

PEARSON

Math Makes Sense

9

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Welcome to

Pearson Math Makes Sense 9

Math helps you understand your world.

This book will help you improve your problem-solving skills and show you how you can use your math now, and in your future career.

The opening pages of **each unit** are designed to help you prepare for success.



UNIT 1

Square Roots and Surface Area

Which geometric objects can you name?
How could you determine their surface areas?

What You'll Learn

- Determine the square roots of fractions and decimals that are perfect squares.
- Approximate the square roots of fractions and decimals that are non-perfect squares.
- Determine the surface areas of composite 3-D objects to solve problems.

Why It's Important

Real-world measures are often expressed as fractions or decimals. We use the square roots of these measures when we work with formulas such as the Pythagorean Theorem.

An understanding of surface area allows us to solve practical problems such as calculating: the amount of paper needed to wrap a gift; the number of cans of paint needed to paint a room; and the amount of siding needed to cover a building.

Key Words

- perfect square
- non-perfect square
- composite object

4

5

Find out **What You'll Learn** and **Why It's Important**. Check the list of **Key Words**.

1.2

Square Roots of Non-Perfect Squares

FOCUS
Approximate the square roots of decimals and fractions that are non-perfect squares.

A ladder is leaning against a wall. For safety, the distance from the base of a ladder to the wall must be about $\frac{1}{3}$ of the height up the wall. How could you check if the ladder is safe?



Investigate

A ladder is 11 m long. The distance from the base of the ladder to the wall is 1.5 m. Estimate how far up the wall the ladder will reach.

Reflect & Share

Compare your strategy for estimating the height with that of another pair of classmates. Did you use a scale drawing? Did you calculate? Which method gives the closer estimate?

Connect

Many fractions and decimals are not perfect squares. That is, they cannot be written as a product of two equal fractions. A fraction or decimal that is not a perfect square is called a **non-perfect square**.

Here are two strategies for estimating a square root of a decimal that is a non-perfect square.

► Using benchmarks.
To estimate $\sqrt{7.5}$, visualize a number line and the closest perfect square on each side of 7.5.
 $\sqrt{4} = 2$ and $\sqrt{9} = 3$
7.5 is closer to 9 than to 4, so $\sqrt{7.5}$ is closer to 3 than to 2.
From the diagram, an approximate value for $\sqrt{7.5}$ is 2.7.
We write $\sqrt{7.5} \approx 2.7$.



► Using a calculator
 $\sqrt{7.5} \approx 2.738612788$
This decimal does not appear to terminate or repeat. There may be many more numbers after the decimal point that cannot be displayed on the calculator.
To check, determine $2.738612788^2 \approx 2,500,000,003$. Since this number is not equal to 7.5, the square root is an approximation.

Example 1 illustrates 4 different strategies for determining the square root of a fraction that is a non-perfect square.

Example 1 Estimating the Square Root of a Fraction

Determine an approximate value of each square root.

- A Solution**
- a) Use benchmarks. Think about the perfect squares closest to the numerator and denominator. In the fraction $\frac{5}{8}$, 8 is close to the perfect square 9, and 5 is close to the perfect square 4.
So, $\sqrt{\frac{5}{8}} \approx \sqrt{\frac{4}{9}} = \frac{2}{3}$
So, $\sqrt{\frac{5}{8}} \approx \frac{2}{3}$

Examples show you how to use the ideas and that there may be different ways to approach the question.

Investigate an idea or problem, usually with a partner, and often using materials.

Connect summarizes the math.

Discuss the Ideas invites you to talk about the math.

Practice questions reinforce the math.

Take It Further questions offer enrichment and extension.

Reflect on the big ideas of the lesson. Think about your learning style and strategies.

Discuss the Ideas

- What is interpolation? When do we use it?
- What is extrapolation? When do we use it?
- When we extrapolate, why is it important to know that the data represent a linear relation?
- What problems might there be if you extrapolate far beyond the last data point?

