Big Ideas Math: Red Accelerated

Parent Newsletter

Key Terms

Integers are the set of whole numbers and their opposites.

The *absolute value* of an integer is the distance between the number and 0 on a number line.

Two numbers that are the same distance from 0, but on opposite sides of 0, are called *opposites*.

The sum of an integer and its *additive inverse*, or opposite, is 0.

Students will...

Define the absolute value of a number.

Find absolute values of numbers.

Add integers.

Show that the sum of a number and its opposite is 0.

Subtract integers.

Multiply integers.

Divide integers.

Solve real-life problems.

Standards

Common Core:

7.NS.1: Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers.

Key Ideas

Additive Inverse Property
- The sum of an integer and its additive inverse, or opposite, is 0.
- $a + (-a) = 0$

Multiplying Integers with the Same Sign
- The product of two integers with the same sign is positive.

Multiplying Integers with Different Signs
- The product of two integers with different signs is negative.

Dividing Integers with the Same Sign
- The quotient of two integers with the same sign is positive.

Adding Integers with the Same Sign
- Add the absolute values of the integers.
- Then use the common sign.

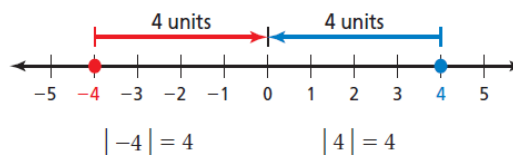**Adding Integers with Different Signs**
- Subtract the lesser absolute value from the greater absolute value.
- Then use the sign of the integer with the greater absolute value.

Dividing Integers with Different Signs
- The quotient of two integers with different signs is negative.

Absolute Value
- The absolute value of an integer is the distance between the number and 0 on a number line.
- The absolute value of a number a is written as $|a|$.

Games

- Choose Wisely
- Top This
- Right on Target
- 5 is Alive
- 6 Sticks
- 7 Not 11
- 8 is Great
- 9 is Fine
- Can 3=2?
- More Fours

These are available online in the *Game Closet* at www.bigideasmath.com.

4 units   4 units

$|-4| = 4$ $|4| = 4$

Good to know.

Reference Tools

An **Idea and Examples Chart** can be used to organize information about a concept. Fill in the top rectangle with a term and its definition or description. Fill in the rectangles that follow with examples to illustrate the term. Each sample answer shows 3 examples, but your student can show more or fewer examples. Idea and examples charts are useful for concepts that can be illustrated with more than one type of example.

Absolute Value: the distance between a number and 0 on the number line

Example
$|3| = 3$

Example
$|-5| = 5$

Example
$|0| = 0$

Essential Questions

How can you use integers to represent the velocity and the speed of an object?

Is the sum of two integers *positive*, *negative*, or *zero*? How can you tell?

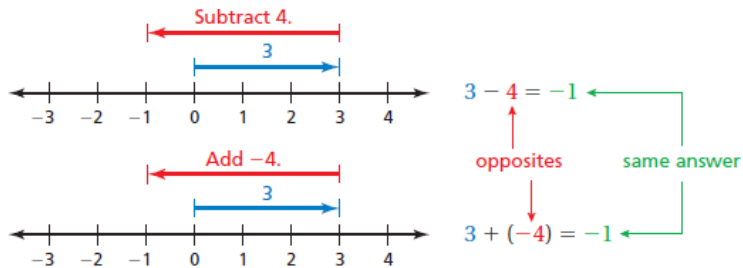How are adding integers and subtracting integers related?

Is the product of two integers *positive*, *negative*, or *zero*? How can you tell?

Is the quotient of two integers *positive*, *negative*, or *zero*? How can you tell?

Key Ideas

Subtracting Integers
- To subtract an integer, add its opposite.

Subtract 4.
3

$3 - 4 = -1$

Add -4.
3

opposites   same answer

$3 + (-4) = -1$

Quick Review

- A number line can be used to compare and order integers.
  - o Numbers to the left are less than numbers to the right.
  - o Numbers to the right are greater than numbers to the left.
- Division by 0 is undefined.
- The absolute value of a number is always a positive number or zero.
- When both factors have the same sign, the product is positive.
- When the factors have different signs, the product is negative.

What's the Point?

The ability to understand and work with integers is very useful in real life for events like measuring rainfall. Have your student collect rain water from the next few storms and measure the amount of collected water in whole centimeters. Record this data and have them plot the data on a number line. Which storm produced the most rain? What is the difference between the lightest rainfall and the heaviest rainfall?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 1: Freezing Solid STEM Video is available online at www.bigideasmath.com.

Hmmm.

Big Ideas Math: Red Accelerated

Parent Newsletter

Chapter 2: Rational Numbers

Standards

Common Core:

7.NS.1: Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.3: Solve real-world and mathematical problems involving the four operations with rational numbers.

Students will...

Understand that a rational number is an integer divided by an integer.

Convert rational numbers to decimals.

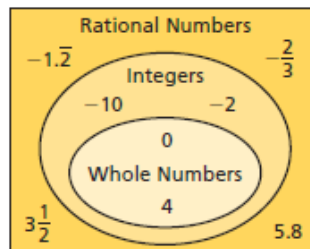Add rational numbers.

Subtract rational numbers.

Multiply and divide rational numbers.

Solve real-life problems.

Key Ideas

Rational Numbers

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

Adding Rational Numbers

- To add rational numbers, use the same rules for signs as you used for integers.
- For example:

$$-\frac{1}{3} + \frac{1}{6} = \frac{-2}{6} + \frac{1}{6} = \frac{-2+1}{6} = \frac{-1}{6} = -\frac{1}{6}$$

Subtracting Rational Numbers

- To subtract rational numbers, use the same rules for signs as you used for integers.
- For example:

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

Multiplying and Dividing Rational Numbers

- To multiply or divide rational numbers, use the same rules for signs as you used for integers.
- For example:

$$-\frac{2}{7} \cdot \frac{1}{3} = \frac{-2 \cdot 1}{7 \cdot 3} = \frac{-2}{21} = -\frac{2}{21}$$

$$-\frac{1}{2} \div \frac{4}{9} = \frac{-1}{2} \cdot \frac{9}{4} = \frac{-1 \cdot 9}{2 \cdot 4} = \frac{-9}{8} = -\frac{9}{8}$$

Key Terms

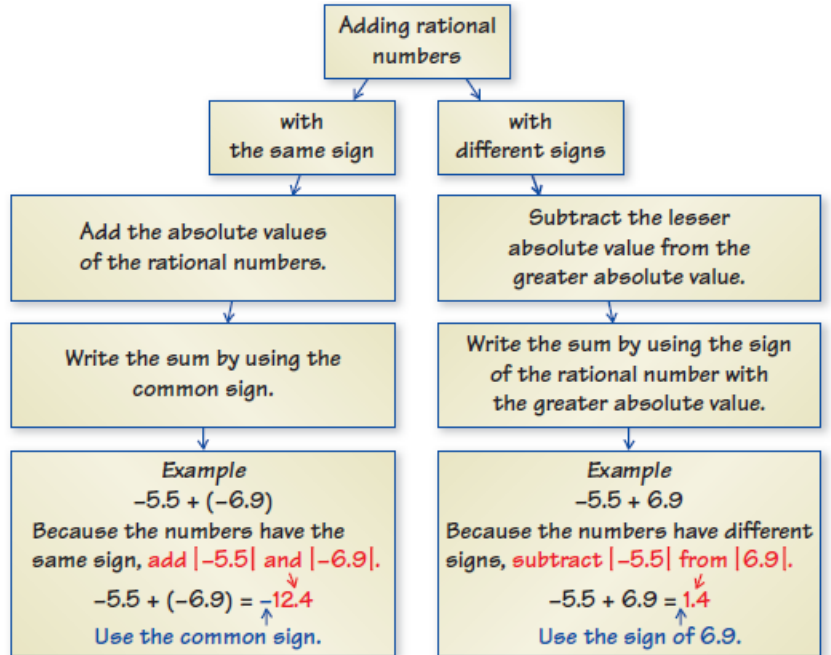A *rational number* is a number that can be written as the ratio of two integers.

A *terminating decimal* is a decimal that ends.

A *repeating decimal* is a decimal that has a pattern that repeats.

Good to know.

Reference Tools

A **Process Diagram** can be used to show the steps involved in a procedure. Process diagrams are particularly useful for illustrating procedures with two or more steps, and they can have one or more branches. As shown, process diagrams can consist of a single flowchart-type diagram, with example(s) included in the last box to illustrate the steps that precede it. Or, the diagram can have two parallel flowcharts, in which the procedure is stepped out in one chart and an example illustrating each step is shown in the other chart.

Adding rational numbers

with the same sign

Add the absolute values of the rational numbers.

Write the sum by using the common sign.

Example
−5.5 + (−6.9)
Because the numbers have the same sign, add |−5.5| and |−6.9|.
−5.5 + (−6.9) = −12.4
Use the common sign.

with different signs

Subtract the lesser absolute value from the greater absolute value.

Write the sum by using the sign of the rational number with the greater absolute value.

Example
−5.5 + 6.9
Because the numbers have different signs, subtract |−5.5| from |6.9|.
−5.5 + 6.9 = 1.4
Use the sign of 6.9.

Essential Questions

How can you use a number line to order rational numbers?

How can you use what you know about adding integers to add rational numbers?

How can you use what you know about subtracting integers to subtract rational numbers?

Why is the product of two negative rational numbers positive?

Quick Review

- Because you can divide any integer by any nonzero integer, you can use long division to write fractions and mixed numbers as decimals. These decimals are also rational numbers and will either *terminate* or *repeat*.

- Every quotient of integers (with a non-zero divisor) is a rational number.

- The distance between any two numbers on a number line is the absolute value of the difference of the numbers.

- When multiplying or dividing fractions, mixed numbers must be written as improper fractions.

What's the Point?

The ability to work with rational numbers is very useful in real life for events like balancing a checkbook. Have your student help you balance your checkbook or check your online bank statement. What is the beginning balance and the end balance? How much was spent in total? Stress to them the importance of checking bank statements because errors can be made.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 2: Carpenter or Joiner STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

BIG IDEAS LEARNING.

Key Terms

Like terms are terms that have the same variables raised to the same exponents.

An algebraic expression is in *simplest form* when it has no like terms and no parentheses.

A *linear expression* is an algebraic expression in which the exponent of the variable is 1.

When *factoring an expression*, you write the expression as a product of factors.

Two equations are *equivalent equations* if they have the same solutions.

Students will...

Apply properties of operations to simplify algebraic expressions.

Apply properties of operations to add and subtract linear expressions.

Factor linear expressions.

Write simple equations.

Solve equations using addition or subtraction.

