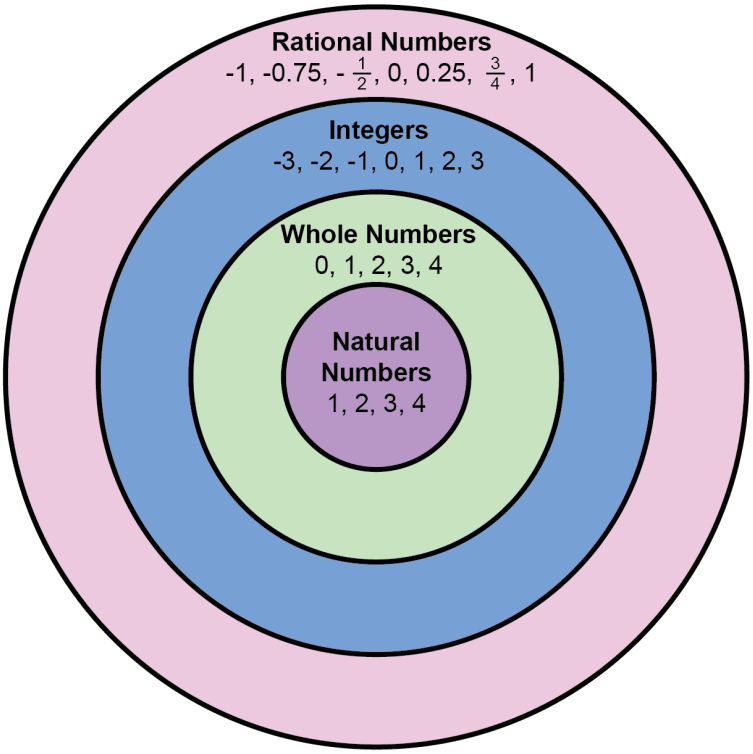
Sixth Grade – Classify Rational Numbers

In math class, your student is about to explore classifying rational numbers. To master this skill, they will build on their knowledge of whole numbers, fractions, and decimals. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Describe and classify natural numbers, whole numbers, integers, and rational numbers using a Venn diagram.

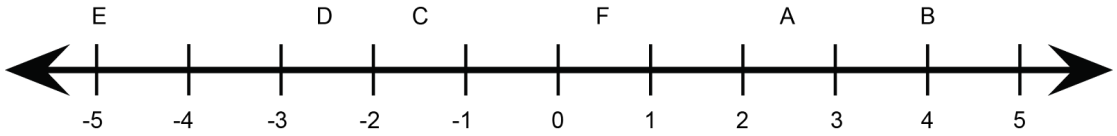


Example: Classify each number by set and subset (if applicable). Justify your answer.

7	• Natural number, whole number, integer, and rational number • 7 is a whole number because it is positive and does not contain a fractional or decimal part. • Whole numbers are subsets of integers and rational numbers.
14.5	• Rational number • 14.5 is excluded from the subsets of whole numbers and integers because it contains a decimal part. It is classified only as a rational number.
-6	• Integer and rational number • -6 is excluded from the subset of whole numbers because it is negative. It is an integer because it has no fraction or decimal parts. It is a rational number because all integers are a subset of rational numbers.
$-2\frac{1}{2}$	• Rational number • $-2\frac{1}{2}$ is excluded from the subsets of integers and whole numbers because it contains a fractional part. It is classified only as a rational number.

- Identify a number, its opposite, and its absolute value.

  Example: Which letter is located at the opposite of −4?

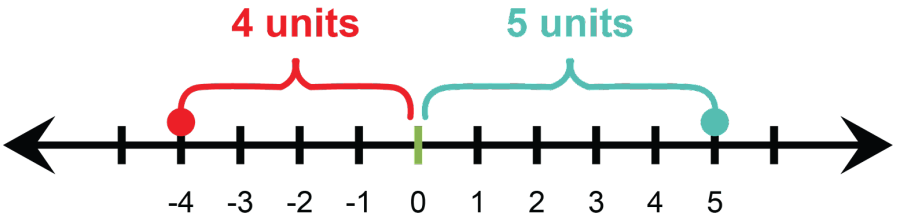


  The answer is letter B. Opposites are equidistant to zero. Both −4 and 4 are four units from zero.