Practice

1. This graph represents a linear relation.

a) Determine each value of x for:
i) $y = 5$ ii) $y = -1$ iii) $y = -2$
b) Determine each value of y for:
i) $x = -4$ ii) $x = 2$ iii) $x = 5$

2. This graph represents a linear relation.

a) Determine each value of x for:
i) $y = 6$ ii) $y = -4$ iii) $y = -8$
b) Determine each value of y for:
i) $x = -6$ ii) $x = 6$ iii) $x = 9$

3. This graph represents a linear relation.

a) Determine each value of x for:
i) $y = 3$ ii) $y = 1$ iii) $y = -2$
b) Determine each value of y for:
i) $x = -3$ ii) $x = 3$ iii) $x = 6$

4. This graph represents a linear relation.

a) Determine each value of x for:
i) $y = 6$ ii) $y = -4$ iii) $y = -7$
b) Determine each value of y for:
i) $x = -5$ ii) $x = 3$ iii) $x = 5$

12. This graph represents a linear relation.

Estimate the value of x when:
a) $y = 3$
b) $x = -3$ c) $x = -5$ d) $x = 10$
e) Estimate the value of x when:
i) $y = -5$ ii) $y = 8$ iii) $y = 10$
Explain how you estimated.

13. Reece works for 5 h each week at a clothing store. This graph shows how her pay relates to the number of weeks she works.

Reece's Pay

Estimate Reece's earnings after 8 weeks.
Estimate how long it will take Reece to earn \$400. What assumption did you make?
What conditions could change that would make this graph no longer valid?

Take It Further

A local convenience store sells 3 different sizes of drinks. The price of each drink is listed below. The store owner plans to introduce 2 new sizes of drinks. She wants the prices and sizes to be related to the drinks she sells already.

Size (mL)	Price (¢)
500	79
750	89
1000	99

a) Graph the data.
b) What should the store owner charge for a 1400-mL drink?
c) What should be the size of a drink that costs 63¢?
Justify your answers.

Reflect

What is the difference between interpolation and extrapolation? When might you use each process? Use examples in your explanation.

Use the **Mid-Unit Review** to refresh your memory of key concepts.

Mid-Unit Review

- Write each power in standard form.
 - 14^3
 - 5^3
 - -8^3
 - $-(-4)^3$
 - $(-6)^3$
 - $(-2)^3$
- Copy and complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
a) 4^5				
b) 2^6				
c) 4^2	7	2	$3 \times 3 = 3 \times 3$	
- Evaluate the first 8 powers of 7. Copy and complete this table.

Power of 7	Standard Form
7^1	
7^2	
7^3	
7^4	
7^5	
7^6	
7^7	
7^8	
- What pattern do you see in the ones digits of the numbers in the second column?
 - Verify that the pattern continues by extending the table for as many powers of 7 as your calculator displays.
 - Use the pattern. Predict the ones digit of each power of 7. Explain your strategy.
 - 7^{11}
 - 7^{14}
 - 7^{17}
 - 7^{21}
- Write in standard form.
 - 10^8
 - 10^9
 - 10^6
 - 10^4
 - 10^2
- Write as a power of 10.
 - one billion
 - one
 - 100
- Evaluate.
 - $(-5)^2$
- The area of Dan's square is 16. One side has a length of 4. Write the area of the square in standard form.
 - 16×16
 - 16^2
 - 16×4
 - 4×4
- Both Sophie and Dan were wrong. Write the correct answer.
 - 16×16
 - 16^2
 - 16×4
 - 4×4
- Identify the student whose error occurred.
 - $(-2)^2 = (-2) \times (-2) = 4$
 - $(-2)^2 = -2 \times -2 = -4$
 - $(-2)^2 = -2 \times 2 = -4$
 - $(-2)^2 = 2 \times 2 = 4$

Start Where You Are

How Can I Learn from Others?

Three students discuss the answers to these questions:

- Evaluate $\frac{5}{6} + \frac{3}{4}$
- Evaluate $3 - 5$

1. Evaluate $\frac{5}{6} + \frac{3}{4}$

Dan said: The sum is $\frac{8}{10}$, which simplifies to $\frac{4}{5}$.
 Jesse said: Dan must be wrong; the answer has to be greater than 1.
 Philippe said: The answer has to be greater than $\frac{1}{2}$ and $\frac{3}{4}$ is less than $\frac{3}{2}$.

To help Dan, Jesse explained how he knew his answer was wrong: I use benchmarks and estimate. Both $\frac{5}{6}$ and $\frac{3}{4}$ are greater than $\frac{1}{2}$, so their sum has to be greater than $\frac{1}{2} + \frac{1}{2} = 1$.

