SEACREST
COUNTRY DAY SCHOOL

Rising 8th Grade Summer Packet

Name: ______________________________

<u>Please show ALL work to receive full credit.</u>

The work in this packet is taken from the "Recall Prior Knowledge" sections in the 8th grade math textbook. It is designed to help students review key concepts that will support their success in next year's course. While much of the content reinforces material already covered, some topics may be unfamiliar. This is intentional and meant to give students a preview of upcoming concepts and an opportunity to stretch their thinking. We encourage students to try their best, and it's completely okay if they don't master every problem—just attempting the work is a valuable part of the learning process.

Have a great summer doing math!

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June 2025

There are 6 chapter reviews to complete in June.
Suggested pacing is below:

June 2-6:	Chapter 1-2
June 9-13:	Chapter 3-4
June 16-20:	Chapter 5
June 23-27:	Chapter 6

Chapter 1

The Real Number System

Have you ever been on a Ferris wheel?

A Ferris wheel revolves around its hub, lifting passengers and carrying them in a circle. You need the number π to calculate the distance traveled in one revolution of a Ferris wheel. Common approximations of π include $\frac{22}{7}$ and 3.14. A closer approximation of π is the calculator value 3.141592654.

Look again at the last digit in the approximation of π. Did you know that the exact value of π does not stop there? π belongs to a group of numbers called irrational numbers.

The real number system comprises irrational numbers and rational numbers. In this chapter, you will learn about the numbers that make up real numbers and how to locate them on a number line.

What numbers make up the set of real numbers?

Name: ______________________ Date: ____________

Expressing rational numbers in $\frac{m}{n}$ form

A rational number is a number that can be written as $\frac{m}{n}$, where m and n are integers with $n \neq 0$.

Integers, fractions, and decimals can all be written as $\frac{m}{n}$.

a $-52 = \frac{-52}{1}$

b
$$7\frac{2}{3} = \frac{7 \cdot 3}{3} + \frac{2}{3}$$
$$= \frac{21}{3} + \frac{2}{3}$$
$$= \frac{23}{3}$$

c
$$-1.64 = -1\frac{64}{100}$$
$$= \frac{-164}{100}$$
$$= \frac{-41}{25}$$

▶ Quick Check

Write each number in $\frac{m}{n}$ form, where m and n are integers, with $n \neq 0$.

1. 29
2. $5\frac{1}{8}$
3. -2.37

Locating rational numbers on a number line

To locate the rational numbers $\frac{3}{4}$ and -1.8 on a number line:

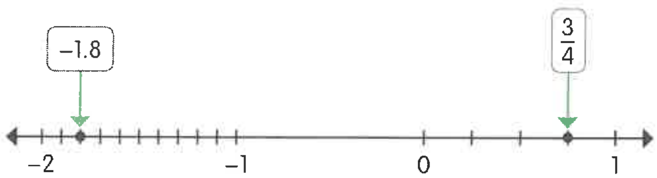
STEP 1 Find the integers that each rational number lies between.

$$0 < \frac{3}{4} < 1, -2 < -1.8 < -1$$

STEP 2 Graph a number line and label the integers.

STEP 3 Divide the distance between −2 and −1 into 10 equal segments and the distance between 0 and 1 into 4 equal segments

STEP 4 Use the segments to locate $\frac{3}{4}$ and −1.8.



Quick Check

Draw a number line. Then, locate each pair of rational numbers on the number line.

4. $\frac{3}{2}$ and −0.25

5. −0.8 and $\frac{1}{5}$

Writing rational numbers as terminating or repeating decimals

Any rational number can be written in decimal form using long division.

To write $\frac{3}{4}$ as a decimal:

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ -2\,8 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

Divide 3 by 4.
Add zeros after the decimal point.

The remainder is 0.

So, $\frac{3}{4}$ = 0.75.

0.75 is called a terminating decimal because it has a finite number of nonzero decimal places.

To write $\frac{2}{11}$ as a decimal:

```
     0.181818
 11) 2.000000      Divide 2 by 11.
                   Add zeros after the decimal point.
     1 1
     -------
       90
       88
     -------
        20
        11
     -------
         90
         88
     -------
          20
          11
     -------
           90
           88
     -------
            2      The remainder will not terminate with 0.
```

You can stop dividing when you see the digits continue to repeat themselves.

So, $\frac{2}{11} = 0.1818...$

0.1818... is called a repeating decimal because it has a group of one or more digits that repeat endlessly.

You write 0.1818... as $0.\overline{18}$ since the digits 1 and 8 repeat.

Quick Check

Using long division, write each rational number as a terminating decimal.

6. $\frac{4}{32}$

7. $\frac{77}{25}$

Using long division, write each rational number as a repeating decimal.

8 $\frac{4}{9}$

9 $\frac{31}{6}$

Comparing rational numbers on a number line

It can be easier to compare rational numbers on a number line if you write the rational numbers as decimals.

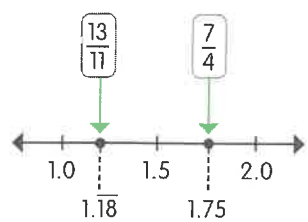
To compare $\frac{13}{11}$ and $\frac{7}{4}$:

$\frac{13}{11} = 1.1818\ldots$

$= 1.\overline{18}$

$\frac{7}{4} = 1.75$

On a number line, 1.75 lies to the right of $1.\overline{18}$.



So, $1.75 > 1.\overline{18}$

$\frac{7}{4} > \frac{13}{11}$

To compare $-1\frac{2}{5}$ and $-\frac{19}{10}$:

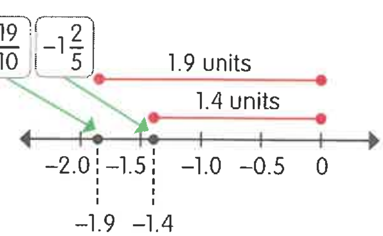
$-1\frac{2}{5} = -1.4$

$-\frac{19}{10} = -1.9$

You can use the absolute values of $-1\frac{2}{5}$ and $-\frac{19}{10}$ to locate the decimals on a number line.

$|-1.4| = 1.4$

$|-1.9| = 1.9$



On a number line, $-\frac{19}{10}$ lies further left of 0 than $-1\frac{2}{5}$.

So, $-1.9 < -1.4$

$-\frac{19}{10} < -1\frac{2}{5}$

RECALL PRIOR KNOWLEDGE

Quick Check

Compare each pair of rational numbers using the symbols < or >. Use a number line to help you.

10. $\frac{20}{3} \bigcirc \frac{5}{2}$

11. $-\frac{18}{5} \bigcirc -1\frac{7}{10}$

Rounding numbers

When rounding a number to a particular place value, you look at the digit to the right of the given place value to decide whether you have to round up or round down.

For example, to round a number to the nearest tenth you round down if the digit in the hundredths place is less than 5. If the digit in the hundredths place is 5 or more, you round up.

Quick Check

Round each decimal to 2 decimal places.

12. 1,356.255
(2 decimal places)

13. 405.4101
(2 decimal places)

Chapter

2 Exponents

How loud is loud?