Solve equations using multiplication or division.

Solve two-step equations.

Solve real-life problems.

Standards

Common Core:

7.EE.1: Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.2: Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

7.EE.4a: Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

Key Ideas

Addition Property of Equality

- Adding the same number to each side of an equation produces an equivalent equation.
- If $a = b$, then $a + c = b + c$.

Subtraction Property of Equality

- Subtracting the same number from each side of an equation produces an equivalent equation.
- If $a = b$, then $a - c = b - c$.

Multiplication Property of Equality

- Multiplying each side of an equation by the same number produces an equivalent equation.
- If $a = b$, then $a \cdot c = b \cdot c$.

Division Property of Equality

- Dividing each side of an equation by the same number produces an equivalent equation.
- If $a = b$, then $a \div c = b \div c$, $c \neq 0$.
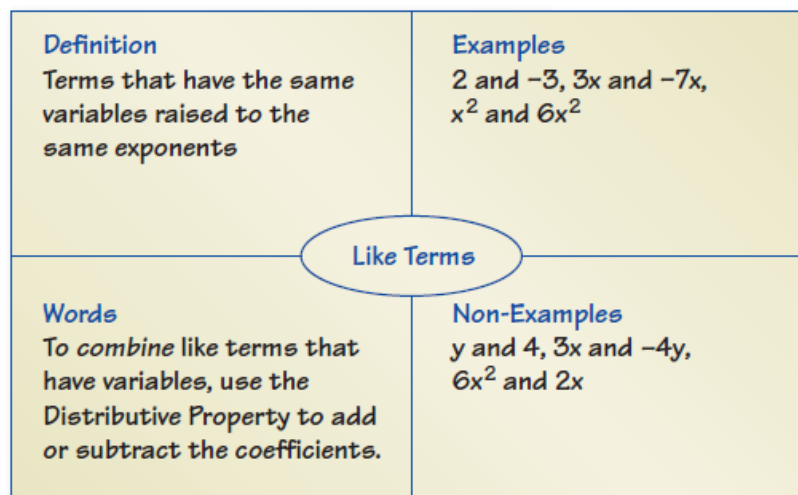
Games

- Let's Race
- Tic-Tac-Toe

These are available online in the *Game Closet* at www.bigideasmath.com.

Good to know.

Reference Tools

A **Four Square** can be used to organize information about a topic. Write the topic in the "bubble" in the middle of the four square. Then write concepts related to the topic in the four squares surrounding the bubble. Any concept related to the topic can be used. Encourage your student to include concepts that will help them learn the topic. Place four squares on note cards to use as a quick study reference.

Definition
Terms that have the same variables raised to the same exponents

Examples
2 and −3, 3x and −7x, x^2 and $6x^2$

Like Terms

Words
To combine like terms that have variables, use the Distributive Property to add or subtract the coefficients.

Non-Examples
y and 4, 3x and −4y, $6x^2$ and 2x

Quick Review

- Parts of an algebraic expression are called *terms*.
- Any letter can be used as a variable.
- To identify terms and like terms in an expression, first write the expression as a sum of its terms.
- The same variables must be raised to the same exponents for terms to be *like terms*.
- To *combine* like terms that have variables, use the Distributive Property to add or subtract the coefficients.
- To subtract a variable term, add the term with the opposite coefficient.
- You can use a vertical or a horizontal method to add linear expressions.
- To subtract one linear expression from another, add the opposite of each term in the expression.
- You can use the Distributive Property to factor out any rational number from an expression.
- Variables can be on either side of the equation.

Essential Questions

How can you simplify an algebraic expression?

How can you use algebra tiles to add or subtract algebraic expressions?

How can you use algebra tiles to solve addition or subtraction equations?

How can you use multiplication or division to solve equations?

How can you use algebra tiles to solve a two-step equation?

What's the Point?

The ability to use expressions and equations is very useful in real life for events like budgeting for a trip to the movies. Have your student figure out how many people they can take to the movies with a certain amount if money. What if everyone gets popcorn?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 3: Rock Climbing STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

Key Terms

An *inequality* is a mathematical sentence that compares expressions. It contains the symbols $<$, $>$, $\leq$, or $\geq$.

A *solution of an inequality* is a value that makes the inequality true.

The set of all solutions of an inequality is called the *solution set*.

The *graph of an inequality* shows all the solutions of the inequality on a number line.

Students will...

Write and graph inequalities.

Use substitution to check whether a number is a solution of an inequality.

Solve inequalities using addition or subtraction.

Solve inequalities using multiplication or division.

Solve multi-step inequalities.

Solve real-life problems.

Standards

Common Core:
7.EE.4b: Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Key Ideas

Addition Property of Inequality

- When you add the same number to each side of an inequality, the inequality remains true.

- If $a < b$, then $a + c < b + c$.

- If $a > b$, then $a + c > b + c$.

Subtraction Property of Inequality

- When you subtract the same number from each side of an inequality, the inequality remains true.

- If $a < b$, then $a - c < b - c$.

- If $a > b$, then $a - c > b - c$.

Multiplication and Division Properties of Inequality (Case 1)

- When you multiply or divide each side of an inequality by the same *positive* number, the inequality remains true.

- If $a < b$ and *c* is positive, then $a \cdot c < b \cdot c$ and $\frac{a}{c} < \frac{b}{c}$.

- If $a > b$ and *c* is positive, then $a \cdot c > b \cdot c$ and $\frac{a}{c} > \frac{b}{c}$.

Multiplication and Division Properties of Inequality (Case 2)

- When you multiply or divide each side of an inequality by the same *negative* number, the direction of the inequality symbol must be reversed for the inequality to remain true.

- If $a < b$ and *c* is negative, then $a \cdot c > b \cdot c$ and $\frac{a}{c} > \frac{b}{c}$.

- If $a > b$ and *c* is negative, then $a \cdot c < b \cdot c$ and $\frac{a}{c} < \frac{b}{c}$.

Good to know.

These properties are also true for $\leq$ and $\geq$.

Reference Tools

A **Y Chart** can be used to compare two topics. List differences between the two topics in the branches of the Y and similarities in the base of the Y. A Y chart serves as a good tool for assessing knowledge of a pair of topics that have subtle but important differences.

Solving Equations

- The sign between two expressions is an equal sign, =.
- One number is the solution.

Solving Inequalities

- The sign between two expressions is an inequality symbol: <, >, ≤, or ≥.
- More than one number can be a solution.

- Use inverse operations to group numbers on one side.
- Use inverse operations to group variables on one side.
- Solve for the variable.

Quick Review

Inequality Symbols				
Symbol	<	>	≤	≥
Key Phrases	• is less than • is fewer than	• is greater than • is more than	• is less than or equal to • is at most • is no more than	• is greater than or equal to • is at least • is no less than

- When you multiply or divide by a negative quantity, reverse the direction of the inequality symbol.

- You solve two-step inequalities in much the same way as you solve two-step equations. You only need to remember to change the direction of the inequality symbol if you multiply or divide by a negative quantity.

Essential Questions

How can you use a number line to represent solutions of an inequality?

How can you use addition or subtraction to solve an inequality?

How can you use multiplication or division to solve an inequality?

How can you use an inequality to describe the dimensions of a figure?

What's the Point?

The ability to write and solve inequalities is very useful in real life for events like making a household budget. Ask your student how they plan on spending their money next month. Then have them make a budget to show at least how much money they will need to earn to cover all the costs.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 4: Space Cadets STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

Standards

Common Core:

7.RP.1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

7.RP.2: Recognize and represent proportional relationships between quantities.

7.RP.3: Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Key Terms

A *ratio* is a comparison of two quantities using division.

A *rate* is a ratio of two quantities with different units.

A rate with a denominator of 1 is called a ***unit rate***.

A *complex fraction* has at least one fraction in the numerator, denominator, or both.

Slope is the rate of change between any two points on a line.

Two quantities x and y show ***direct variation*** when $y = kx$, where k is a number and $k \neq 0$.

The number k in the direct variation equation is called the ***constant of proportionality***.

Students will...

Find ratios, rates, and unit rates.

Find ratios and rates involving ratios of fractions.

Use equivalent ratios to determine whether two ratios form a proportion.

Use the Cross Products Property to determine whether two ratios form a proportion.

Use graphs to determine whether two ratios form a proportion.

Interpret graphs of proportional relationships.

Write proportions.

Solve proportions using mental math.

Solve proportions using multiplication or the Cross Products Property.

Use a point on a graph to write and solve proportions.

Find the slopes of lines.

Interpret the slopes of lines as rates.

Identify direct variation from graphs or equations.

Use direct variation models to solve problems.

Key Ideas

Proportions
- A proportion is an equation stating that two ratios are equivalent.
- Two quantities that form a proportion are proportional.

Cross Products
- In the proportion $\frac{a}{b} = \frac{c}{d}$, the products $a \cdot d$ and $b \cdot c$ are called **cross products**.

Cross Products Property
- The cross products of a proportion are equal.
- $\frac{a}{b} = \frac{c}{d}$
  $ad = bc$, where $b, d \neq 0$

Direct Variation
The graph of $y = kx$ is a line with a slope of k that passes through the origin. So, two quantities that show direct variation are in a proportional relationship.
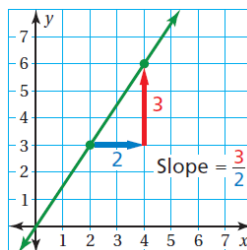
Solving Proportions

Method 1: Use mental math.

Method 2: Use the Multiplication Property of Equality.
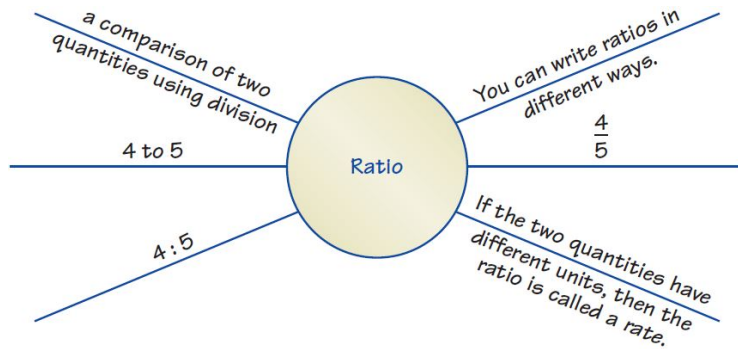
Method 3: Use the Cross Products Property.

Slope
- The slope is a measure of the *steepness* of a line.
- To find the slope of a line, find the ratio of the change in y (vertical change) to the change in x (horizontal change).

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Slope} = \frac{3}{2}$$

Good to know.

Reference Tools

a comparison of two quantities using division

4 to 5

4 : 5

Ratio

You can write ratios in different ways.