Philippe explained his strategy for adding: I know I can add the same types of fractions. For $\frac{5}{6}$ and $\frac{3}{4}$ to be the same type, I write them as equivalent fractions with the same denominator. Then I add the numerators.

$$\frac{5}{6} + \frac{3}{4} = \frac{10}{12} + \frac{9}{12} = \frac{19}{12} = 1\frac{7}{12}$$

2. Evaluate $3 - 5$

Philippe said: There is no answer because 5 is greater than 3.
 Jesse said: I just switch the numbers around and calculate $5 - 3 = 2$.
 Dan said: No, you can't change the order of the numbers — subtraction is not commutative. You have to think about integers.

To help Philippe and Jesse, Dan explained two strategies:

- I can visualize coloured tiles, and add zero pairs.
- I can also use a number line. The difference between 2 numbers is the distance between 2 points on the number line.

Check

- Evaluate.
 - $\frac{2}{3} + \frac{1}{4}$
 - $\frac{3}{5} + \frac{2}{3}$
 - $\frac{4}{6} + \frac{1}{2}$
 - $\frac{5}{8} + \frac{3}{4}$
 - $\frac{7}{9} - \frac{2}{3}$
 - $\frac{11}{12} - \frac{5}{6}$
 - $\frac{13}{14} - \frac{3}{7}$
 - $\frac{17}{18} - \frac{11}{9}$
- Evaluate.
 - $7 - 3$
 - $3 - 7$
 - $-3 - 7$
 - $-3 - (-7)$
 - $-5 + 4$
 - $-6 - (-3)$
 - $8 - (-10)$
 - $-8 - 10$

Start Where You Are illustrates strategies you may use to show your best performance.

Study Guide

Scale Diagrams

For an enlargement or reduction, the scale factor is: $\frac{\text{Length on scale diagram}}{\text{Length on original diagram}}$.
 An enlargement has a scale factor > 1 . A reduction has a scale factor < 1 .

Similar Polygons

Similar polygons are related by an enlargement or a reduction. When two polygons are similar:

- their corresponding angles are equal: $\angle A = \angle E$, $\angle B = \angle F$, $\angle C = \angle G$, $\angle D = \angle H$ and
- their corresponding sides are proportional: $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$ or Any of the ratios $\frac{AB}{EF}$, $\frac{BC}{FG}$, $\frac{CD}{GH}$, and $\frac{DA}{HE}$ is the scale factor.

Similar Triangles

When we check whether two triangles are similar:

- their corresponding angles must be equal: $\angle P = \angle S$ and $\angle Q = \angle T$ and $\angle R = \angle U$ or
- their corresponding sides must be proportional: $\frac{PQ}{ST} = \frac{QR}{TU}$ and $\frac{PR}{SU}$ or Any of the ratios $\frac{PQ}{ST}$, $\frac{QR}{TU}$, and $\frac{PR}{SU}$ is the scale factor.

Line Symmetry

A shape has line symmetry when a line divides the shape into two congruent parts so that one part is the image of the other part after a reflection in the line of symmetry.

Rotational Symmetry

A shape has rotational symmetry when it coincides with itself after a rotation of less than 360° about its centre. The number of times the shape coincides with itself is the order of rotation.
 The angle of rotation symmetry = $\frac{360^\circ}{\text{the order of rotation}}$

Review

- This photo of participants in the Arctic Winter Games is to be enlarged. Measure the photo. What are the dimensions of the enlargement for each scale factor?
 - 3
 - 2.5
 - $\frac{3}{2}$
 - $\frac{21}{4}$
- Draw this pentagon on 1-cm grid paper. Then draw an enlargement of the shape with a scale factor of 2.5.
- A full-size pool table has dimensions approximately 270 cm by 138 cm. A model of a pool table has dimensions 180 cm by 92 cm.
 - What is the scale factor for this reduction?
 - A standard-size pool cue is about 144 cm long. What is the length of a model of this pool cue with the scale factor from part a?
- Here is a scale diagram of a ramp. The height of the ramp is 1.8 m. Measure the lengths on the scale diagram. What is the length of the ramp?
- Gina plans to build a triangular dog run against one side of a dog house. Here is a scale diagram of the run. The wall of the dog house is 2 m long. Calculate the lengths of the other two sides of the dog run.
- Which pentagon is similar to the red pentagon? Justify your answer.

Study Guide summarizes key ideas from the unit.

Review questions allow you to find out if you are ready to move on.

The *Practice and Homework Book* provides additional support.