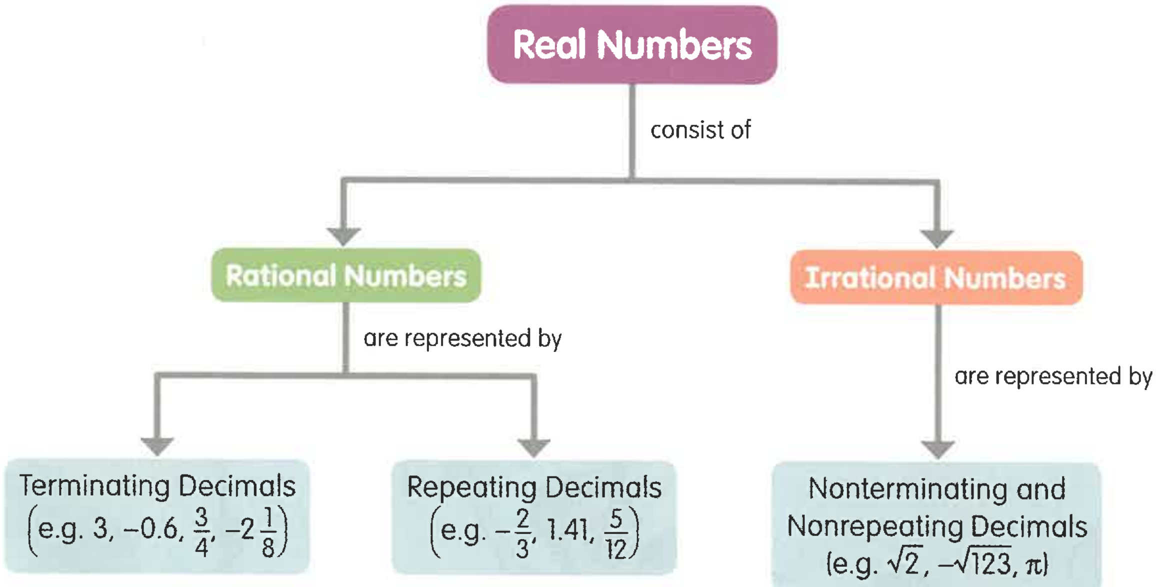
The human ear can hear a range of noises, from a soft whisper to the enormous blast of a rocket being launched into space. The intensity of sound is measured using a scale that involves powers of 10. A general rule of thumb is that if a noise sounds ten times as loud to your ears as another noise, the intensity is 10 decibels greater for the louder noise. In this chapter, you will learn how to use exponents to compare quantities such as the intensities of different noises.

How do you represent repeated multiplication of the same factor?

Name: ______________________ Date: ____________

Interpreting the real number system

The real number system is a combination of the set of rational numbers and the set of irrational numbers.



Unlike rational numbers, irrational numbers do not have exact values. You use rational approximations of irrational numbers to compare the size of irrational numbers and locate them approximately on a number line.

Quick Check

Locate each irrational number on a number line.

1. $\sqrt[3]{-47}$

2. $\sqrt{19}$

Adding and subtracting integers

You can use a number line to add and subtract integers. When you add a positive integer, move to the right on the number line. When you add a negative integer, move to the left. You can also use these rules.

Adding or Subtracting Integers	Rule	Expression
Add integers with the same sign.	Add the absolute values and keep the same sign.	$3 + 5 = 8$
Add integers with different signs.	Subtract the absolute values and use the sign of the number with the greater absolute value.	$-5 + 8 = 3$
Subtract two integers.	Add the opposite of the number being subtracted.	$8 - 3$ $= 8 + (-3)$ $= 5$

▶ Quick Check

Evaluate each expression.

3. $-3 + (-4)$

4. $-4 - (-2)$

Multiplying and dividing integers

You multiply or divide integers just as you do whole numbers, except that you must keep track of the signs. To multiply or divide integers, always multiply or divide the absolute values, and use these rules to determine the sign of the result.

Multiplying or Dividing Integers	Rule	Expression
Multiply or divide two integers with the same sign.	Multiply or divide the absolute values of the numbers and make the result positive.	$24 \cdot 4 = 96$ $(-24) \div (-4) = 6$
Multiply or divide two integers with different signs.	Multiply or divide the absolute values of the numbers and make the result negative.	$25 \cdot (-5) = -125$ $(-25) \div 5 = -5$

RECALL PRIOR KNOWLEDGE

Quick Check

Evaluate each expression.

5. $(-7) \cdot (-3)$

6. $(-12) \div 3$

Finding the square of a whole number

5^2 is called the square of 5. The square of a whole number is called a perfect square. Since $5 \times 5 = 25$, 25 is a perfect square.

Quick Check

Find the square of each number.

7. 9

8. 12

Finding the cube of a whole number

4^3 is called the cube of 4. The cube of a whole number is called a perfect cube. Since $4 \times 4 \times 4 = 64$, 64 is a perfect cube.

Quick Check

Find the cube of each number.

9. 8

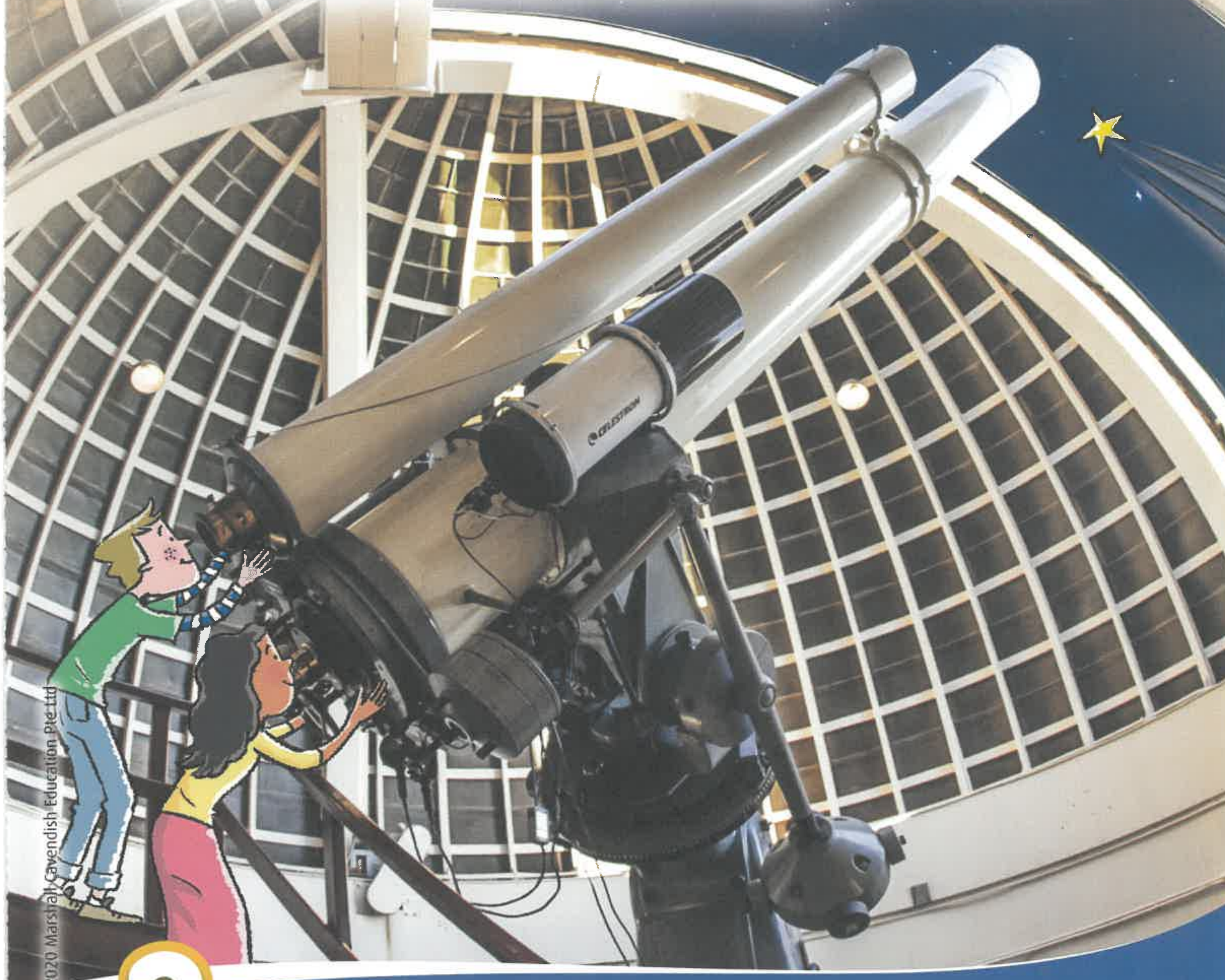
10. 11

Chapter

3 Scientific Notation

How far away are the stars?

When you look at the stars through a telescope, you are seeing light that has traveled an enormous distance. Proxima Centauri, the star that is closest to Earth after the Sun, is 39,900,000,000,000 kilometers from Earth. Many numbers like this are so large that scientists have invented a method called scientific notation to write them. In this chapter, you will use scientific notation to describe and compare very large and very small numbers.