$\dfrac{4}{5}$

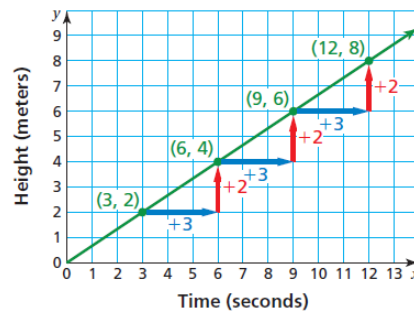If the two quantities have different units, then the ratio is called a rate.

An **Information Wheel** can be used to organize information about a concept. Write the concept in the middle of the "wheel." Then write information related to the concept on the "spokes" of the wheel. Related information can include, but is not limited to: vocabulary words or terms, definitions, formulas, procedures, examples, and visuals. This type of organizer serves as a good summary tool because any information related to a concept can be included.

Quick Review

- You can graph the values from a ratio table.

Time, x (seconds)	Height, y (meters)
3	2
6	4
9	6
12	8

+3, +3, +3 (on Time column)
+2, +2, +2 (on Height column)

- The graph of every proportional relationship is a line through the origin.

- When two quantities *vary directly*, the ratio of one quantity to another is a *constant*.

- One way to write a proportion is to use a table.

	Last Month	This Month
Purchase	2 ringtones	3 ringtones
Total Cost	6 dollars	x dollars

Use columns:

$$\dfrac{2 \text{ ringtones}}{6 \text{ dollars}} = \dfrac{3 \text{ ringtones}}{x \text{ dollars}}$$

Numerators have the same units.

Denominators have the same units.

Use rows:

$$\dfrac{2 \text{ ringtones}}{3 \text{ ringtones}} = \dfrac{6 \text{ dollars}}{x \text{ dollars}}$$

The units are the same on each side of the proportion.

Essential Questions

How do rates help you describe real-life problems?

How can proportions help you decide when things are "fair"?

How can you write a proportion that solves a problem in real life?

How can you use ratio tables and cross products to solve proportions?

How can you compare two rates graphically?

How can you use a graph to show the relationship between two quantities that vary directly? How can you use an equation?

What's the Point?

The ability to write and solve ratios and proportions is very useful in real life for events like converting between measures. If you are driving in Canada, speed is measured in km/h. Ask your student what the speed limit is in miles per hour if a sign says "Speed Limit 110 km/h."

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 5: Painting a Large Room STEM Video is available online at www.bigideasmath.com.

Hmmm.

Big Ideas Math: Red Accelerated

Parent Newsletter

BIG IDEAS LEARNING.

Standards

Common Core:

7.EE.3: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

7.RP.3: Use proportional relationships to solve multistep ratio and percent problems.

Key Ideas

Writing Percents as Decimals
- Remove the percent symbol. Then divide by 100, or just move the decimal point two places to the left.
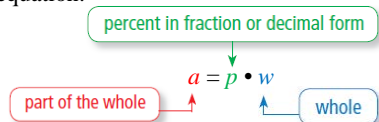
Writing Decimals as Percents
- Multiply by 100, or just move the decimal point two places to the right. Then add a percent symbol.

The Percent Proportion
You can represent "*a* is *p* percent of *w*" with the proportion $\frac{a}{w} = \frac{p}{100}$ where *a* is part of the whole *w*, and *p*%, or $\frac{p}{100}$, is the percent.

The Percent Equation
To represent "*a* is *p* percent of *w*," use an equation.

percent in fraction or decimal form

$$a = p \bullet w$$

part of the whole   whole

Percent Error

$$\text{Percent error} = \frac{\text{amount of error}}{\text{actual amount}}$$
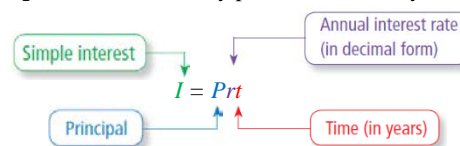
Percents of Increase and Decrease

$$\text{Percent of increase} = \frac{\text{new amount} - \text{original amount}}{\text{original amount}}$$

$$\text{Percent of decrease} = \frac{\text{original amount} - \text{new amount}}{\text{original amount}}$$
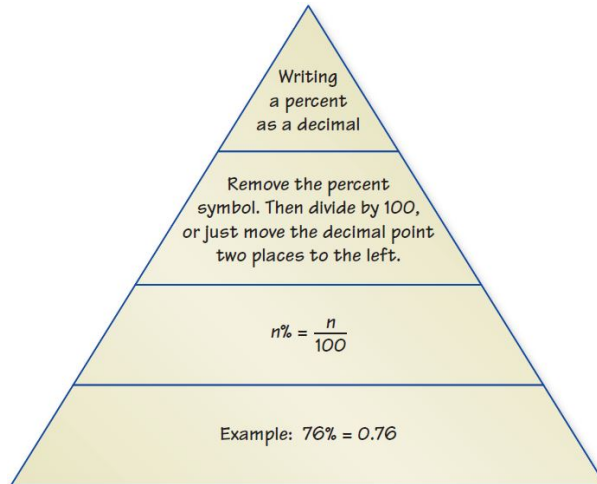
Key Terms

A **percent of change** is the percent that a quantity changes from the original amount.

When the original amount increases, the percent of change is called a **percent of increase**.

When the original amount decreases, the percent of change is called a **percent of decrease**.

A **percent error** is the percent that an estimated quantity differs from the actual amount.

A **discount** is a decrease in the original price of an item.

The increase from what the store pays to the selling price is called a **markup**.

Interest is money paid or earned for the use of money.

The **principal** is the amount of money borrowed or deposited.

Simple interest is money paid or earned only on the principal.

Students will...

Write percents as decimals.

Write decimals as percents.

Compare and order fractions, decimals, and percents.

Use the percent proportion to find parts, wholes, and percents.

Use the percent equation to find parts, wholes, and percents.

Find percents of increase.

Find percents of decrease.

Use percent of discounts to find prices of items.

Use percent of markups to find selling prices of items.

Use the simple interest formula to find interest earned or paid, annual interest rates, and amounts paid on loans.

Solve real-life problems.

Simple Interest
Simple interest is money paid or earned only on the principal.

Simple interest

Annual interest rate (in decimal form)

$$I = Prt$$

Principal   Time (in years)

Good to know.

Reference Tools

A **Summary Triangle** can be used to explain a concept. Typically, the summary triangle is divided into 3 or 4 parts. In the top part, write the concept being explained. In the middle part(s), write any procedure, explanation, description, definition, theorem, and/or formula(s). In the bottom part, write an example to illustrate the concept. They can be placed on note cards to use as a quick study reference.

Writing
a percent
as a decimal

Remove the percent symbol. Then divide by 100, or just move the decimal point two places to the left.

$n\% = \dfrac{n}{100}$

Example: $76\% = 0.76$

Games

- I Have…Who Has…?
- Order Matters

These are available online in the *Game Closet* at www.bigideasmath.com.

Essential Questions

How does the decimal point move when you rewrite a percent as a decimal and when you rewrite a decimal as a percent?

How can you order numbers that are written as fractions, decimals, and percents?

How can you use models to estimate percent questions?

How can you use an equivalent form of the percent proportion to solve a percent problem?

What is a percent of decrease? What is a percent of increase?

How can you find discounts and selling prices?

How can you find the amount of simple interest earned on a savings account? How can you find the amount of interest owed on a loan?

Quick Review

Percent/Decimal Review
- 25% is 25 per one hundred or 0.25.
- 250% is 250 per one hundred or 2.5.
- 0.25% is 25 hundredths per one hundred or 0.0025.
- 0.025% is 25 thousandths per one hundred or 0.00025.

- When comparing and ordering fractions, decimals, and percents, write the numbers as all fractions, all decimals, or all percents.

- Percent bar models help estimate answers, while ratio tables can be used to find the exact answers.

- The percent error compares the amount of error to the actual amount.

- For the Simple Interest formula, the interest rate is written as a decimal. Time is written in terms of years. When time is given in months, remember to express it as a fraction of a year or as a decimal.

What's the Point?

The ability to use percents is very useful in real life when taking out a loan on a car. Ask your student to research car loans through different banks or dealerships. How much interest would they pay over the life of a specific loan? Does this seem like a good choice? Why or Why not?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 6: Tornado! STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

Standards

Common Core:

7.G.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.2: Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.5: Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Key Ideas

Classifying Triangles Using Angles

acute triangle — all acute angles

obtuse triangle — 1 obtuse angle

right triangle — 1 right angle

equiangular triangle — 3 congruent angles

Classifying Triangles Using Sides

scalene triangle — no congruent sides

isosceles triangle — at least 2 congruent sides

equilateral triangle — 3 congruent sides

Sum of the Angle Measures of a Triangle

The sum of the angle measures of a triangle is 180°.

$$x + y + z = 180$$

Sum of the Angle Measures of a Quadrilateral

The sum of the angle measures of a quadrilateral is 360°.

$$w + x + y + z = 360$$

Scale

The measurements in scale drawings and models are proportional to the measurements of the actual object.

Key Terms

Two angles are *adjacent angles* when they share a common side and have the same vertex.

Two angles are *vertical angles* when they are opposite angles formed by the intersection of two lines.

Congruent angles have the same measure.

Two angles are *complementary angles* when the sum of their measures is 90°.

Two angles are *supplementary angles* when the sum of their measures is 180°.

Congruent sides have the same length.

A *scale drawing* is a proportional, two-dimensional drawing of an object.

A *scale model* is a proportional, three-dimensional model of an object.

The *scale* gives the ratio that compares the measurements of the drawing or model with the actual measurements.

A scale without units is called a *scale factor*.

Students will...

Identify adjacent and vertical angles.

Find angle measures using adjacent and vertical angles.

Classify pairs of angles as complementary, supplementary, or neither.

Find angle measures using complementary and supplementary angles.

Construct triangles with given angle measures.

Construct triangles with given side lengths.

Understand that the sum of the angle measures of any triangle is 180°.

Find missing angle measures in triangles.

Understand that the sum of the angle measures of any quadrilateral is 360°.

Find missing angle measures in quadrilaterals.

Construct quadrilaterals.
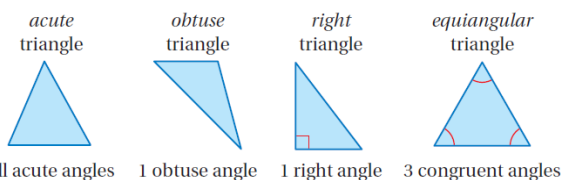
Use scale drawings to find actual distances.

Find scale factors.