  Example: Which has a greater value, $|-4|$ or $|5|$?

  A. 5 because it is farther from zero
  B. 5 because it is positive
  C. $|-4|$ because it is negative
  D. $|-4|$ because it is closer to zero

  Answer choice A is correct. It is modeled below showing the greater distance from zero. If a student chose C or D, they demonstrate a lack of understanding of absolute value.



While working with your student at home, you may find the following vocabulary terms helpful in your communication about classifying rational numbers. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **absolute value:** the distance a number is from zero on a number line; also called the magnitude of a number; never negative
  - **integer:** any one of the positive whole numbers, negative whole numbers, and zero; any member of the set of all whole numbers and their opposites
  - **natural numbers:** a number used for counting
  - **opposite number:** the number on the other side of 0 on the number line, and the same distance from 0
  - **rational number:** a number that can be written as a fraction of integers a/b, where $b \neq 0$; a number that can be written as a ratio using two integers
  - **set:** collections of objects or things
  - **Venn diagram:** an illustration that uses circles to show the relationships among things or finite groups of things; circles that overlap have a commonality while circles that do not overlap do not share those traits
  - **whole number:** numbers zero and above that contain no fractional or decimal part; a positive number without a fractional piece

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Rational numbers are used all around our everyday lives. Chat about where you use rational numbers in your everyday life. Below are a few examples:

- ★ Where do you see negative numbers in the real world? Talk with your student about positive and negative numbers in finance. Examples include deposits, savings, and overdrawn accounts.

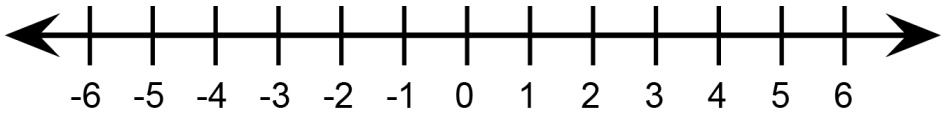
- ★ Why do we have so many types of numbers? Brainstorm situations where numbers are important, what type of number is normally used, and why that number is needed. For example, recipes often use fractions. That's because the recipe may taste better with $\frac{1}{2}$ teaspoon of salt and may be too salty with 1 teaspoon of salt. Decimals are almost always needed in pricing and are easily seen on signs that show gas prices.

Sixth Grade – Compare and Order Rational Numbers

In math class, your student is about to explore comparing and ordering rational numbers. To master this skill, they will build on their knowledge of comparing and ordering whole numbers and decimals in fifth grade and classifying rational numbers learned in sixth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Compare rational numbers using >, <, and =. This scope includes comparing positive and negative integers, decimals, fractions, and percentages. Real-world contexts for this skill may include financial situations, scores, temperatures, and many others.

  Example: Estimate the location of the pairs of numbers on the number line. Compare the numbers using the symbols >, <, or =. Convert numbers to the same form if needed. For example, in the first comparison, convert 0.25 to the fraction $\frac{1}{4}$ to compare it to $\frac{1}{2}$.



$\frac{1}{2} > 0.25$	$50\% = 0.5$	$-\frac{1}{4} < 0.9$
$-5 > -6$	$33\% < \frac{3}{4}$	$0.159 < 0.2$
$0 > -\frac{1}{3}$	$0.7 = 0.700$	$-5.9 < 5.9$

- Order rational numbers from least to greatest or greatest to least. Students are expected to order a variety of rational numbers in the same problem. They may use a number line to order.