How do you write very large and very small numbers in a convenient way?

RECALL PRIOR KNOWLEDGE

Name: ______________________ Date: ____________

Multiplying and dividing decimals by positive powers of 10

When you multiply a decimal by a positive power of 10, the decimal point moves to the right.

Examples:

$1.47 \cdot 10 = 14.7$ Multiply by 10^1.

$1.47 \cdot 100 = 147$ Multiply by 10^2.

$-1.47 \cdot 100 = -147$ Multiply by 10^2.

When you divide a decimal by a positive power of 10, the decimal point moves to the left.

Examples:

$1.2 \div 10 = 0.12$ Divide by 10^1.

$1.2 \div 100 = 0.12$ Divide by 10^2.

$-1.2 \div 100 = -0.012$ Divide by 10^2.

Quick Check

Evaluate each expression.

1. $1.8 \cdot 100$

2. $-0.28 \cdot 10^3$

3. $1.3 \cdot 10^4$

4. $74.5 \div 1{,}000$

5. $-3.8 \div 10$

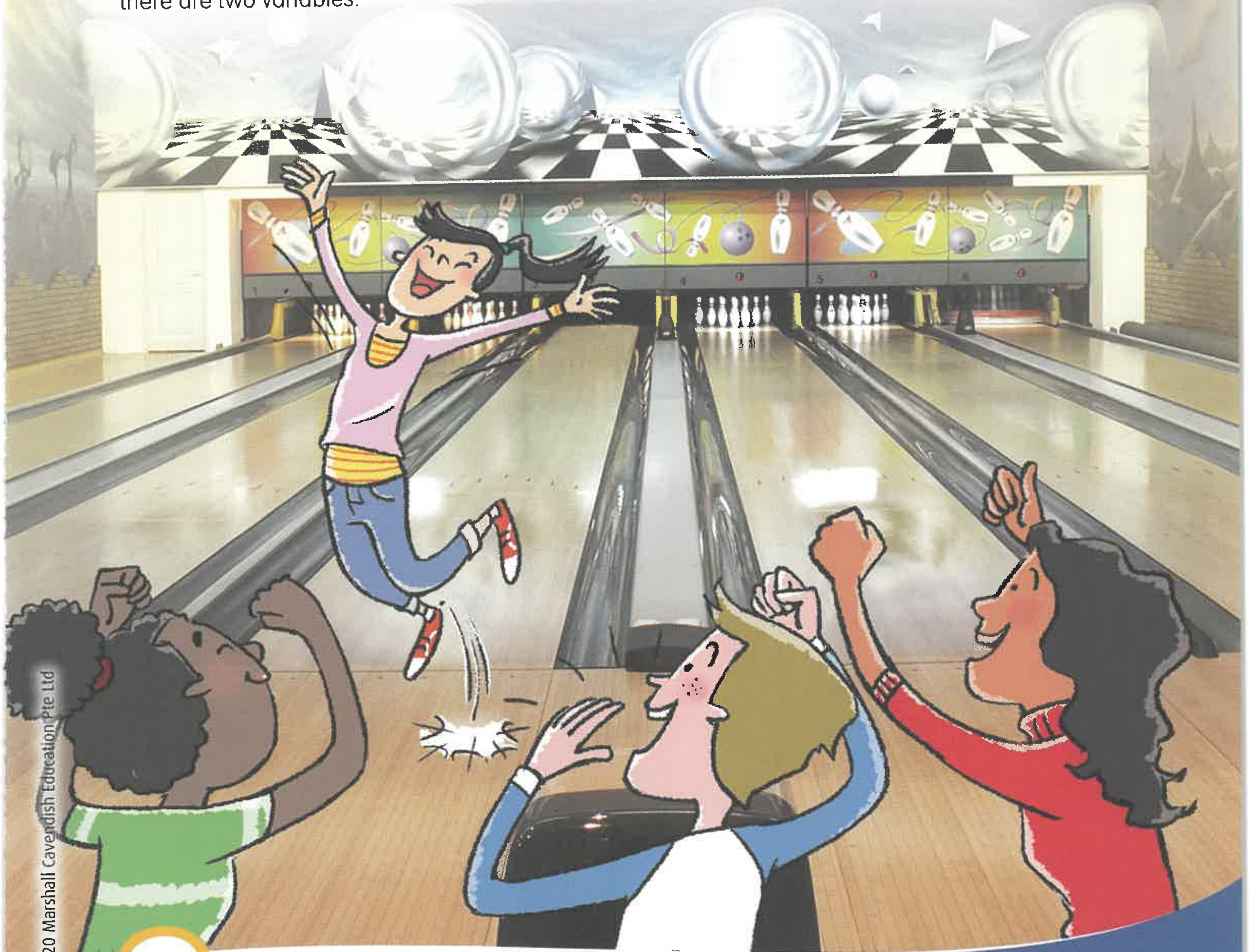
6. $2.81 \div 10^2$

Chapter 4

Linear Equations and Inequalities

Who wants to go bowling?

You and three friends want to go bowling. The bowling alley charges \$3.25 for each pair of shoes you rent and \$4.75 per game. All four of you need to rent shoes and you are not sure yet how many games you will play. What will be your group's total cost? In this situation, there are two quantities that can vary: the number of games your group plays and the group's total cost. In this chapter, you will learn how to write linear equations to represent situations in which there are two variables.



How do you solve for a variable in a linear equation with two variables?

RECALL PRIOR KNOWLEDGE

Name: ______________________________ Date: ______________

Identifying equivalent equations

Equivalent equations are equations that have the same solution. Performing the same operation on both sides of an equation produces an equivalent equation.

For example, $x = 8$ and $x - 2 = 6$ are equivalent equations. If you subtract 2 from both sides of $x = 8$, you obtain $x - 2 = 6$. The solution to both equations is $x = 8$.

Quick Check

Determine whether each pair of equations is equivalent. Justify each answer.

1. $x + 4 = 10$ and $x - 1 = 3$

2. $\frac{1}{5}x = 4$ and $x = 20$

3. $0.5x + 1 = 1.5$ and $2x = 2$

4. $2(x + 9) = 14$ and $2(x - 7) = -18$

Expressing the relationship between two quantities with a linear equation

A wall has width w feet and length $2w$ feet. The perimeter, P feet, of the wall is $2w + 2w + w + w = 6w$ feet.

You can express the relationship between the perimeter and the width of the wall with the linear equation $P = 6w$. In the equation, w is the independent variable and P is the dependent variable because the value of P depends on the value of w.

▶ Quick Check

Write a linear equation for each situation. State the independent and dependent variables for each equation.

5. A manufacturer produces beverages in small and large bottles. Each small bottle contains s liters of beverage. Each large bottle contains t liters, which is 1 more liter than the quantity in the small bottle. Express t in terms of s.

6. Hunter is 4 years younger than Alex. Express Alex's age, a, in terms of Hunter's age, h.

7. A bouquet of lavender costs $12. Find the cost, C dollars, of n bouquets of lavender.

8. The distance traveled by a bus, d miles, is 40 times the time, t hours, of the journey. Find d in terms of t.

Solving algebraic equations

To solve an equation, you isolate the variable on one side of the equation. To do this, you add, subtract, multiply or divide both sides of the equation by the same nonzero number.

$$4x + 7 = 15$$

$4x + 7 - 7 = 15 - 7$ Subtract 7 from both sides.

$4x = 8$ Simplify.

$\frac{4x}{4} = \frac{8}{4}$ Divide both sides by 4.

$x = 2$ Simplify.

Remember to keep an equation balanced by performing the same operation on both sides.

When solving the equation $5x + 3(x - 2) = 50$, which includes an expression with parentheses, you need to use the distributive property.

$$5x + 3(x - 2) = 50$$

$5x + 3x - 6 = 50$ Use the distributive property.

$8x - 6 = 50$ Combine like items.

$8x - 6 + 6 = 50 + 6$ Add 6 to both sides.

$8x = 56$ Simplify.

$\frac{8x}{8} = \frac{56}{8}$ Divide both sides by 8.