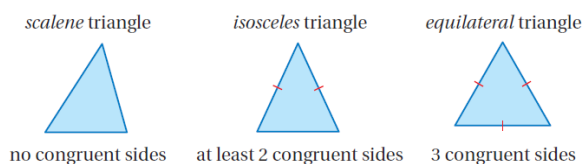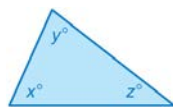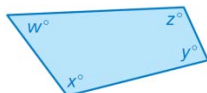Use scale drawings to find actual perimeters And areas.

Recreate scale drawings at a different scale.

Good to know.

Reference Tools

An **Example and Non-Example Chart** can be used to list examples and non-examples of a vocabulary word or term. Write examples of the word or term in the left column and non-examples in the right column. This type of organizer serves as a good tool for assessing knowledge of pairs of topics that have subtle but important differences, such as complementary and supplementary angles.

Complementary Angles

Examples	Non-Examples
60° 30°	30° 150°
45° 45°	
16° 74°	119°
89°, 1°	63°, 26°

Essential Questions

What can you conclude about the angles formed by two intersecting lines?

How can you classify two angles as complementary or supplementary?

How can you construct triangles?

How can you classify quadrilaterals?

How can you enlarge or reduce a drawing proportionally?

Quick Review

A quadrilateral is a polygon with four sides. The diagram shows properties of different types of quadrilaterals and how they are related. When identifying a quadrilateral, use the name that is most specific.

Quadrilateral

Trapezoid — quadrilateral with exactly one pair of parallel sides

Parallelogram — quadrilateral with opposite sides that are parallel and congruent

Kite — quadrilateral with two pairs of congruent adjacent sides and opposite sides that are not congruent

Rectangle — parallelogram with four right angles

Rhombus — parallelogram with four congruent sides

Square — parallelogram with four congruent sides and four right angles

- When two lines intersect, two pairs of vertical angles are formed. Vertical angles are congruent.

- Adjacent sides share a common vertex.

- The measurements in scale drawings and models are proportional to the measurements of the actual object.

1 in. ← drawing distance
10 mi ← actual distance

1 in. : 10 mi
drawing actual

An angle can be classified by its measure.

- A right angle is 90°

- An acute angle is less than 90°

- An obtuse angle is between 90° and 180°

- A straight angle is 180°.

What's the Point?

The ability to use scale drawings is very useful in real life when making building plans or in architectural design. Ask your student to make a scale drawing of their ideal bedroom. How would they have to change the dimensions of their real bedroom to create the ideal bedroom?

The STEM Videos available online show ways to use mathematics in real-life situations.
The Chapter 7: Trick Shots in Film STEM Video is available online at www.bigideasmath.com.

Hmmm...

Big Ideas Math: Red Accelerated

Parent Newsletter

BIG IDEAS LEARNING.

Standards

Common Core:

7.G.4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

7.G.6: Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Key Terms

A *circle* is the set of all points in a plane that are the same distance from a point called the *center*.

The distance around a circle is called the *circumference*.

The ratio $\frac{\text{circumference}}{\text{diameter}}$ is the same for *every* circle and is represented by the Greek letter π, called *pi*.

A *semicircle* is one-half of a circle.

A *composite figure* is made up of triangles, squares, rectangles, semicircles, and other two-dimensional figures.

Students will…

Describe a circle in terms of radius and diameter.

Understand the concept of pi.

Find circumferences of circles and perimeters of semicircles.

Find perimeters of composite figures.

Find areas of circles and semicircles.

Find areas of composite figures by separating them into familiar figures.

Good to know.

Solve real-life problems.

Key Ideas

Radius and Diameter
The diameter d of a circle is twice the radius r. The radius r of a circle is one-half the diameter d.

Diameter: $d = 2r$ **Radius:** $r = \frac{d}{2}$

circle

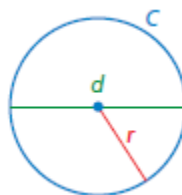The **radius** is the distance from the center to any point on the circle.

center

The **diameter** is the distance across the circle through the center.

Circumference of a Circle
The circumference C of a circle is equal to π times the diameter d or π times twice the radius r.

$$C = \pi d \qquad \text{or} \qquad C = 2\pi r$$

Area of a Circle
The area A of a circle is the product of π and the square of the radius.

$$A = \pi r^2$$

Composite Figures
- A composite figure is made up of triangles, squares, rectangles, semicircles, and other two-dimensional figures.

- To find the perimeter of a composite figure, find the distance around the figure.

- To find the area of a composite figure, separate it into figures with areas you know how to find. Then find the sum of the areas of those figures.
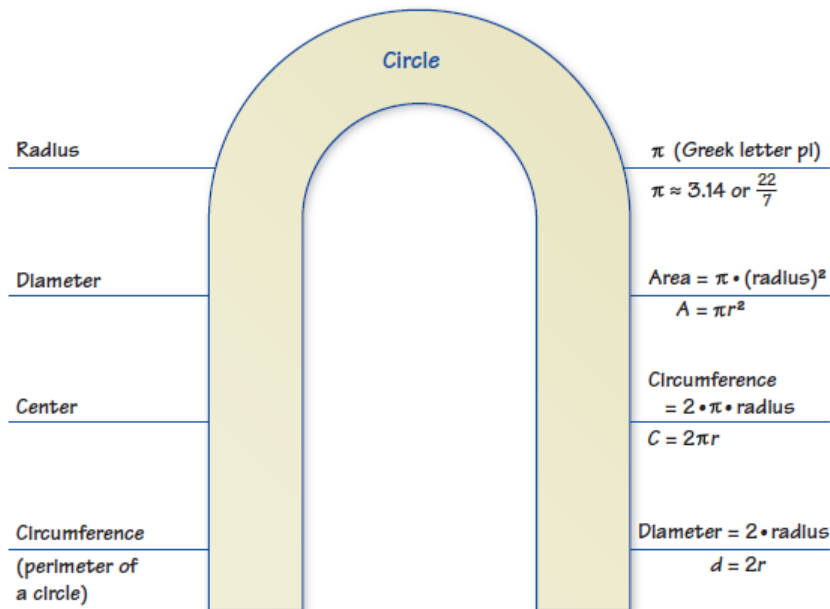
Reference Tools

A **Word Magnet** can be used to organize information associated with a vocabulary word or term. As shown, write the word or term inside the magnet. Write associated information on the blank lines that "radiate" from the magnet. Associated information can include, but is not limited to: other vocabulary words or terms, definitions, formulas, procedures, examples, and visuals. This type of organizer serves as a good summary tool because any information related to a topic can be included.

Circle

Radius

Diameter

Center

Circumference (perimeter of a circle)

π (Greek letter pi)
$\pi \approx 3.14$ or $\frac{22}{7}$

Area = $\pi \cdot$ (radius)^2
$A = \pi r^2$

Circumference
$= 2 \cdot \pi \cdot$ radius
$C = 2\pi r$

Diameter = $2 \cdot$ radius
$d = 2r$

Essential Questions

How can you find the circumference of a circle?

How can you find the perimeter of a composite figure?

How can you find the area of a circle?

How can you find the area of a composite figure?

Quick Review

- Pi (π) is a constant whose value is approximately 3.14 or $\frac{22}{7}$.

- Area includes everything inside the figure.

- The radius is half the diameter.

- The symbol $\approx$ means *approximately equal to*.

- To find the perimeter of a composite figure, find the distance around the figure.

Games

- Math Card War
- Pick your Polygon

These are available online in the *Game Closet* at www.bigideasmath.com.

What's the Point?

The ability to use properties of circles and area is very useful in real life for events like putting up a pool. Have your student measure their yard. What size of a circular swimming pool would fit best? How many square feet would be needed to add a deck?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 8: Track and Field STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

Chapter 9: Surface Area and Volume

Students will...

Use two-dimensional nets to represent three-dimensional solids.

Find surface areas of rectangular and triangular prisms.

Find surface areas of regular pyramids.

Find surface areas of cylinders.

Find volumes of prisms.

Find volumes of pyramids.

Describe the intersections of planes and solids.

Solve real-life problems.

Key Terms

The *lateral surface area* of a prism is the sum of the areas of the lateral faces.

A *regular pyramid* is a pyramid whose base is a regular polygon.

The height of each lateral face of a pyramid is the *slant height* of the pyramid.

A two-dimensional shape formed by the intersection of a plane and a solid is called a *cross section*.

Standards

Common Core:

7.G.3: Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

7.G.4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

7.G.6: Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Key Ideas

Surface Area of a Rectangular Prism
The surface area S of a rectangular prism is the sum of the areas of the bases and the lateral faces.

$$S = 2\,\ell w + 2\,\ell h + 2wh$$

Areas of bases

Areas of lateral faces

Surface Area of a Pyramid
The surface area S of a pyramid is the sum of the areas of the base and the lateral faces.
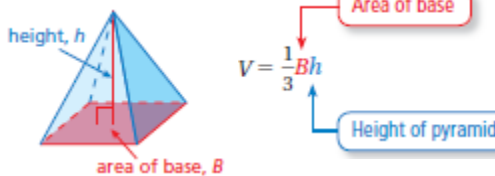
$S =$ area of base $+$ areas of lateral faces

Surface Area of a Prism
The surface area S of any prism is the sum of the areas of the bases and the lateral faces.

$S =$ areas of bases $+$ areas of lateral faces

Volume of a Pyramid
The volume V of a pyramid is one-third the product of the area of the base and the height of the pyramid.

$$V = \frac{1}{3}Bh$$

Area of base

Height of pyramid

area of base, B

Essential Questions

How can you find the surface area of a prism?

How can you find the surface area of a pyramid?

How can you find the surface area of a cylinder?

How can you find the volume of a prism?

How can you find the volume of a pyramid?

Good to know.

Reference Tools

An **Information Frame** can be used to help organize and remember concepts. Write the topic in the middle rectangle. Then write related concepts in the spaces around the rectangle. Related concepts can include *Words*, *Numbers*, *Algebra*, *Example*, *Definition*, *Non-Example*, *Visual*, *Procedure*, *Details,* and *Vocabulary*. Your student can place their information frames on note cards to use as a quick study reference.

Visual:

Words:
The surface area S of a rectangular prism is the sum of the areas of the bases and the lateral faces.

Surface Areas of Rectangular Prisms

Areas of bases   Areas of lateral faces

Algebra:
$S = 2\ell w + 2\ell h + 2wh$

Example:
$S = 2\ell w + 2\ell h + 2wh$
$= 2(3)(4) + 2(3)(5) + 2(4)(5)$
$= 24 + 30 + 40$
$= 94 \text{ in.}^2$

5 in.   4 in.   3 in.