Practice Test

- Which polynomial in t do these tiles represent?
 - Classify the polynomial by degree and by the number of terms.
 - Identify the constant term and the coefficient of the t^2 -term.
- Write a polynomial for the perimeter of this shape. Simplify the polynomial.
 - Determine the perimeter of the shape when $d = 5$ m.
- Sketch algebra tiles to explain why:
 - $3x + 2x$ equals $5x$
 - $(3x)(2x)$ equals $6x^2$
- A student determined the product $3x(x + 4)$. The student's answer was $3x^2 + 4$. Use a model to explain whether the student's answer is correct.
- Add or subtract as indicated. What strategy will you use each time?
 - $(15 - 3d) + (3 - 15d)$
 - $(9b + 3) - (9 - 3b^2)$
 - $(2y^2 + 5y - 6) + (-7y^2 + 2y - 6)$
 - $(7y^3 + y) - (3y - y^2)$
- Multiply or divide as indicated. What strategy will you use each time?
 - $25m(3m - 2)$
 - $-3(3x^2 - 2x - 1)$
 - $(8x^2 - 4x) \div 2x$
 - $-8 \div \frac{3x^2 - 12x - 20}{x - 3}$
- Determine two polynomials with:
 - a sum of $3x^2 - 4x - 2$
 - a difference of $3x^2 - 4x - 2$
- A rectangle has dimensions $5x$ and $3x + 8$.
 - Sketch the rectangle and label it with its dimensions.
 - What is the area of the rectangle?
 - What is the perimeter of the rectangle?

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The **Practice Test** models the kind of test your teacher might give.

Unit Problem Raising Money for the Pep Club

There are 25 students in the school's Pep Club.

- The Pep Club can buy new uniforms from 2 different suppliers.
 - Company A charges \$500, plus \$22 per uniform.
 - Company B charges \$300, plus \$28 per uniform.
 - Define a variable, then write an equation that can be used to determine the number of uniforms that will result in equal costs at both companies.
 - Solve the equation. Verify the solution.
 - Which company should the Pep Club choose? Justify your recommendation.
 - How much money must the Pep Club raise to purchase the uniforms?
- The Pep Club decides to raise the money for the uniforms by selling snacks at lunch time. The snacks cost the Pep Club \$6.00 for a box of 30.
 - Determine the cost per snack.
 - The Pep Club makes a profit of \$0.25 on each snack sold. Suppose the club does raise the money it needs. Define a variable, then write an inequality that can be used to determine how many snacks might have been sold. How many boxes of snacks did the members of the Pep Club need?
 - Solve the inequality.
 - Verify the solution.

Your work should show:

- an equation and inequality and how you determined them
- how you determined the solutions of the equation and the inequality
- clear explanations of your reasoning.

Reflect on Your Learning How is solving a linear inequality like solving a linear equation? How is it different? Include examples in your explanation.

UNIT Problem 311

The **Unit Problem** presents problems to solve, or a project to do, using the math of the unit.