$x = 7$ Simplify.

▶ Quick Check

Solve each equation.

9. $4x - 2 = 14$

10. $\frac{1}{3}v + 9 = 2$

11. $c + 2(1 - c) = 10$

12. $3(2 + 3x) - 1 = 32$

Representing fractions as repeating decimals

A repeating decimal has a group of one or more digits that repeat endlessly. You use bar notation to show the digits that repeat.

To write $\frac{40}{33}$ as a decimal:

```
       1.2121
33 ) 40.0000
     33
      7 0
      6 6
        40
        33
         70
         66
          40
          33
           7
```

Divide until the remainders start repeating.

So, $\frac{40}{33} = 1.2121... = 1.\overline{21}$.

Quick Check

Write the decimal for each fraction. Use bar notation.

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

14. $\frac{16}{99}$

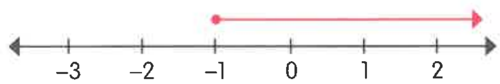
RECALL PRIOR KNOWLEDGE

Solving algebraic inequalities

The process of solving an algebraic inequality is the same as solving an algebraic equation, except that you have to reverse the direction of the inequality symbol when you multiply or divide both sides by a negative number.

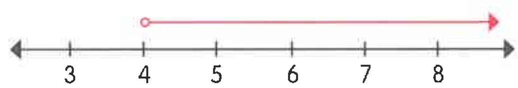
$3(3 - 4x) - 1 \le 20$	
$9 - 12x - 1 \le 20$	Use the distributive property.
$-12x + 8 \le 20$	Simplify.
$-12x + 8 - 8 \le 20 - 8$	Subtract 8 from both sides.
$-12x \le 12$	Simplify.
$\frac{-12x}{-12} \ge \frac{12}{-12}$	Divide both sides by –12 and reverse the inequality symbol.
$x \ge -1$	Simplify.

The solution set is represented on a number line as shown.



You use a shaded circle above –1 to indicate that –1 is a solution of the inequality $3(3 - 4x) - 1 \le 20$.

The solution set $x > 4$ of another equality is represented on a number line as shown.



You use an empty circle above 4 to indicate that 4 is not a solution of the inequality.

Quick Check

Solve each inequality and graph the solution set on a number line.

15. $x - 6 \le 9$

16. $3 - 5(x - 1) < 18$

Chapter 5

Lines and Linear Equations

How steep is that slope?

If you like to snowboard, you probably want to know how steep a mountain is before you try to go down it. You can describe how steep a mountain is by using a ratio to compare the change in elevation between two points to the horizontal distance between the two points. The greater that ratio, the steeper the mountain. In this chapter, you will learn how to find slopes of lines on coordinate planes.

How do you write an equation of a linear graph?

Name: ______________________ Date: ____________

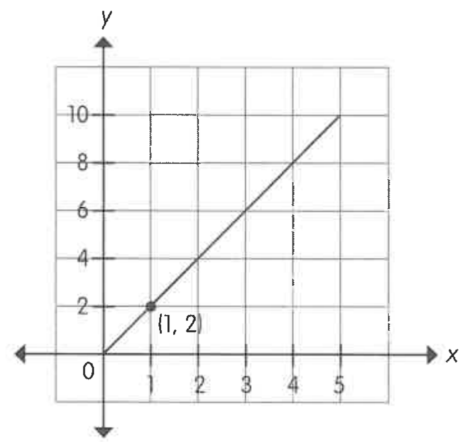
Interpreting direct proportion

If $\frac{y}{x} = k$ or $y = kx$, where k is a constant value, then y is said to be directly proportional to x. The constant value k in a direct proportion is called the constant of proportionality. The graph of a direct proportion is always a line through the origin (0, 0) but does not lie along the horizontal or vertical axis.

The constant of proportionality in a direct proportion is often represented by a unit rate k. In general, you can use the point (1, y) on a direct proportion graph to find a constant of proportionality. You can then use the unit rate to write a direct proportion equation $y = kx$.

The graph shows that y is directly proportional to x. The line passes through the point (1, 2). The unit rate is 2.

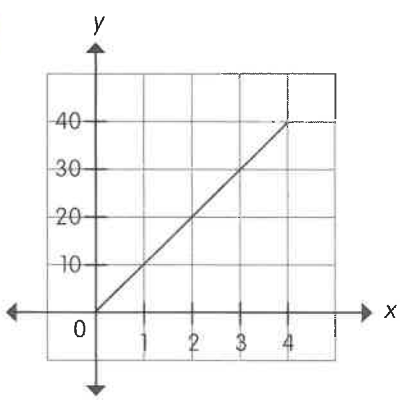
So, the equation of the direct proportion is $y = 2x$.



▶ Quick Check

Determine whether each graph represents a direct proportion. If so, find the constant of proportionality. Then, write the direct proportion equation.

1



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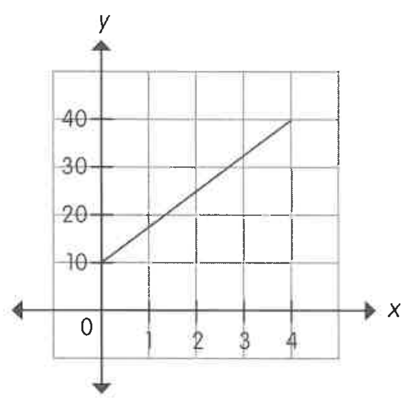


Chapter 6

Systems of Linear Equations

Have you ever planned a trip?

Suppose you stay at Town A and your uncle stays at Town B. Your family has arranged to meet your uncle at Niagara Falls during the school vacation. You know the distances from both towns to Niagara Falls. You are tasked with planning the trip so that your family and your uncle reach Niagara Falls at the same time. In this chapter, you will learn to write and solve two equations involving two variables that will help you to plan trips and solve other problems.

How do you solve two equations involving two variables?

Name: ______________________ Date: __________

Graphing linear equations using a table of values

To graph a linear equation, you first construct a table of *x*- and *y*-values.

For example, to construct a table of values for the equation $y = 2x + 1$, you choose values for x and solve to find the corresponding values for y.

When $x = 0$, $y = 2(0) + 1 = 1$.

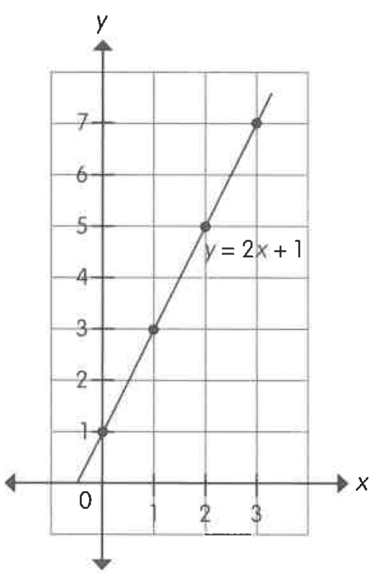
When $x = 1$, $y = 2(1) + 1 = 3$.

When $x = 2$, $y = 2(2) + 1 = 5$.

When $x = 3$, $y = 2(3) + 1 = 7$.

x	0	1	2	3
y	1	3	5	7

From the table of values, you plot the pairs of values on a coordinate grid. Then, join the points using a straight line to graph the linear equation.



RECALL PRIOR KNOWLEDGE

▶ Quick Check

Complete the table of values and graph each linear equation. Use graph paper. Use 1 grid square to represent 1 unit on both axes. Use suitable axes for both axes.

1. $y = 5x$

x	0	1	2	3
y				

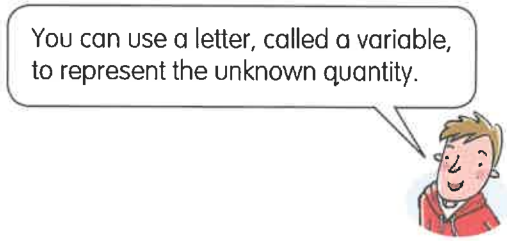
2. $y = -x + 2$

x	0	1	2	3
y				

Solving real-world problems algebraically

Real-world problems can be modeled using algebraic equations. You use algebraic reasoning to translate the problem into an algebraic expression. Then, you write an algebraic equation and solve it.

