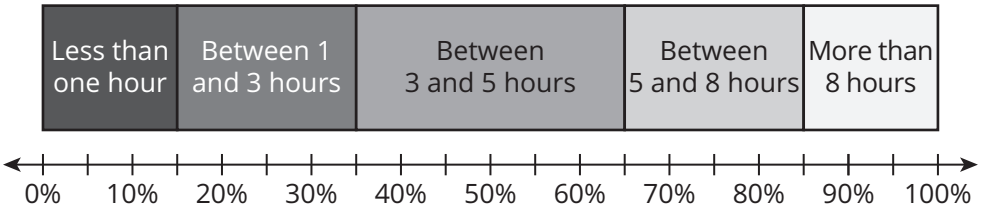


a. Which grade-level team read the greatest number of books on Saturday? How many books did the students in that grade-level read?

b. Which grade-level team read the greatest number of total books during the Read-a-Thon? How many total books did that grade-level team read?

B. Use the given information to answer the questions.

A magazine surveyed 35,000 students in Grades 6–12. A question on the survey asked students how many hours a week they spend surfing the internet. The survey had 5 responses to choose from: less than one hour, between 1 and 3 hours, between 3 and 5 hours, between 5 and hours, and more than 8 hours. The results of the survey are shown in the percent bar graph.



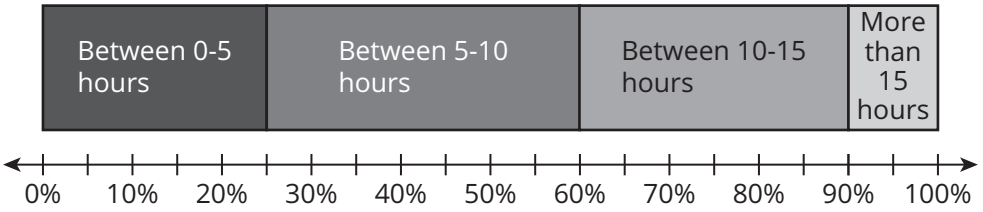
1. Determine the percent of the values in each category.

2. How many hours per week do twice as many students surf the internet as students who surf the internet more than 8 hours per week?

3. If 35,000 students responded to the survey, how many students spend between 1 and 3 hours per week surfing the internet?

4. Which category represents the mode?

The city surveyed the residents to determine how many hours each month residents used the library. The survey had 4 responses to choose from: between 0 and 5 hours, between 5 and 10 hours, between 10 and 15 hours, and more than 15 hours. The results of the survey are shown in the percent bar graph shown below.



5. Determine the percent of the values in each category.

6. What percent of residents spent between 5 and 10 hours each month at the library?

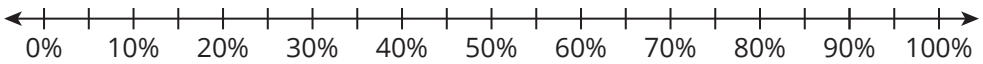
7. Which category represents the mode?

8. Kara concludes that more residents use the library between 0–5 hours each month than residents who use the library more than 15 hours each month. Is Kara correct? Explain your reasoning.

CC BY NC

9. Students in sixth grade were asked their favorite sport. The results are shown in the table. Use the table to make a percent bar graph to represent the data in the table.

Favorite Sport	
Sport	Number of Students
Baseball	27
Basketball	45
Football	21
Soccer	57



Extension

Develop a statistical question that you could ask that results in categorical data. Survey at least 25 people and record their responses. Create a data display that best represents your survey results, and explain why you chose that particular display.

Spaced Practice

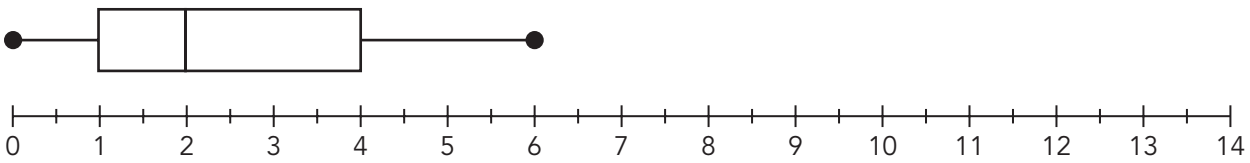
Construct a box plot for each data set.

1. The data are 0, 2, 6, 9, 11, 15, 17, and 20.

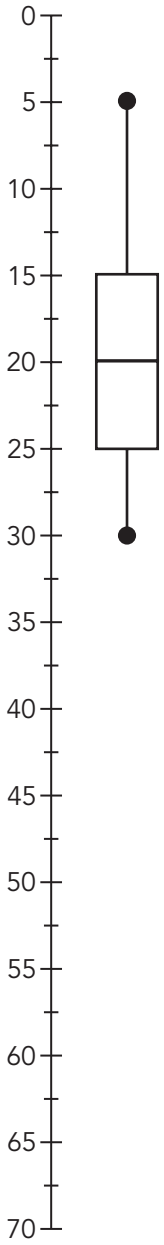
2. The data are 10, 13, 13, 14, 16, 20, 28, and 35.

Determine the range, the median, Q1, Q3, and the IQR for each given box plot.

3.



4.



ISBN: 978-1-970197-17-4

© 2024 Texas Education Agency. Portions of this work are adapted, with permission, from the originals created by and copyright © 2021 Carnegie Learning, Inc.

This work is licensed under a Creative Commons Attribution-Non-Commerial-4.0 International License.

You are free:

to Share—to copy, distribute, and transmit the work
to Remix—to adapt the work

Under the following conditions:

Attribution—You must attribute any adaptations of the work in the following manner:

> This work is based on original works of the Texas Education Agency and Carnegie Learning, Inc. This work is made available under a Creative Commons Attribution-Non-Commercial-4.0 International License. This does not in any way imply endorsement by those authors of this work.

NonCommercial—You may not use this work for commercial purposes.

With the understanding that:

For any reuse or distribution, you must make clear to others the license terms of this work. The best way to do this is with a link to this web page:

> https://creativecommons.org/licenses/by-nc/4.0/

Trademarks and trade names are shown in this book strictly for illustrative and educational purposes and are the property of their respective owners. References herein should not be regarded as affecting the validity of said trademarks and trade names.

Printed in the USA

Images

www.pixabay.com