Cumulative Review Units 1–3

- Determine the value of each square root.
 - $\sqrt{\frac{1}{25}}$
 - $\sqrt{\frac{100}{81}}$
 - $\sqrt{\frac{9}{121}}$
 - $\sqrt{1.44}$
 - $\sqrt{0.16}$
 - $\sqrt{3.24}$
- Determine the side length of a square with each area below. Explain your strategy.
 - 64 cm^2
 - 1.21 m^2
 - 72.25 mm^2
- Calculate the number whose square root is:
 - 0.7
 - 1.6
 - 0.0006
 - $\frac{1}{16}$
 - $\frac{1}{4}$
 - $\frac{3}{16}$
- Which decimals and fractions are perfect squares? Explain your reasoning.
 - $\frac{25}{63}$
 - $\frac{12}{27}$
 - $\frac{1}{16}$
 - 0.016
 - 4.9
 - 0.121
- A square garden has area 6.76 m^2 .
 - What is the side length of the garden?
 - One side of the garden is against a house. How much fencing is needed to enclose the garden? How do you know?
- Determine 2 decimals that have square roots from 12 to 13.
- Use any strategy you wish to estimate the value of each square root.
 - $\sqrt{\frac{1}{39}}$
 - $\sqrt{\frac{65}{4}}$
 - $\sqrt{0.8}$
 - $\sqrt{0.11}$
- Determine the unknown length in each triangle to the nearest tenth.
- Write each product as a power, then evaluate.
 - $4 \times 4 \times 4$
 - $8 \times 8 \times 8 \times 8$
 - $(-3)(-3)(-3)(-3)(-3)(-3)(-3)$
 - $(-2)(-2)(-2)(-2)(-2)(-2)(-2)(-2)$
 - $(-10 \times 10 \times 10 \times 10 \times 10)$
 - $(-1)(0)(0)(0)(0)(0)(0)(0)(0)(0)$
- Predict the sign of each answer, then evaluate.
 - $(-3)^3$
 - $(-5)^6$
 - 4^{-4}
 - $(-7)^3$
 - 7^{-6}
 - $(-10)^6$
- Write each number using powers of 10.
 - 800
 - 52 000
 - 1760
 - 7 000 004
- Evaluate.
 - $13 \times (-2)^3 - 4^2$
 - $(-7 + 5)^2 - [4 + (-1)^3]^2$
 - $9^2 - (-3)^3 + 5^2 - 2^3$
 - $(3^2 - 2)^3 + (4^2 + 3)^2$
 - $(-4)^2 - 3^3 + (-2)^2 - 1^3$
 - $8^3 - (-4)^2 \times 2^{10}$
- Express as a single power.
 - $6^3 \times 6^5 + 6^8$
 - $(-3)^6 \div (-3)^2 \times (-3)^3$
 - $(-3)^7 \times (-3)^3$
 - $(-3)^2 \times (-3)^5$
 - $\frac{2^5}{2^2} \times \frac{2^3}{2^4}$
- Evaluate.
 - $2^7 - 4^3 \times 4^0 + 3^3$
 - $(-2)^6 \div (-2)^4 - (-2)^2 + (-2)^3$
 - $-5^2(5^3 + 5) - 5^3$
 - $4^6 \times 4^8$
 - $4^6 \times 4^8$
- A wheat field is 10 000 m wide. The area of the field is 10^8 m^2 .
 - Use the exponent laws to determine the length of the field.
 - What is the perimeter of the field? Did you use any exponent laws to calculate the perimeter? Explain.
- Simplify, then evaluate each expression.
 - $(6^2)^3 + (6^2)^3$
 - $(2^4 + 2^3)^2 + (3^2 + 3)^2$
 - $(-1)^3 + (-2)^3 - [(-5)^3 \times (-3)^2]^2$
 - $(4 \times 9)^2 + (3^2)^2$
 - $[(-4)^2]^2 - [(-2)^3]^2 - [(-3)^2]^2$
 - $(9 + (-3))^2 \times 3^2$
- Show each set of numbers on a number line. Order the numbers from least to greatest.
 - $-1.9, -3.5, 4.8, -2.8, 1.2, -3.3$
 - $\frac{18}{25}, -\frac{1}{3}, \frac{1}{2}, -\frac{2}{3}, -\frac{11}{15}, -\frac{2}{3}$
 - $\frac{3}{4}, -\frac{1}{4}, \frac{1}{4}, \frac{1}{3}, \frac{1}{3}, \frac{1}{3}$
 - $1.4, \frac{1}{2}, -1.01, \frac{1}{2}, -0.11$
 - $\frac{1}{2}, -0.2, 0.25, -\frac{1}{2}, -0.7, \frac{1}{2}$
- Determine each sum or difference.
 - $17.4 + (-15.96)$
 - $-8.38 + (-1.927)$
 - $-4.5 - (-13.67)$
 - $13.28 - 19.71$
 - $-4 - \frac{2}{3}$
 - $\frac{1}{4} + (-\frac{6}{5})$
 - $-\frac{17}{4} - \frac{11}{3}$
 - $3^2 - (-2)^2$
- The changes in value of a stock were recorded in the table below.

Day	Change in Value (\$)
Monday	-0.50
Tuesday	0.307
Wednesday	-0.065

The price of the stock by the end of the day on Wednesday was \$85.400. Use rational numbers to calculate the price of the stock on Monday morning.
- Determine each product or quotient.
 - $(-1.6)(2.5)$
 - $(-12.0)(-12.8)$
 - $(-8.64) \div (-2.7)$
 - $4.592 \div (-0.82)$
 - $(\frac{2}{3})(\frac{6}{5})$
 - $(-\frac{9}{5})(\frac{2}{15})$
 - $(-\frac{1}{2}) \div (-\frac{8}{5})$
 - $(-\frac{3}{5}) \div \frac{2}{3}$
- Evaluate.
 - $(-\frac{1}{2}) - \frac{1}{3} + (-\frac{3}{10}) - \frac{1}{4}$
 - $(-2.1)(8.5) - 6.8 + 4$
 - $(-\frac{2}{3})(\frac{5}{6}) + \frac{1}{2} \div (-\frac{1}{3})$
 - $2^4 - (-3^4) + 5(\frac{2}{3} - 3)$

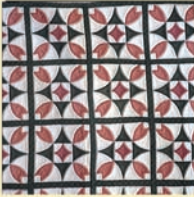
148 Cumulative Review

Keep your skills sharp with **Cumulative Review**.