For example, Michelle has 4 more pencils than Dana. If they have 12 pencils altogether, find the number of pencils Michelle has.



Let the number of pencils that Michelle has be x. — Define the variable.

Number of pencils that Dana has: $x - 4$
Total number of pencils that the girls have: $x + x - 4 = 12$

Find the number of pencils that Michelle has.

$x + x - 4 = 12$	
$2x - 4 = 12$	Add the like terms.
$2x - 4 + 4 = 12 + 4$	Add 4 to both sides.
$2x = 16$	Simplify.
$\frac{2x}{2} = \frac{16}{2}$	Divide both sides by 2.
$x = 8$	Simplify.

Michelle has 8 pencils.

▶ Quick Check

Solve.

3. Connor bought 30 hardcover and paperback books. Each hardcover book cost \$20 and each paperback cost \$8. If Connor spent a total of \$480, how many paperbacks did he buy?

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July 2025

There are 6 chapter reviews to complete in July.
Suggested pacing is below:

July 7-11:	Chapter 7-8
July 14-18:	Chapter 9-10
July 21-25:	Chapter 11
July 28-31:	Chapter 12

Chapter 7

Functions

How much can a food truck owner earn at a football game?

Inside a football stadium, two teams play to win the game. There is a different kind of competition outside the stadium. Food trucks line up side by side to sell delicious food to hungry spectators.

Imagine setting up a food truck at a football game. Your earnings will depend on a number of factors, such as the number of customers, or the number of food items you sell.

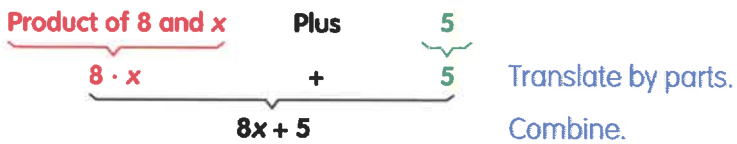
In other words, there is a relation between two quantities, such as "number of customers" and "earnings". In mathematics, certain types of relations between quantities are called functions. In this chapter, you will learn to represent functions using tables, equations and graphs.

How can you represent and interpret a function?

Name: ____________________ Date: __________

Writing algebraic expressions to represent unknown quantities

Sara buys 8 ribbons at x dollars each. She spends another $5. Write an algebraic expression for the total amount of money she spends.



She spends $(8x + 5)$ dollars in total.

Quick Check

Write an algebraic expression.

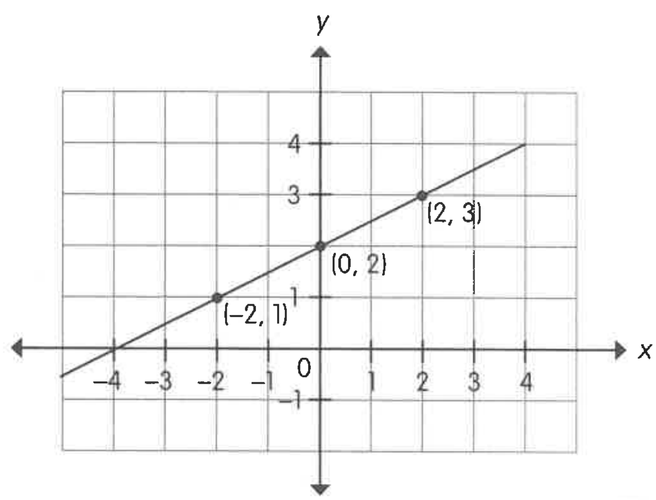
1. y highlighters are shared equally among 9 students. One of the students, María, buys another 3 highlighters. Write an algebraic expression for the number of highlighters she has in total.

Graphing a linear equation using a table of values

Graph the equation $y = 0.5x + 2$.

Construct a table showing the coordinates of three points, then graph the equation.

x	−2	0	2
y	1	2	3



Quick Check

Construct a table of values for each linear equation. Graph the equation on graph paper.

2. $y = -2x + 3$

3. $y = \frac{4}{3}x - 2$

Chapter

8 The Pythagorean Theorem

How far can you throw a baseball across the field?

You are playing third base in a baseball game. There are runners on first and second bases. The batter hits a ground ball right to you. You step on third base. One runner out! You then throw the ball to first base just in time to get the batter out. Double play!

It all happened so fast and you wonder how far you had to throw the ball to get it from third base to first base. You can use the Pythagorean Theorem to find the answer.

How do you use the Pythagorean Theorem to find the length of an unknown side of a right triangle?

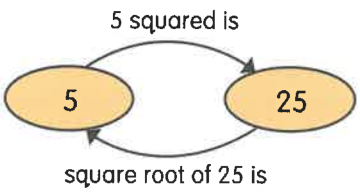
RECALL PRIOR KNOWLEDGE

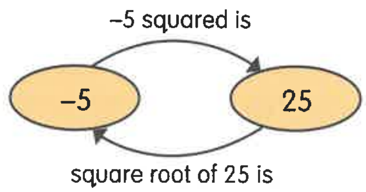
Name: ______________________________ Date: ______________

Understanding squares and square roots

To find the square of a number, raise it to the second power, which is the same as multiplying the number by itself.

For example, the square of 5, or 5^2, is $5 \cdot 5 = 25$. The square of −5, or $(-5)^2$, is $(-5) \cdot (-5) = 25$. 5 and −5 are the square roots of 25.





The symbol for square root is $\sqrt{\ }$.
The square roots of 25 are $\sqrt{25} = 5$ and $-\sqrt{25} = -5$.

The product of two positive numbers is positive. The product of two negative numbers is also positive. The product of two zeros is zero. So, the square of a number is always greater than or equal to zero. Every positive number has two square roots. The square root of 0 is 0.

Since squares of numbers are never negative, square roots of negative numbers do not exist.

Quick Check

Evaluate the square of each number.

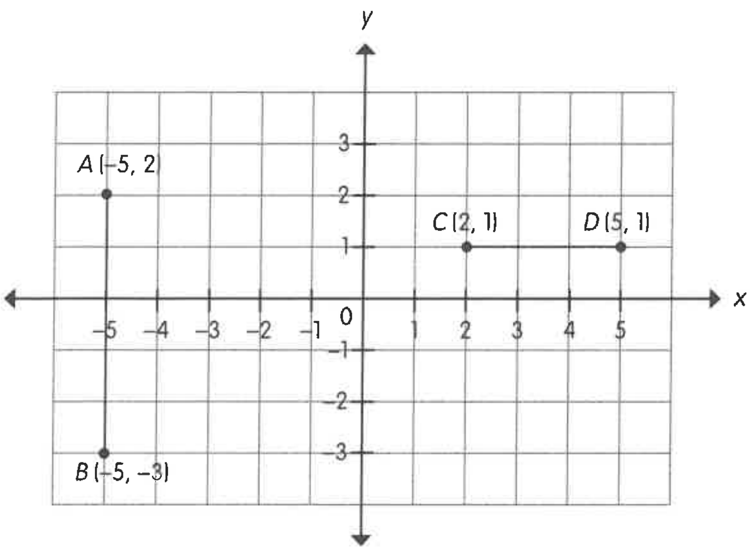
1. 3
2. −7
3. $\frac{1}{4}$
4. $-\frac{2}{3}$

Evaluate the square roots of each number.

5. 25
6. 64
7. 400
8. $\frac{1}{4}$

Finding the lengths of horizontal and vertical line segments

You can find the lengths of horizontal and vertical line segments on the coordinate plane by counting the number of units between the endpoints of the line segments.



The length of $\overline{AB}$ is 5 units because there are 5 units between the points A and B.

The length of $\overline{CD}$ is 3 units because there are 3 units between the points C and D.

Another way is to find the absolute value of the difference between the coordinates of the endpoints.

For example, length of $\overline{AB} = |2 - (-3)|$
$= |2 + 3|$
$= |5|$
$= 5$ units

length of $\overline{CD} = |2 - 5|$
$= |-3|$
$= 3$ units

▶ Quick Check

Plot each pair of points on the coordinate plane above. Draw the line segment connecting each pair of points and find its length.