Key Ideas

Surface Area of a Cylinder
The surface area S of a cylinder is the sum of the areas of the bases and the lateral surface.
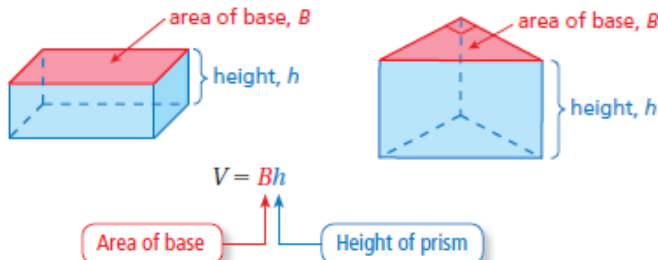
$S = 2\pi r^2 + 2\pi rh$

Areas of bases   Area of lateral surface

base $2\pi r$ lateral surface h base

Volume of a Prism
The volume V of a prism is the product of the area of the base and the height of the prism.

area of base, B   height, h
area of base, B   height, h

$V = Bh$

Area of base   Height of prism

What's the Point?

The ability to calculate surface area and volume is very useful in real life for events like packaging a product. Have your student measure a cereal box and calculate the surface area and volume of the box. Could the box be a different size with a smaller surface area and still hold the same amount of cereal? Why do you think the company made the box the size it is?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 8: Paper Measurements STEM Video is available online at www.bigideasmath.com.

Hmmm.

Parent Newsletter

Chapter 10: Probability and Statistics

Students will...

Identify and count the outcomes of experiments.

Understand the concept of probability and the relationship between probability and likelihood.

Find probabilities of events.

Find relative frequencies.

Use experimental probabilities to make predictions.

Use theoretical probabilities to find quantities.

Compare experimental and theoretical probabilities.

Use tree diagrams, tables, or a formula to find the number of possible outcomes.

Find probabilities of compound events.

Identify independent and dependent events.

Use formulas to find probabilities of independent and dependent events.

Use simulations to find experimental probabilities.

Determine when samples are representative of populations.

Use data from random samples to make predictions about populations.

Use multiple samples to make predictions about populations.

Use measures of center and variation to compare populations.

Use random samples to compare populations.

Essential Questions

In an experiment, how can you determine the number of possible results?

How can you describe the likelihood of an event?

How can you use relative frequencies to find probabilities?

How can you find the number of possible outcomes of one or more events?

What is the difference between dependent and independent events?

How can you determine whether a sample accurately represents a population?

How can you compare data sets that represent two populations?

Key Terms

The *relative frequency* of an event is the fraction or percent of the time that the event occurs in an experiment.

The set of all possible outcomes of one or more events is called the *sample space*.

A *compound event* consists of two or more events.

Events are *independent events* if the occurrence of one event *does not* affect the likelihood that the other event(s) will occur.

Events are *dependent events* if the occurrence of one event *does* affect the likelihood that the other event(s) will occur.

A *simulation* is an experiment that is designed to reproduce the conditions of a situation or process.

A *population* is an entire group of people or objects.

A *sample* is a part of the population.

An *unbiased sample* is representative of a population because it is selected at random and is large enough to provide accurate data..

A *biased sample* is not representative of a population because one or more parts of the population are favored over others..

Standards

Common Core:

7.SP.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

7.SP.2: Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

7.SP.3: Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

7.SP.4: Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

7.SP.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

7.SP.6: Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

7.SP.7: Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

7.SP.8: Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Good to know.

Reference Tools

Write important vocabulary or formulas in this space.

If P(event) = 0, the event is impossible.

If P(event) = 0.25, the event is unlikely.

If P(event) = 0.5, the event is equally likely to happen or not happen.

If P(event) = 0.75, the event is likely.

If P(event) = 1, the event is certain.

Probability

A number that measures the likelihood that an event will occur

Can be written as a fraction, decimal, or percent

Always between 0 and 1, inclusive

Write your notes about the topic in this space.

Write your questions about the topic in this space.

How do you find the probability of two or more events?

A **Notetaking Organizer** can be used to write notes, vocabulary, and questions about a topic. In the space on the left, write important vocabulary or formulas. In the space on the right, write notes about the topic. In the space at the bottom, write questions about the topic.

Quick Review

- When an experiment is performed *at random* or *randomly*, all of the possible outcomes are equally likely.
- Probabilities can be written as fractions, decimals, or percents.
- You can use tables and tree diagrams to find the sample space of two or more events.
- You can use a sample to make an *inference*, or conclusion, about a population.
- You use the mean and the mean absolute deviation (MAD) to describe symmetric distributions of data.
- You use the median and the interquartile range (IQR) to describe skewed distributions of data.
- You can use random samples to make comparisons about two populations.

Key Ideas

Outcomes and Events

An **experiment** is an investigation or a procedure that has varying results. The possible results of an experiment are called **outcomes**. A collection of one or more outcomes is an **event**. The outcomes of a specific event are called **favorable outcomes**.

For example, randomly selecting a marble from a group of marbles is an experiment. Each marble in the group is an outcome. Selecting a green marble from the group is an event.

Probability

The **probability** of an event is a number that measures the likelihood that the event will occur. Probabilities are between 0 and 1, including 0 and 1. The diagram relates likelihoods (above the diagram) and probabilities (below the diagram).

	Unlikely	Equally likely to happen or not happen	Likely	
Impossible				Certain
0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
0	0.25	0.5	0.75	1
0%	25%	50%	75%	100%

Probability of Independent Events

The probability of two or more independent events is the product of the probabilities of the events.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$
$$P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B) \cdot P(C)$$

Finding the Probability of an Event

When all possible outcomes are equally likely, the probability of an event is the ratio of the number of favorable outcomes to the number of possible outcomes. The probability of an event is written as P(event).

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Experimental Probability

Probability that is based on repeated trials of an experiment is called **experimental probability**.

$$P(\text{event}) = \frac{\text{number of times the event occurs}}{\text{total number of trials}}$$

Theoretical Probability

When all possible outcomes are equally likely, the **theoretical probability** of an event is the ratio of the number of favorable outcomes to the number of possible outcomes.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

Fundamental Counting Principle

An event M has m possible outcomes. An event N has n possible outcomes. The total number of outcomes of event M followed by event N is $m \times n$.

Probability of Dependent Events

The probability of two dependent events A and B is the probability of A times the probability of B after A occurs.

$$P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$$

What's the Point?

The ability to use probability and statistics is very useful in real life when you are making important decisions like what your college major should be. Ask your student what they want their career to be. Then have them research job openings to see what type of degrees employers are looking for. Based on this data, what is the probability of finding employment in their fields of interest?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 10: Massively Multiplayer Rock Paper Scissors STEM Video is available online at www.bigideasmath.com.

Games

- Anything But Eight
- Take Your Chances

These are available online in the *Game Closet* at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

BIG IDEAS LEARNING

Students will...

Name corresponding angles and corresponding sides of congruent figures.

Identify congruent figures.

Identify translations.

Translate figures in the coordinate plane.

Identify reflections.

Reflect figures in the *x*-axis or the *y*-axis of the coordinate plane.

Identify rotations.

Rotate figures in the coordinate plane.

Use more than one transformation to find images of figures.

Name corresponding angles and corresponding sides of similar figures.

Identify similar figures.

Find unknown measures of similar figures.

Understand the relationship between perimeters of similar figures.

Understand the relationship between areas of similar figures.

Find ratios of perimeters and areas for similar figures.

Dilate figures in the coordinate plane.

Use more than one transformation to find images of figures.

Identify dilations.

Key Terms

A *transformation* changes a figure into another figure.

The new figure formed by a transformation is called the *image*.

A *translation* is a transformation in which a figure slides but does not turn.

A *reflection*, or *flip*, is a transformation in which a figure is reflected in a line called the line of reflection.

A *line of reflection* is a line that a figure is reflected in to create a mirror image of the original figure.

A *dilation* is a transformation in which a figure is made larger or smaller with respect to a point called the center of dilation.

A point with respect to which a figure is dilated is called the *center of dilation*.

The ratio of the side lengths of the image to the corresponding side lengths of the original figure is the *scale factor* of the dilation.

Standards

Common Core:
8.G.1: Verify experimentally the properties of rotations, reflections, and translations.

8.G.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Essential Questions

How can you identify congruent triangles?

How can you arrange tiles to make a tessellation?

How can you use reflections to classify a frieze pattern?

What are the three basic ways to move an object in a plane?

How can you use proportions to help make decisions in art, design, and magazine layouts?

How do changes in dimensions of similar geometric figures affect the perimeters and the areas of the figures?

How can you enlarge or reduce a figure in the coordinate plane?

Key Ideas

Similar Figures

- Figures that have the same shape but not necessarily the same size are called **similar figures**.
- Two figures are similar when
  - corresponding side lengths are proportional and
  - corresponding angles are congruent.

Triangle *ABC* is similar to Triangle *DEF*.

Side Lengths
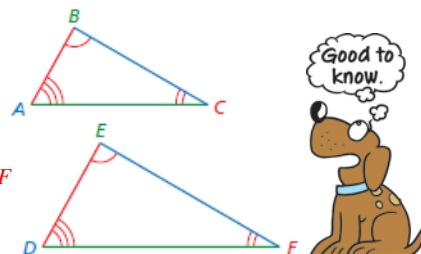$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

Angles
$\angle A \cong \angle D$
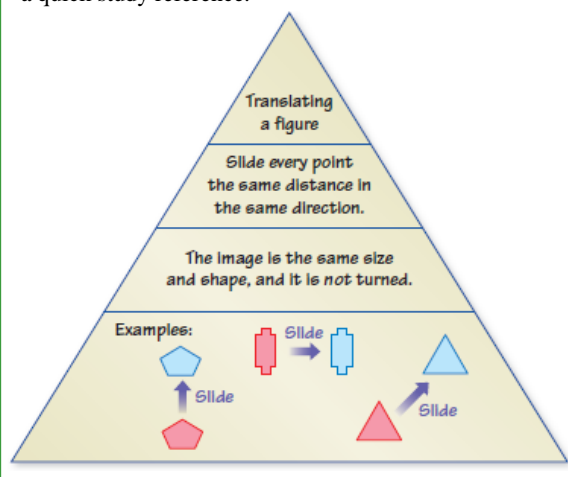$\angle B \cong \angle E$
$\angle C \cong \angle F$

Figures
$\triangle ABC \sim \triangle DEF$

Good to know.

Reference Tools

A **Summary Triangle** can be used to explain a concept. Typically, the summary triangle is divided into 3 or 4 parts. In the top part, write the concept being explained. In the middle part(s), write any procedure, explanation, description, definition, theorem, and/or formula(s). In the bottom part, write an example to illustrate the concept. Place summary triangles on note cards to use as a quick study reference.