Explore some interesting math when you do the **Projects**.

Project **Constructing a Math Quilt**


A quilt consists of small blocks that tessellate.



Materials

- ruler
- compass
- centric crayons or markers
- construction paper
- scissors
- glue
- dynamic geometry software (optional)

Part 1




The larger shape in this quilt block is a square with side length 13 cm. Within the square there is a circle and within this circle there is a smaller square.

- What is the side length of the smaller square?
- Describe the triangles in the block.

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GAME **Make Your Own Kaleidoscope**

The kaleidoscope was invented in 1816. It uses mirrors placed at different angles to produce patterns with symmetry.









You will need

- 2 small rectangular mirrors
- masking tape

To make a simple kaleidoscope, use masking tape to join two mirrors so they stand at an angle.

Place your mirrors on the arms of each angle below. Sketch and describe what you see. Include any lines of symmetry in your sketch.

1.  2.  3. 

4.  5.  6. 


360 UNIT 7: Similarity and Transformations

Play a **Game** with your classmates or at home to reinforce your skills.

Icons remind you to use **technology**. Follow the instructions for using a computer or calculator to do math.

Technology **Verifying the Angle Properties**

Dynamic geometry software on a computer or a graphing calculator can be used to verify the circle properties in Lesson 4.3.



FOCUS

- Use dynamic geometry software to verify the properties of angles in a circle.

The diagrams show what you might see as you conduct the investigations that follow.

To verify the property of inscribed and central angles

- Construct a circle.
- Mark three points on the circle. Label them A, B, and C. Label the centre of the circle O.
- Join AB and BC. Join OA and OC.
- Measure $\angle ABC$ and $\angle AOC$. What do you notice?
- Drag point C around the circle. Do not drag it between points A and B. Does the measure of $\angle ABC$ change? What property does this verify?

Technology 413

Illustrated Glossary

acute angle: an angle measuring less than 90°

acute triangle: a triangle with three acute angles



algebraic expression: a mathematical expression containing a variable; for example, $6x - 4$ is an algebraic expression

angle bisector: the line that divides an angle into two equal angles



angle of rotation symmetry: the minimum angle required for a shape to rotate and coincide with itself

approximate: a number close to the exact value of an expression; the symbol \approx means "is approximately equal to"

arc: a segment of the circumference of a circle



area: the number of square units needed to cover a region

average: a single number that represents a set of numbers (see mean, median, and mode)

bar graph: a graph that displays data by using horizontal or vertical bars

bar notation: the use of a horizontal bar over a decimal digit to indicate that it repeats; for example, $1.\bar{3}$ means 1.333 333 ...

base: the side of a polygon or the face of an object from which the height is measured

base of a power: see power

bin: a prejudice that is in favor of or against a topic

binomial: a polynomial with two terms; for example, $3x - 8$

bisector: a line that divides a line segment or an angle into two equal parts

capacity: the amount a container can hold

Cartesian Plane: another name for a coordinate grid (see coordinate grid)

census: a data collection method using each member of the population

central angle: an angle whose arms are radii of a circle

certain event: an event with probability 1, or 100%

chance: probability expressed as a percent

chord: a line segment that joins two points on a circle

circle graph: a diagram that uses sectors of a circle to display data

circumference: the distance around a circle, also the perimeter of the circle

coefficient: the numerical factor of a term; for example, in the terms $3x$ and $3x^2$, the coefficient is 3

common denominator: a number that is a multiple of each of the given denominators; for example, 12 is a common denominator for the fractions $\frac{1}{3}$ and $\frac{1}{4}$

common factor: a number that is a factor of each of the given numbers; for example, 3 is a common factor of 15, 9, and 21

commutative property: the property of addition and multiplication that states that numbers can be added or multiplied in any order; for example, $3 + 5 = 5 + 3$; $3 \times 3 = 3 \times 3$

composite number: a number with three or more factors; for example, 6 is a composite number because its factors are 1, 2, 3, and 6

Illustrated Glossary 541

The **Illustrated Glossary** is a dictionary of important math words.