9. (–3, 1) and (–3, –3)

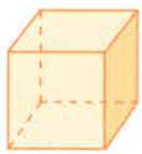
10. (1, 2) and (1, –1)

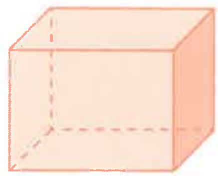
11. (1, –3) and (5, –3)

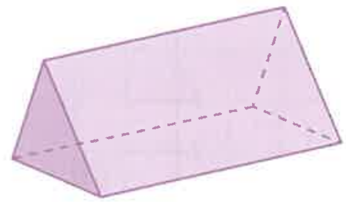
12. (–5, 3) and (5, 3)

Identifying cross sections of prisms

In a prism, the faces of the two ends are parallel polygons with the same shape and size. A cube has six square faces. Other prisms are named according to the shape of its two end faces.

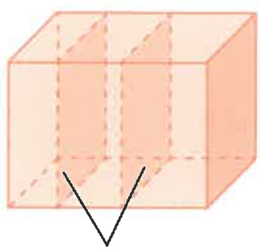

cube

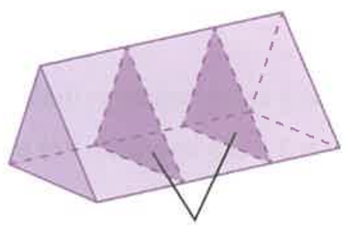

rectangular prism


triangular prism

You can slice through a solid in different ways. Each slice is a cross section of the solid.

A prism has cross sections that are parallel and of the same shape and size as the two end faces. These are called uniform cross sections.


Uniform rectangular cross sections


Uniform triangular cross sections

Quick Check

What is the shape of the cross section when a prism is sliced as described?

13. A rectangular prism sliced parallel to its rectangular base.

14. A triangular prism sliced parallel to its triangular face.

15. A cube sliced diagonally into two triangular prisms of the same shape and size.

Chapter 9

Geometric Transformations

How do animators make characters move?

In video games and cartoons, a character or object may change its position, size, or orientation.

Before computers and software were used in animation, movement in animation was created using a sequence of hand-drawn images. Today, computer programmers write mathematical instructions that describe the sequence of changes needed to show movement. These changes are made using geometric transformations.

You can draw figures on the coordinate plane and use transformations to change the coordinates of each point on the figure. For example, a transformation called translation is used to move a point to another point horizontally to the left or right, vertically up or down, or diagonally.

In this chapter, you will learn different ways of moving points in the coordinate plane. You will learn how to write algebraic expressions for these movements.

How do translations, reflections, rotations, and dilations change the properties of a figure on a coordinate plane?

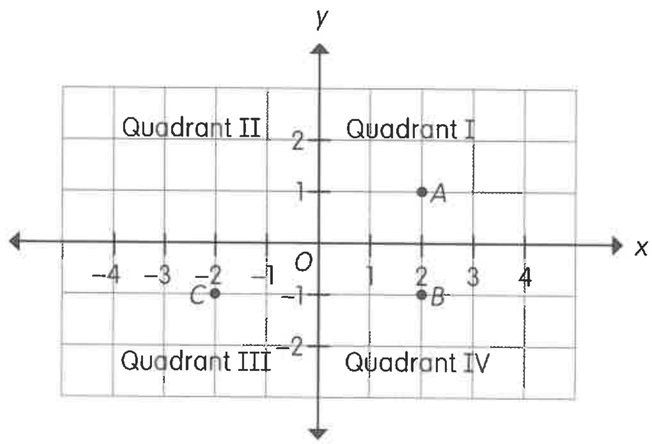
RECALL PRIOR KNOWLEDGE

Name: ______________________ Date: ____________

Recognizing reflections of points on the coordinate plane

A point can be represented on a coordinate plane.

Point $A(2, 1)$ is in Quadrant I, point $B(2, -1)$ is in Quadrant IV, and point $C(-2, -1)$ is in Quadrant III.



Each of the three points is 1 unit from the *x*-axis and 2 units from the *y*-axis. The *y*-coordinates of *A* and *B* have opposite signs. The *x*-coordinates of *B* and *C* have opposite signs.

A and *B* are reflections of each other in the *x*-axis. *B* and *C* are reflections of each other in the *y*-axis.

The distance between *A* and *B* is 2 units.
The distance between *B* and *C* is 4 units.

▶ Quick Check

1. Points *W* and *Z* are reflections of each other in the *x*-axis. *W* is the point $(4, -3)$. What are the coordinates of *Z*?

2. A point *S* is the reflection of $R(1, 4)$ in the *x*-axis. What is the distance between *R* and *S*?

3. Points $P(-2, 5)$ and $Q(-2, -5)$ are reflections of each other in a line. What is the equation of the line?

4. Points $M(2, -1)$ and $N(-2, -1)$ are reflections of each other in a line. What is the equation of line?

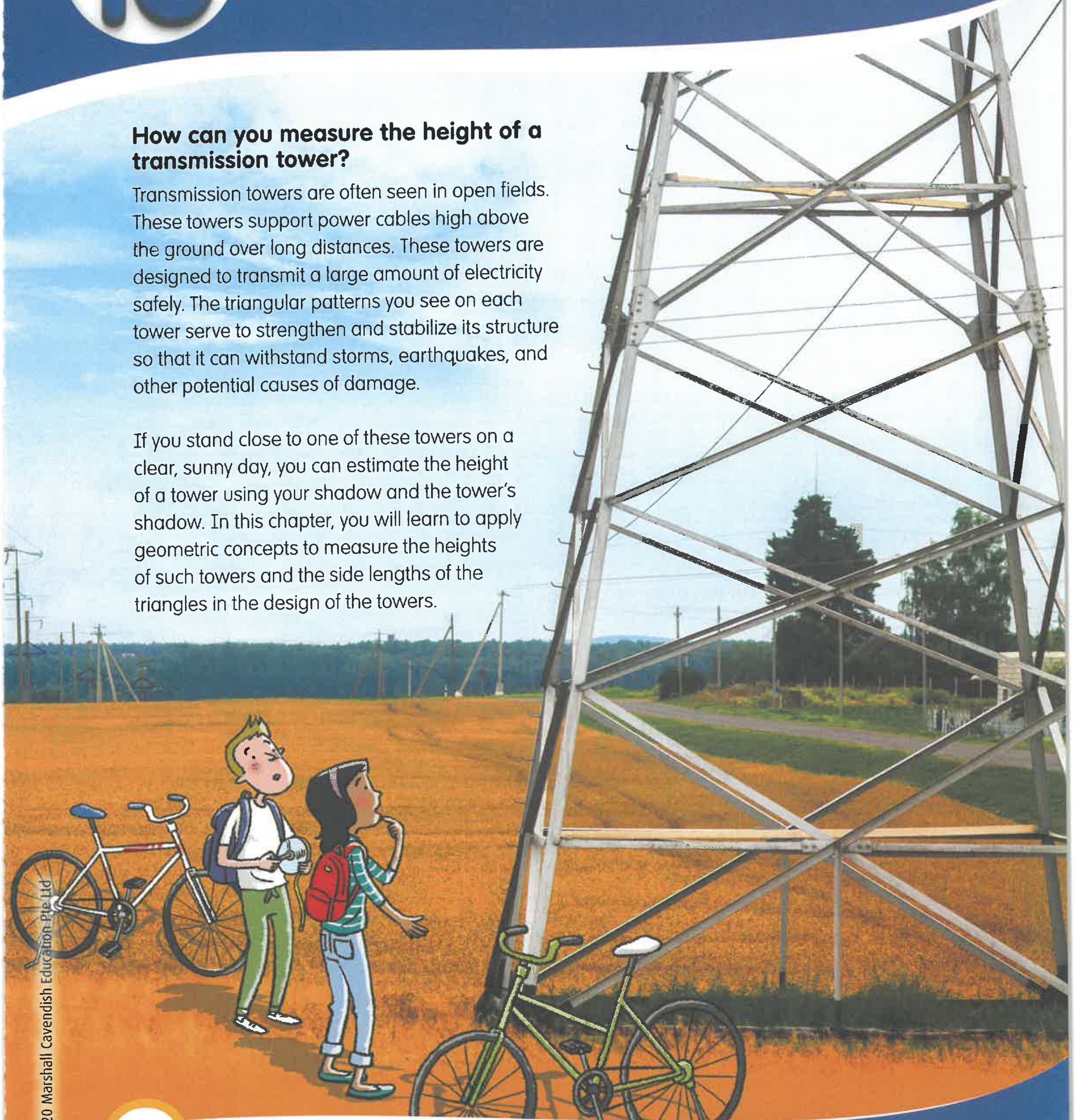
Chapter 10

Congruence and Similarity

How can you measure the height of a transmission tower?