Translating a figure

Slide every point the same distance in the same direction.

The image is the same size and shape, and it is not turned.

Examples:

Slide

Slide

Slide

Quick Review

- In a translation, every point of the figure moves the same distance and in the same direction.
- A reflection creates a mirror image of the original figure.
- The symbol ∼ means *is similar to*.
- The symbol ≅ means *is congruent to*.
- The image of a translation, reflection, or rotation is congruent to the original figure, and the image of a dilation is similar to the original figure.
- Two figures are similar when one can be obtained from the other by a sequence of translations, reflections, rotations, and dilations.

What's the Point?

The ability to use transformations is very useful in real life when building scale models. Scale models are used by engineers to design many different things. Have your student create a scale model of something with toothpicks, clay, or paper. What kind of transformation does this represent?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 11: Shadow Puppets STEM Video is available online at www.bigideasmath.com.
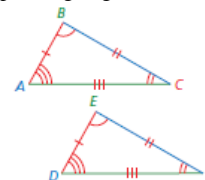
Key Ideas

Congruent Figures

Figures that have the same size and the same shape are called **congruent figures**. The triangles below are congruent.

Matching angles are called **corresponding angles**.

Matching sides are called **corresponding sides**.

Identifying Congruent Figures

Two figures are congruent when corresponding angles and corresponding sides are congruent.

Triangle *ABC* is congruent to Triangle *DEF*.

$\triangle ABC \cong \triangle DEF$
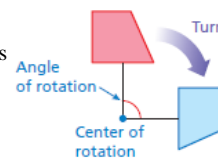
Translations in the Coordinate Plane

- To translate a figure a units horizontally and b units vertically in a coordinate plane, add a to the x-coordinates and b to the y-coordinates of the vertices. Positive values of a and b represent translations up and right. Negative values of a and b represent translations down and left.
- $(x, y) \rightarrow (x + a, y + b)$
- In a translation, the original figure and its image are congruent.

Reflections in the Coordinate Plane

- To reflect a figure in the x-axis, take the opposite of the y-coordinate. To reflect a figure in the y-axis, take the opposite of the x-coordinate.
- Reflection in x-axis: $(x, y) \rightarrow (x, -y)$
  Reflection in y-axis: $(x, y) \rightarrow (-x, y)$
- In a reflection, the original figure and its image are congruent.

Rotations

- A **rotation**, or *turn*, is a transformation in which a figure is rotated about a point called the **center of rotation**.
- The number of degrees a figure rotates is the **angle of rotation**.
- In a rotation, the original figure and its image are congruent.

Turn

Angle of rotation

Center of rotation

Perimeters of Similar Figures

When two figures are similar, the ratio of their perimeters is equal to the ratio of their corresponding side lengths.

Areas of Similar Figures

When two figures are similar, the ratio of their areas is equal to the *square* of the ratio of their corresponding side lengths.

Dilations in the Coordinate Plane

- To dilate a figure with respect to the origin, multiply the coordinates of each vertex by the scale factor k.
- $(x, y) \rightarrow (kx, ky)$
- When $k > 1$, the dilation is an enlargement.
- When $k > 0$ and $k < 1$, the dilation is a reduction.

Big Ideas Math: Red Accelerated

Parent Newsletter

Key Terms

A line that intersects two or more lines is called a *transversal*.

When two parallel lines are cut by a transversal, four *interior angles* are formed on the inside of the parallel lines and four *exterior angles* are formed on the outside of the parallel lines.

The angles inside a polygon are called *interior angles* of the polygon.

The angles outside the polygon that are adjacent to the interior angles are called *exterior angles* of the polygon.

A polygon is *convex* when every line segment connecting any two vertices lies entirely inside the polygon.

A polygon is *concave* when at least one line segment connecting any two vertices lies outside the polygon.

In a *regular polygon*, all the sides are congruent, and all the interior angles are congruent.

Indirect measurement uses similar figures to find a missing measure when it is difficult to find directly.

Students will...

Identify the angles formed when parallel lines are cut by a transversal.

Find the measures of angles formed when parallel lines are cut by a transversal.

Understand that the sum of the interior angle measures of a triangle is 180°.

Find the measures of interior and exterior angles of triangles.

Find the sum of the interior angle measures of polygons.

Understand that the sum of the exterior angle measures of a polygon is 360°.

Find the measures of interior and exterior angles of polygons.

Understand the concept of similar triangles.

Identify similar triangles.

Use indirect measurement to find missing measures.

Standards

Common Core:
8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Essential Questions

How can you describe angles formed by parallel lines and transversals?

How can you describe the relationships among the angles of a triangle?

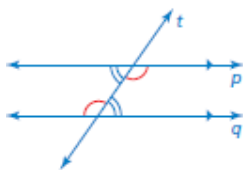How can you find the sum of the interior angle measures and the sum of the exterior angle measures of a polygon?

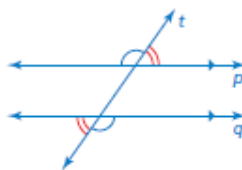How can you use angles to tell whether triangles are similar?

Good to know.

Key Ideas

Alternate Interior Angles and Alternate Exterior Angles
When a transversal intersects parallel lines, alternate interior angles are congruent and alternate exterior angles are congruent.
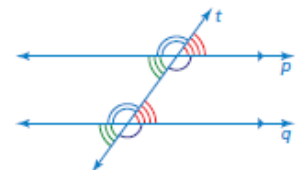
Alternate interior angles   Alternate exterior angles

Corresponding Angles
When a transversal intersects parallel lines, corresponding angles are congruent.

Corresponding angles

Interior Angle Measures of a Polygon
- The sum S of the interior angle measures of a polygon with n sides is
  $$S = (n - 2) \cdot 180°.$$

Reference Tools

Transversals

Examples	Non-Examples
line p line q line r	line a line b line c
line a line b line c line d	line p line t

An **Example and Non-Example Chart** can be used to list examples and non-examples of a vocabulary word or term. Write examples of the word or term in the left column and non-examples in the right column. This type of organizer serves as a good tool for assessing knowledge of pairs of topics that have subtle but important differences, such as complementary and supplementary angles.

Key Ideas

Interior Angle Measures of a Triangle
- The sum of the interior angle measures of a triangle is 180°.
- $x + y + z = 180$

Exterior Angle Measures of a Triangle
- The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.
- $z = x + y$

Exterior Angle Measures of a Polygon
- The sum of the measures of the exterior angles of a convex polygon is 360°.
- $w + x + y + z = 360$

Angles of Similar Triangles
- When two angles in one triangle are congruent to two angles in another triangle, the third angles are also congruent and the triangles are similar.

Games
- Picture This

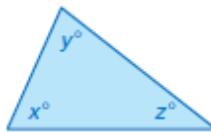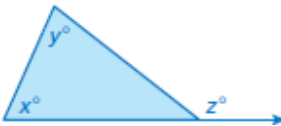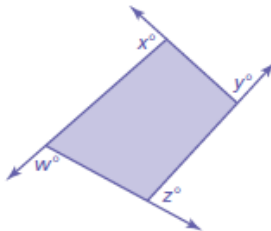This is available online in the *Game Closet* at www.bigideasmath.com.

Quick Review
- Lines in the same plane that do not intersect are called *parallel lines*.
- Lines that intersect at right angles are called *perpendicular lines*.
- When parallel lines are cut by a transversal, several pairs of congruent angles are formed.
- Corresponding angles lie on the same side of the transversal in corresponding positions.
- Alternate interior angles and alternate exterior angles lie on opposite sides of the transversal.
- A *polygon* is a closed plane figure made up of three or more line segments that intersect only at their endpoints.
- For polygons whose names you don't know, you can use the phrase "*n*-gon," where *n* is the number of sides.

What's the Point?

The ability to work with angles and triangles is very useful in real life for events like building a staircase. Have your student measure the individual stairs at their house or school. What do they notice about the angles? Are they similar? What would happen if they were different?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 12: Honeycombs STEM Video is available online at www.bigideasmath.com.

Hmmm.

Big Ideas Math: Red Accelerated

Parent Newsletter

Chapter 13: Graphing and Writing Linear Equations

Standards

Common Core:

8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Students will...

Understand that lines represent solutions of linear equations.

Graph linear equations.

Find slopes of lines by using two points.

Find slopes of lines from tables.

Identify parallel and perpendicular lines.

Write and graph proportional relationships.

Find slopes and y-intercepts of graphs of linear equations.

Graph linear equations written in slope-intercept form.

Graph linear equations written in standard form.

Write equations of lines in slope-intercept form.

Write equations of lines using a slope and a point.
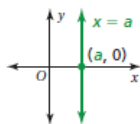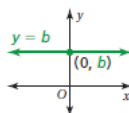
Write equations of lines using two points.

Key Ideas

Linear Equation
You can use a graph to show the solutions of a linear equation.

Graphing Horizontal and Vertical Lines

The graph of $y = b$ is a horizontal line passing through $(0, b)$.

The graph of $x = a$ is a vertical line passing through $(a, 0)$.

Forms of Linear Equations

- A linear equation written in the form $y = mx + b$ is in **slope-intercept form**. The slope of the line is m, and the y-intercept of the line is b.

- The **standard form** of a linear equation is $ax + by = c$ where a and b are not both zero.

- A linear equation written in the form $y - y_1 = m(x - x_1)$ is in **point-slope form**. The line passes through the point (x_1, y_1), and the slope of the line is m.
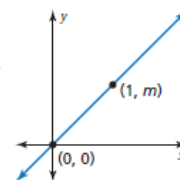
Parallel and Perpendicular Lines and Slope
- Lines in the same plane that do not intersect are parallel lines.
- Nonvertical parallel lines have the same slope.
- All vertical lines are parallel.
- Lines in the same plane that intersect at right angles are perpendicular lines.
- Two nonvertical lines are perpendicular when the product of their slopes is -1.
- Vertical lines are perpendicular to horizontal lines.
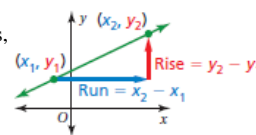
Direct Variation
- When two quantities x and y are proportional, the relationship can be represented by the direct variation equation $y = mx$, where m is the constant of proportionality.
- The graph of $y = mx$ is a line with a slope of m that passes through the origin.