  Example: Five temperatures are shown below in degrees.

  $$4°, 0°, -6°, 2°, -4°$$

  Place these temperatures in order from warmest to coldest.
  4°, 2°, 0°, −4°, −6°

  Example: The length of 4 strings are shown in inches.

  $$6.5,\ 6\ \tfrac{7}{8},\ 6.125,\ 6\ \tfrac{3}{4}$$

  Order these strings in order from longest to shortest.
  $6\ \tfrac{7}{8}$, $6\ \tfrac{3}{4}$, 6.5, 6.125

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- **Terms to Know**
  - **context:** the situation in which something is found or happens
  - **equal to (=):** having exactly the same amount or value
  - **greater than (>):** more than another (for example, 49 > 12)
  - **inequality:** a mathematical sentence that uses symbols such as <, ≤, >, or ≥ to compare two quantities
  - **integer:** any one of the positive whole numbers, negative whole numbers, and zero; any member of the set of all whole numbers and their opposites
  - **less than (<):** smaller than another (for example, 432 < 501)
  - **number line:** a line on which numbers are marked at intervals
  - **rational number:** a number that can be written as a fraction of integers a/b, where $b \neq 0$; a number that can be written as a ratio using two integers

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Math outside the Classroom!

Comparing and ordering rational numbers are used all around our everyday lives. Chat about where you use comparing or ordering rational numbers in your everyday life. Below are a few examples:

★ Positive and negative numbers are often used when measuring temperature. Make these numbers more personal for your student. Find the lowest and highest local temperature on record. Compare the records for your location to the records for the United States.
- Prospect Peak, Alaska, holds the record for the coldest temperature, which was recorded at −80 degrees in 1971.
- The highest recorded temperature in the world may have been in Furnace Creek (Death Valley), California, in 1913. Scientists have challenged the validity of the measurement, which was recorded as 134.1 degrees.

★ Use a weather app or website to compare today's temperatures around the world. You can use this opportunity to talk about the relationship between math and science by comparing the temperatures from the equator to the temperatures of locations north and south of the equator.

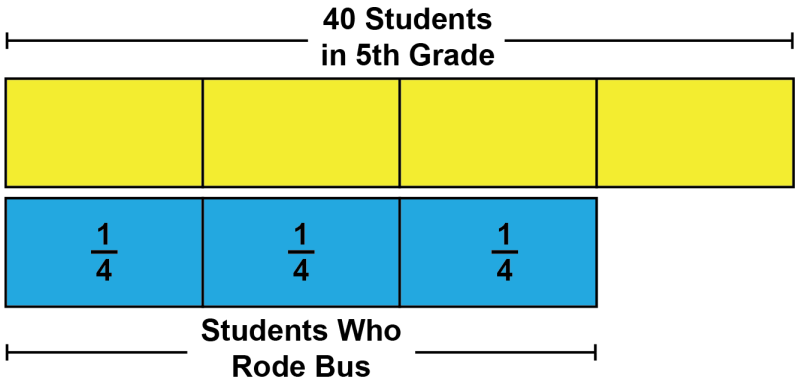
★ Integers are also used when referring to elevation. Find the elevation of your location and compare it to the highest and lowest elevations in the United States.
- Denali, a mountain in Alaska, is 20,310 feet above sea level.
- The lowest elevation in the United States is Death Valley, California, which is 282 feet below sea level.

Sixth Grade – Positive Rational Number Operations

In math class, your student is about to explore operations with positive rational numbers. To master this skill, they will build on their knowledge of whole number, decimal, and fraction operations from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Determine, with and without computation, whether a quantity is increased or decreased when multiplied by a fraction. Students will understand that when multiplying a fraction greater than one, the number increases, and when multiplying a fraction less than one, the number decreases.

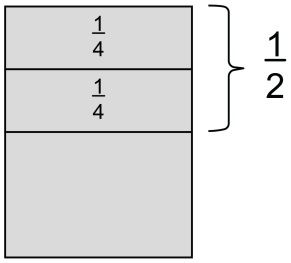
  Example: There were 40 students in the fifth grade. Three-fourths of the students rode the bus to school. This strip diagram represents the number of students who rode the bus. How many students rode the bus? Explain your reasoning.