Transmission towers are often seen in open fields. These towers support power cables high above the ground over long distances. These towers are designed to transmit a large amount of electricity safely. The triangular patterns you see on each tower serve to strengthen and stabilize its structure so that it can withstand storms, earthquakes, and other potential causes of damage.

If you stand close to one of these towers on a clear, sunny day, you can estimate the height of a tower using your shadow and the tower's shadow. In this chapter, you will learn to apply geometric concepts to measure the heights of such towers and the side lengths of the triangles in the design of the towers.



How do you determine if two figures are congruent or similar?

Name: ______________________ Date: ____________

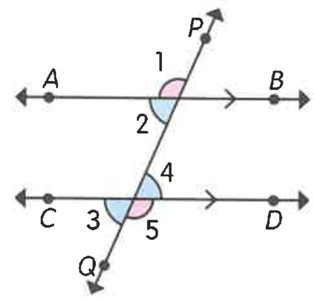
Finding angle measures formed by parallel lines and transversals

The figure shows two parallel lines $\overline{AB}$ and $\overline{CD}$, and a transversal $\overline{PQ}$.

$\angle 2$ and $\angle 4$ are alternate interior angles. $m\angle 2 = m\angle 4$.

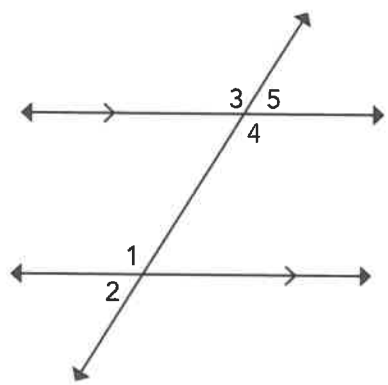
$\angle 1$ and $\angle 5$ are alternate exterior angles. $m\angle 1 = m\angle 5$.

$\angle 2$ and $\angle 3$ are corresponding angles. $m\angle 2 = m\angle 3$.



In the figure, not drawn to scale, $m\angle 1 = 130°$. Find $m\angle 2$, $m\angle 3$, $m\angle 4$, and $m\angle 5$.

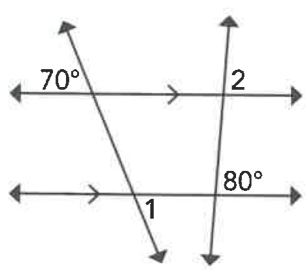
$m\angle 1 + m\angle 2 = 180°$	Supp. $\angle s$
$130° + m\angle 2 = 180°$	Substitute 130° for $m\angle 1°$.
$130° + m\angle 2 - 130° = 180° - 130°$	Subtract 130° from both sides.
$m\angle 2 = 50°$	Simplify.
$m\angle 3 = m\angle 1 = 130°$	Corr. $\angle s$
$m\angle 4 = m\angle 1 = 130°$	Alt. int. $\angle s$
$m\angle 5 = m\angle 2$	Alt. ext. $\angle s$
$= 50°$	



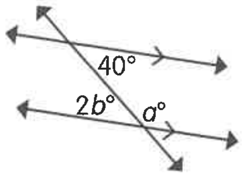
Quick Check

Solve. The figures are not drawn to scale.

1. Find $m\angle 1$ and $m\angle 2$.

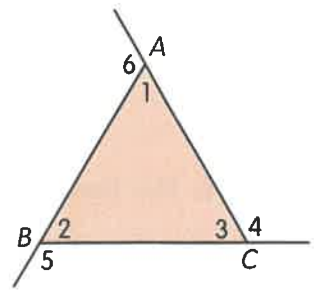


2 Find the values of a and b.



Using the angle sum of triangles to find interior and exterior angles of triangles

In $\triangle ABC$, $\angle 1$, $\angle 2$, and $\angle 3$ are interior angles. $\angle 4$, $\angle 5$, and $\angle 6$ are exterior angles.



The sum of the measures of the interior angles of a triangle is 180°.
$m\angle 1 + m\angle 2 + m\angle 3 = 180°$

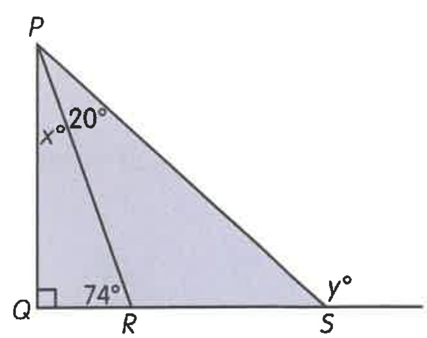
An exterior angle of a triangle is supplementary to the interior angle it is adjacent to.

$m\angle 1 + m\angle 6 = 180°$
$m\angle 2 + m\angle 5 = 180°$
$m\angle 3 + m\angle 4 = 180°$

The measure of an exterior angle is equal to the sum of the measures of the other two interior angles.

$m\angle 4 = m\angle 1 + m\angle 2$
$m\angle 5 = m\angle 1 + m\angle 3$
$m\angle 6 = m\angle 2 + m\angle 3$

The figure shows a right triangle.
Find the values of x and y.



In right $\triangle PQR$,

$90° + 74° + x° = 180°$	$\angle$ sum of triangle
$164° + x° = 180°$	Simplify.
$164° + x° - 164° = 180° - 164°$	Subtract 164° from both sides.
$x° = 16°$	Simplify.
$x = 16$	Write the value of x.

In right $\triangle PQS$,

$y° = m\angle PQS + m\angle SPQ$	Ext. $\angle$ of triangle
$y° = 90° + 16° + 20°$	Substitute the measures of angles.
$y° = 126°$	Simplify.
$y = 126$	Write the value of y.

RECALL PRIOR KNOWLEDGE

Quick Check

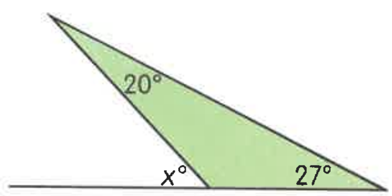
The measures of two interior angles are given for each triangle. Find the measure of the third interior angle.

3. $\triangle DEF$: 20°, 80°

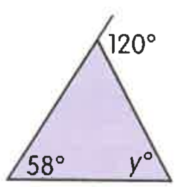
4. $\triangle PQR$: 37°, 76°

Solve. The figures are not drawn to scale.

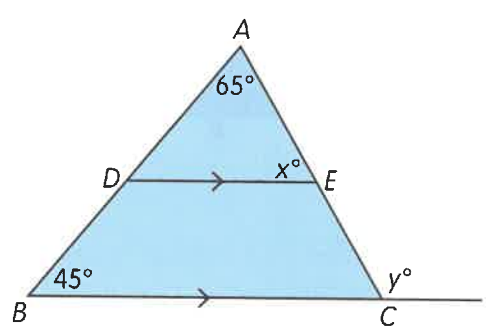
5. Find the value of x.



6. Find the value of y.



7. Find the value of x and y.



Chapter 11

Volume and Surface Area

How large is the pyramid?

The Great Pyramid of Giza is the oldest and largest of the three pyramids in the Giza pyramid complex in Egypt. Built more than 4,000 years ago, erosion over the centuries has reduced the size of the pyramid. It currently has a square base of side 756 ft and a height of 456 ft.