Slope
The slope m of a line is a ratio of the change in y to the change in x between any two points, (x_1, y_1) and (x_2, y_2), on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$
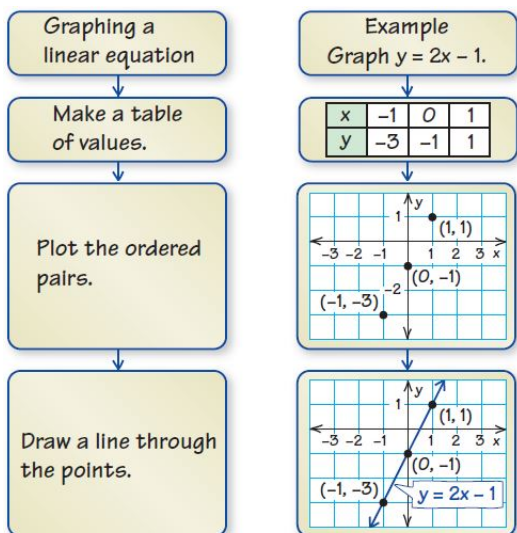
- Lines with a positive slope rise from left to right.
- Lines with a negative slope fall from left to right.
- Lines with a slope of 0 are horizontal.
- Lines with an undefined slope are vertical.

Good to know.

Game

- Six in a Row

This is available online in the *Game Closet* at www.bigideasmath.com.

Reference Tools

A **Process Diagram** can be used to show the steps involved in a procedure. Process diagrams are particularly useful for illustrating procedures with two or more steps, and they can have one or more branches. As shown, process diagrams can have two parallel parts, in which the procedure is stepped out in one part and an example illustrating each step is shown in the other part. Or, the diagram can be made up of just one part, with example(s) included in the last "bubble" to illustrate the steps that precede it.

Graphing a linear equation

→ Make a table of values.

→ Plot the ordered pairs.

→ Draw a line through the points.

Example
Graph $y = 2x - 1$.

x	-1	0	1
y	-3	-1	1

Points: $(1, 1)$, $(0, -1)$, $(-1, -3)$

$y = 2x - 1$

Key Terms

A *linear equation* is an equation whose graph is a line.

The points on the line are *solutions* of the equation.

Slope is the rate of change between any two points on a line.

The *x-intercept* of a line is the x-coordinate of the point where the line crosses the x-axis.

The *y-intercept* of a line is the y-coordinate of the point where the line crosses the y-axis.

The *rise* is the change in y between any two points on a line.

The *run* is the change in x between any two points on a line.

Essential Questions

How can you recognize a linear equation? How can you draw its graph?

How can you use the slope of a line to describe the line?

How can you describe the graph of the equation $y = mx$?

How can you describe the graph of the equation $y = mx + b$?

How can you describe the graph of the equation $ax + by = c$?

How can you write an equation of a line when you are given the slope and the y-intercept of the line?

How can you write an equation of a line when you are given the slope and a point on the line?

Quick Review

- Another way to discuss the equation $y = b$ is to say that "y always equals a certain number, while x can equal anything." For example, if $y = -4$, the table of values may look like this:

x	-1	0	1	2
y	-4	-4	-4	-4

- Another way to discuss the equation $x = a$ is to say that "x always equals a certain number, while y can equal anything." For example, if $x = -2$, the table of values may look like this:

x	-2	-2	-2	-2
y	-1	0	1	2

- A *direct variation* equation is a special kind of linear equation, one whose graph passes through the origin.

- The *point-slope form* of the equation of a line is equivalent to the *slope-intercept form* and is the equation of a unique line.

What's the Point?

The ability to write and graph linear equations is very useful in real life for events like predicting arrival times. Have your student calculate what time they will arrive at school given the distance and the average speed of the car. What point on the coordinate plane does their answer represent?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 13: Hurricanes! STEM Video is available online at www.bigideasmath.com.

Parent Newsletter

Chapter 14: Real Numbers and the Pythagorean Theorem

Standards

Common Core:

8.NS.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).

8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.G.6: Explain a proof of the Pythagorean Theorem and its converse.

8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
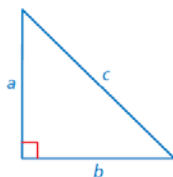
8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Key Ideas

The Pythagorean Theorem

- In any right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

$$a^2 + b^2 = c^2$$

Converse of the Pythagorean Theorem

- If the equation $a^2 + b^2 = c^2$ is true for the side lengths of a triangle, then the triangle is a right triangle.

Key Terms

A **square root** of a number is a number that, when multiplied by itself, equals the given number.

A **perfect square** is a number with integers as its square roots.

The symbol $\sqrt{}$ is called a **radical sign**. It is used to represent a square root.

The number under the radical sign is called the **radicand**.

A **cube root** of a number is a number that, when multiplied by itself, and then multiplied by itself again, equals the given number.

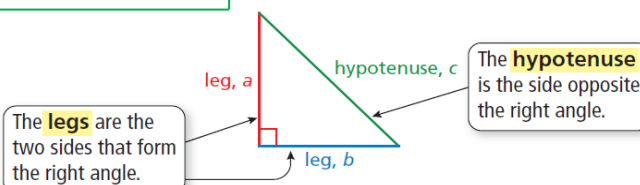A **perfect cube** is a number that can be written as the cube of an integer.

In mathematics, a rule is called a **theorem**.

An **irrational number** cannot be written as the ratio of two integers.

Rational numbers and irrational numbers together form the set of **real numbers**.

Sides of a Right Triangle

The sides of a right triangle have special names.

The **legs** are the two sides that form the right angle.

The **hypotenuse** is the side opposite the right angle.

Students will...

Find square roots of perfect squares.

Evaluate expressions involving square roots.

Use square roots to solve equations.

Find cube roots of perfect cubes.

Evaluate expressions involving cube roots.

Use cube roots to solve equations.

Provide geometric proof of the Pythagorean Theorem.

Use the Pythagorean Theorem to find missing side lengths of right triangles.

Define irrational numbers.

Approximate square roots.

Approximate values of expressions involving irrational numbers.

Write a repeating decimal as a fraction.

Use the converse of the Pythagorean Theorem to identify right triangles.
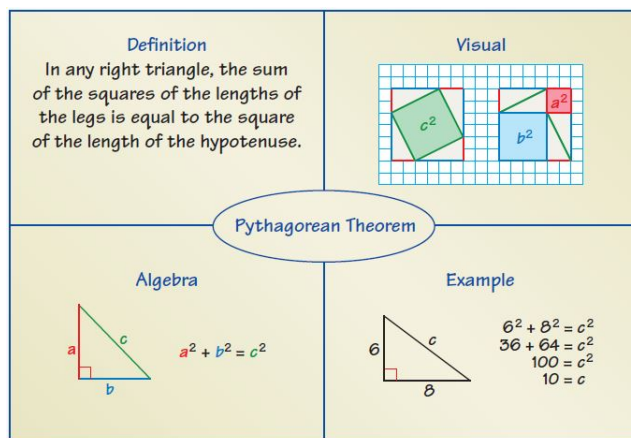
Use the Pythagorean Theorem to find distances in a coordinate plane.

Solve real-life problems.

Good to know.

Reference Tools

A **Four Square** can be used to organize information about a topic. Write the topic in the "bubble" in the middle of the four square. Then write concepts related to the topic in the four squares surrounding the bubble. Any concept related to the topic can be used. Place four squares on note cards to use as a quick study reference.

Definition
In any right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

Visual

c^2 a^2 b^2

Pythagorean Theorem

Algebra

$a^2 + b^2 = c^2$

Example

$6^2 + 8^2 = c^2$
$36 + 64 = c^2$
$100 = c^2$
$10 = c$

Key Ideas

Distance Formula

The distance d between any two points (x_1, y_1) and (x_2, y_2) is given by the formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.
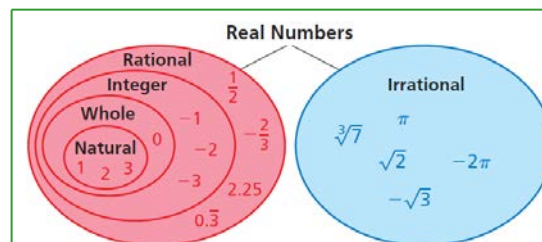
Writing a Repeating Decimal as a Fraction

Let a variable x equal the repeating decimal d.

Step 1: Write the equation $x = d$.

Step 2: Multiply each side of the equation by 10 to form a new equation, where n is the number of repeating digits.

Step 3: Subtract the original equation from the new equation.

Step 4: Solve for x.

Real Numbers

Rational
Integer
Whole
Natural
1 2 3
0 −2
−1
$\frac{1}{2}$
$-\frac{2}{3}$
−3
2.25
$0.\overline{3}$

Irrational
$\sqrt[3]{7}$
π
$\sqrt{2}$ -2π
$-\sqrt{3}$

Quick Review

- Squaring a positive number and finding a square root are inverse operations.

- The cube root of a perfect cube is an integer and can be evaluated as part of an expression.

- The Pythagorean Theorem is only true for right triangles.

- The square root of any whole number that is not a perfect square is irrational. The cube root of any integer that is not a perfect cube is irrational.

- The decimal form of an irrational number neither terminates nor repeats.

- A *subset* is a set in which every element is contained within a larger set.

- The sets of rational numbers and irrational numbers are subsets of the set of real numbers.

- The sets of natural numbers, whole numbers, and integers are subsets of the set of rational numbers.

- The *converse* of a statement switches the hypothesis and the conclusion.

What's the Point?

The ability to use the Pythagorean Theorem is very useful in real life when trying to decide what size of TV to buy. Companies size their TV's by the diagonal length of the screen. Have your students measure the length and width of a space for a TV. What size TV would fit?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations.
The Chapter 14: Metronome Design STEM Video is available online at www.bigideasmath.com.

Big Ideas Math: Red Accelerated

Parent Newsletter

Key Terms

A *sphere* is the set of all points in space that are the same distance from a point called the *center*.

A *hemisphere* is one-half of a sphere.

Similar solids are solids that have the same shape and proportional corresponding dimensions.

Standards

Common Core: 8.G.9: Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
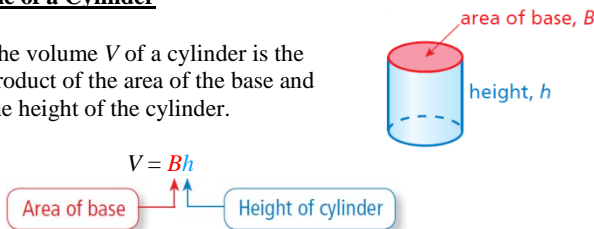
Students will...

Find the volumes of cylinders.

Find the heights of cylinders given the volumes.

Find the volumes of cones.

Find the heights of cones given the volumes.

Find the volumes of spheres.

Find the radii of spheres given the volumes.

Identify similar solids.

Use properties of similar solids to find missing measures.

Understand the relationship between surface areas of similar solids.