A pyramid is a particular type of three-dimensional figure, also called a solid. In this chapter, you will learn how to find the volume and surface area of pyramids and other types of solids.

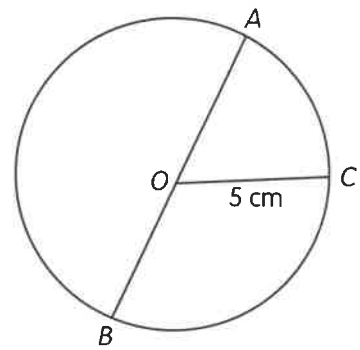
How do you find the volume and surface area of a solid?

RECALL PRIOR KNOWLEDGE

Name: ______________________ Date: ______________

Finding the circumference and the area of a circle

In the circle, O is the center, OC is a radius (denoted by r) and AB is a diameter. A diameter is twice the length of a radius.



The perimeter of a circle is called the circumference.

For any circle, the circumference divided by the diameter gives a constant value, which you denote by the Greek letter, π.

The value of π is approximately 3.14, to the nearest hundredth. Sometimes the fraction $\frac{22}{7}$ is used as an approximation for π.

For the circle shown:

In terms of π, circumference of circle $= 2\pi r$

$$= 2 \cdot \pi \cdot 5$$
$$= 10\pi \text{ cm}$$

Using 3.14 as an approximation for π, area of circle $= \pi r^2$

$$\approx 3.14 \cdot 5^2$$
$$\approx 78.5 \text{ cm}^2$$

Quick Check

Solve.

1. A circle has diameter 5 inches.

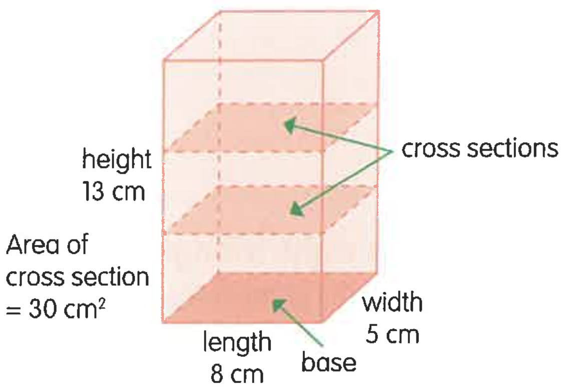
   a Find the circumference of the circle, in terms of π.

   b Find the area of the circle. Use 3.14 as an approximation for π.

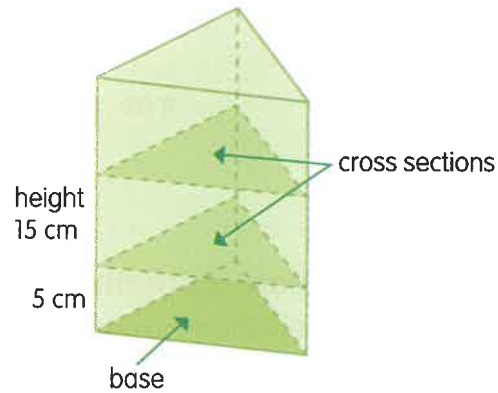
2. The circumference of a circle is 16π centimeters. Find the area of the circle, in terms of π.

Finding the volume and surface area of a prism

In a prism, the faces of the two ends (top and base) are parallel polygons. The cross sections are congruent and parallel to the two end faces. Hence, a prism has uniform cross sections.



rectangular prism



triangular prism

Volume of rectangular prism = Length • Width • Height
= Area of cross section • Height
$= 8 \cdot 5 \cdot 13$
$= 520$ cm^3

Volume of triangular prism = Area of cross section • Height
$= 30 \cdot 15$
$= 450$ cm^3

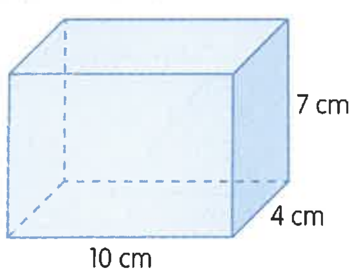
The surface area of a prism is the sum of the areas of all the faces, which is the area of a net of the prism.

For the rectangular prism, surface area $= (8 \cdot 13 + 5 \cdot 13 + 8 \cdot 5) \cdot 2$
$= 418$ cm^2

▶ Quick Check

Find the volume and total surface area of each solid.

3



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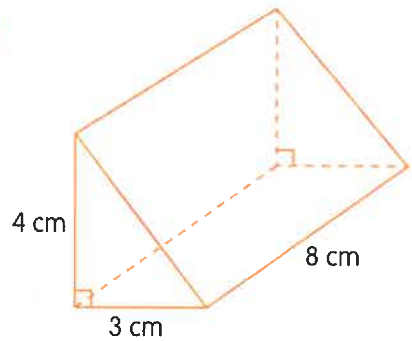
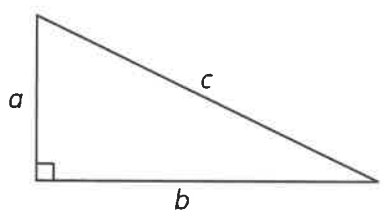


Using Pythagorean Theorem to find lengths of a right triangle

The Pythagorean Theorem is the relationship between the lengths of the three sides of a right triangle.



The relationship can be expressed as the equation $a^2 + b^2 = c^2$.

Find the value of x in the right triangle.

$x^2 + 4^2 = 5^2$ Pythagorean Theorem

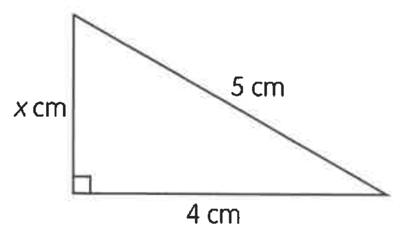
$x^2 + 16 = 25$

$x^2 = 25 - 16$

$= 9$

$x = \sqrt{9}$

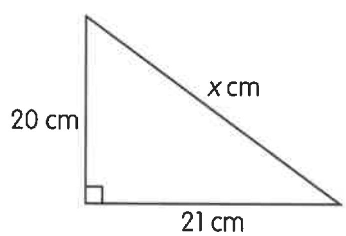
$= 3$



▶ Quick Check

Find the value of x in each triangle.

5



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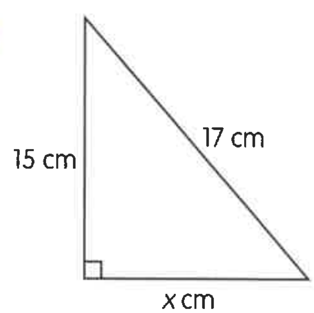

Chapter 12

Statistics

Have you ever been in a bike race?

Two things that a cyclist has to think about in a bike race are cadence and speed. The cyclist's cadence is the rate at which he or she turns the pedals. The cyclist can try to maintain a steady cadence by adjusting gears as he or she cycles up or down a slope.

The cyclist's speed, which is the distance he or she travels over unit time, is related to his or her cadence. An increase in cadence leads to an increase in speed.

Cadence and speed are an example of two related variables. You can collect data on a pair of related variables to analyze them. In this chapter, you will learn how to present and interpret the relationship between data of related variables.

How do you represent and interpret bivariate data and categorical data?

Name: ______________________ Date: ____________

Finding relative frequencies

The table shows the numbers of items ordered by 90 customers at a snack bar during lunch hour. It also shows the relative frequency for each item.

Item	Number Ordered	Relative Frequency
Hot dogs	18	$\frac{18}{90} = 0.2$
Nachos	9	$\frac{9}{90} = 0.1$
Hamburgers	36	$\frac{36}{90} = 0.4$
Grilled cheese sandwiches	18	$\frac{18}{90} = 0.2$
Popcorn buckets	9	$\frac{9}{90} = 0.1$

Since each relative frequency represents a fraction of the total number of customers, the sum of the relative frequencies is 1.

Quick Check

Solve.

1. The table shows the numbers of students involved in four sports at a high school. Find the relative frequency for each sport.

Sport	Number of Students	Relative Frequency
Baseball		
Tennis		
Soccer		
Swimming		