Understand the relationship between volumes of similar solids.
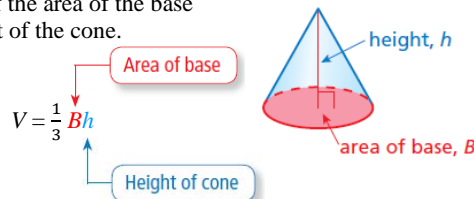
Solve real-life problems.

Key Ideas

Volume of a Cylinder

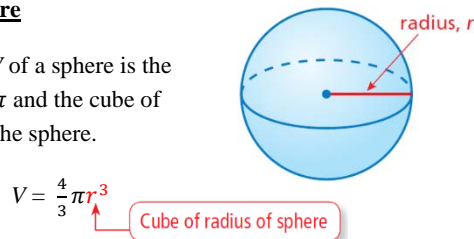- The volume V of a cylinder is the product of the area of the base and the height of the cylinder.

$$V = Bh$$

Area of base → B
Height of cylinder → h

Volume of a Cone

- The volume V of a cone is one-third the product of the area of the base and the height of the cone.
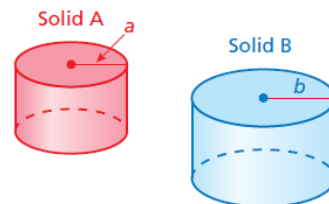
$$V = \frac{1}{3}Bh$$

Area of base → B
Height of cone → h

Volume of a Sphere

- The volume V of a sphere is the product of $\frac{4}{3}\pi$ and the cube of the radius of the sphere.

$$V = \frac{4}{3}\pi r^3$$

Cube of radius of sphere → r^3
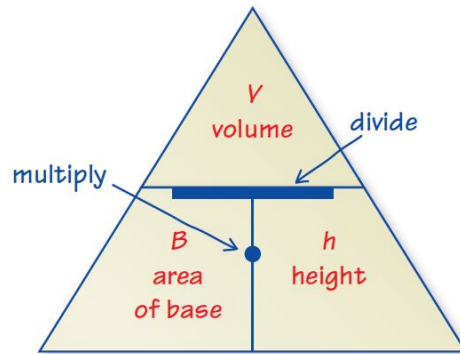
Surface Areas of Similar Solids

When two solids are similar, the ratio of their surface areas is equal to the square of the ratio of their corresponding linear measures.

$$\frac{\text{Surface Area of A}}{\text{Surface Area of B}} = \left(\frac{a}{b}\right)^2$$

Solid A

Solid B

Good to know.

Reference Tools

A **Formula Triangle** can be used to arrange variables and operations of a formula. Divide a triangle into the same number of parts as there are variables and factors in a formula. Then write the variables and factors in the parts of the triangle and place either a multiplication or a division symbol, as appropriate, between the parts. This type of organizer can help your student learn the formulas as well as see how the variables in the formulas are related. Place formula triangles on note cards to use as a quick study reference.
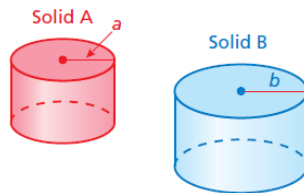

👓 Key Ideas

$$\frac{\text{Volume of A}}{\text{Volume of B}} = \left(\frac{a}{b}\right)^3$$
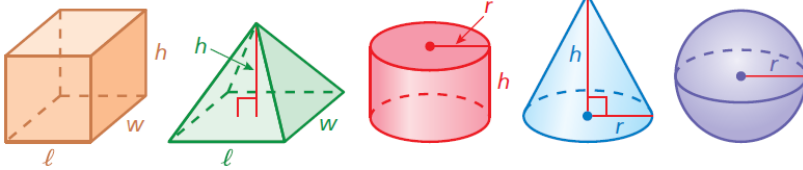
Volumes of Similar Solids

When two solids are similar, the ratio of their volumes is equal to the cube of the ratio of their corresponding linear measures.

Linear Measures

Essential Questions

How can you find the volume of a cylinder?

How can you find the volume of a cone?

How can you find the volume of a sphere?

When the dimensions of a solid increase by a factor of k, how does the surface area change? How does the volume change?

Quick Review

- To find the area of a composite figure, find the sum the areas of the basic figures.

- Pi (π) is the ratio of a circle's circumference (perimeter) to its diameter. This ratio is constant regardless of the size of the circle.

- Area is measured in square units. Volume is measured in cubic units.

- Volume = Bh is the general formula for both prisms and cylinders. The base of a cylinder is a circle, so the general formula can be rewritten as the specific formula $V = \pi r^2 h$.

- The *height* of a cone is the perpendicular distance from the base to the vertex.

- When the dimensions of a solid are multiplied by k, the surface area is multiplied by k^2 and the volume is multiplied by k^3.

What's the Point?

The ability to understand and use volume is very useful in real life for events like marketing and packaging food. Have your student measure a few different shaped packages at the grocery store. How much can the containers hold? Why might the calculated volume be different from the actual amount in the package?

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 15: Canning Salsa STEM Video is available online at www.bigideasmath.com.

Parent Newsletter

BIG IDEAS LEARNING®

Chapter 16: Exponents and Scientific Notation

Standards

Common Core:

8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Key Terms

A *power* is a product of repeated factors.

The *base* of a power is the common factor.

The *exponent* of a power indicates the number of times the base is used as a factor.

A number is written in *scientific notation* when it is represented as the product of a factor and a power of 10.

Essential Questions

How can you use exponents to write numbers?

How can you use inductive reasoning to observe patterns and write general rules involving properties of exponents?

How can you divide two powers that have the same base?

How can you evaluate a nonzero number with an exponent of zero? How can you evaluate a nonzero number with a negative integer exponent?

How can you read numbers that are written in scientific notation?

How can you write a number in scientific notation?

How can you perform operations with numbers written in scientific notation?

Students will...

Write expressions using integer exponents.

Evaluate expressions involving integer exponents.

Multiply powers with the same base.

Find a power of a power.

Find a power of a product.

Divide powers with the same base.

Simplify expressions involving the quotient of powers.

Evaluate expressions involving numbers with zero as an exponent.

Evaluate expressions involving negative integer exponents.

Identify numbers written in scientific notation.

Write numbers in standard form.

Compare numbers in scientific notation.

Write large and small numbers in scientific notation.

Perform operations with numbers written in scientific notation.

Add, subtract, multiply, and divide numbers written in scientific notation.

Good to know.

Key Ideas

Product of Powers Property

- To multiply powers with the same base, add their exponents.
- $a^m \cdot a^n = a^{m+n}$

Power of a Power Property

- To find a power of a power, multiply the exponents.
- $(a^m)^n = a^{mn}$

Power of a Product Property

- To find a power of a product, find the power of each factor and multiply.
- $(ab)^m = a^m b^m$

Quotient of Powers Property

- To divide powers with the same base, subtract their exponents.
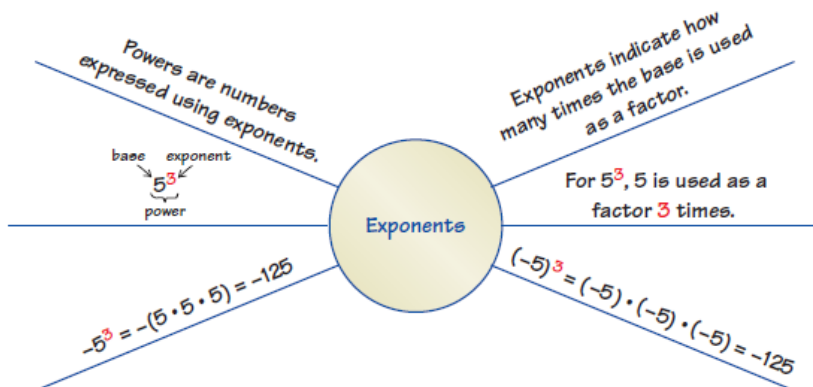- $\frac{a^m}{a^n} = a^{m-n}$, where $a \neq 0$

Zero Exponents

- For any nonzero number a, $a^0 = 1$. The power 0^0 is *undefined*.
- $a^0 = 1$, where $a \neq 0$

Negative Exponents

- For any integer n and any nonzero number a, a^{-n} is the reciprocal of a^n.
- $a^{-n} = \frac{1}{a^n}$, where $a \neq 0$

Reference Tools

An **Information Wheel** can be used to organize information about a concept. Write the concept in the middle of the "wheel." Then write information related to the concept on the "spokes" of the wheel. Related information can include, but is not limited to: vocabulary words or terms, definitions, formulas, procedures, examples, and visuals. This type of organizer serves as a good summary tool because any information related to a concept can be included.

Powers are numbers expressed using exponents.

base exponent
$$5^3$$
power

Exponents indicate how many times the base is used as a factor.

For 5^3, 5 is used as a factor 3 times.

Exponents

$$-5^3 = -(5 \cdot 5 \cdot 5) = -125$$

$$(-5)^3 = (-5) \cdot (-5) \cdot (-5) = -125$$

Key Ideas

Writing Numbers in Standard Form

The absolute value of the exponent indicates how many places to move the decimal point.

- If the exponent is negative, move the decimal point to the left.
- If the exponent is positive, move the decimal point to the right.

Scientific Notation

- A number is written in scientific notation when it is represented as the product of a factor and a power of 10.
- The factor must be greater than or equal to 1 and less than 10.

Writing Numbers in Scientific Notation

Step 1: Move the decimal point so it is located to the right of the leading nonzero digit.

Step 2: Count the number of places you moved the decimal point. This indicates the exponent of the power of 10.

Number Greater Than or Equal to 10
- Use a positive exponent when you move the decimal point to the left.

$$8600 = 8.6 \times 10^3$$
3

Number Between 0 and 1
- Use a negative exponent when you move the decimal point to the right.

$$0.0024 = 2.4 \times 10^{-3}$$
3

Quick Review

-
  base   exponent
  $$\left(\frac{1}{2}\right)^5 = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$$
  power $\frac{1}{2}$ is used as a factor 5 times.

- Use parentheses to write powers with negative bases.

- When a number is written without an exponent, its exponent is 1.

- When dividing powers, do not divide the bases.

- Scientific notation is used to write very small and very large numbers.

- When you write a number greater than or equal to 1 and less than 10 in scientific notation, use zero as the exponent.

- To add or subtract numbers written in scientific notation with the same power of 10, add or subtract the factors. When the numbers have different powers of 10, first rewrite the numbers so they have the same power of 10.

What's the Point?

The ability to use exponents and scientific notation is very useful in real life when working with very large and very small numbers. Have your student research the population of a few countries they would like to visit and write the numbers in scientific notation. Which country has the highest population per square mile? How about the lowest population per square mile? Why is this information useful?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 16: The Drake Equation STEM Video is available online at www.bigideasmath.com.