30 students rode the bus. 40 ÷ 4 = 10, so each unit within the whole student population has a value of 10; $\frac{1}{4}$ of 40 is 10, and 10 × 3 = 30. The quantity 40 is decreased when multiplied by the fraction $\frac{1}{4}$.

- Use visual fraction models to represent dividing a fraction by a fraction. Just like in whole number division, draw a model by starting with the quantity being divided, and then divide it into pieces. In fraction division, you may start with a fraction, and then further divide the part into even more parts.

  Example: Richard has $\frac{1}{2}$ of a yard of fabric. He is going to make towels; each towel uses $\frac{1}{4}$ of a yard of fabric. This model shows one entire yard divided into half; then that half divided into quarters.



  Richard can make two $\frac{1}{4}$ of a yard towels with $\frac{1}{2}$ of a yard of fabric.

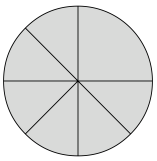
- Use several strategies to divide fractions. One common strategy is the multiplying-by-the-reciprocal method.

  The reciprocal of $\frac{1}{8}$ is $\frac{8}{1}$. When multiplied, a number and its reciprocal equal 1.

  $\frac{1}{8} \times \frac{8}{1} = 1$. Using models first, students will develop an understanding of why this method works.

  Example: Patty has $\frac{3}{4}$ of a pizza. She wanted to cut it into servings of $\frac{1}{8}$ of a slice. How many servings will Patty have?

  Using a model:

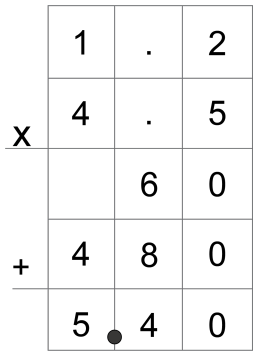


  The model shows that in $\frac{3}{4}$ of the pizza, there are six $\frac{1}{8}$ slices.

  Using computation:
  $\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \times \frac{8}{1} = \frac{24}{4} = 6$ servings

- Multiply positive rational numbers fluently with emphasis on the importance of place value and final decimal placement. Estimating the final product will help ensure proper decimal placement and the reasonableness of the product.

  Example: A race car driver can drive one lap in 1.2 minutes. How long will it take the driver to drive 4.5 laps?



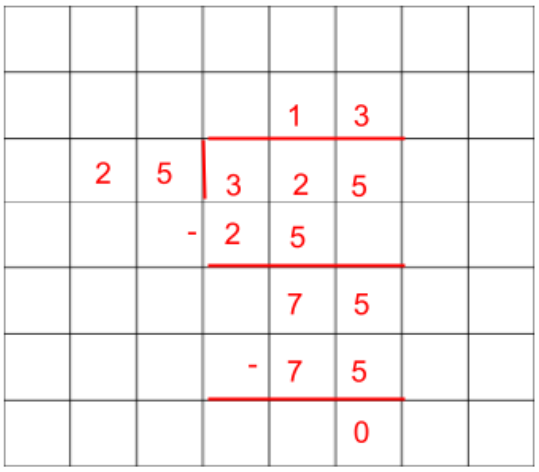
  5.4 minutes. Students can estimate first by rounding 1.2 to 1 and 4.5 to 5. 1 × 5 = 5, so they know the answer should be close to 5. Then, they can count the number of digits behind the decimal in the factors and place that many digits behind the decimal in the product.

- Divide positive rational numbers fluently. They will rewrite the problem through changing place values.
    - Multiply the divisor by a multiple of 10 to remove the decimal.
    - Multiply the dividend by the same multiple of 10.
    - Place the decimal correctly in the quotient by bringing it straight up.

  Example: How many strips of cloth 2.5 meters long can Zoe cut from a cloth that is 32.5 meters long?

    - 2.5 × 10 = 25
    - 32.5 × 10 = 325

  Divide using the standard algorithm.



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- **Terms to Know**
  - **computation:** the act, process, or method of computing
  - **denominator:** the bottom number within a fraction; the number that represents the whole and how many parts total are in the whole
  - **dividend:** the number you divide into; a quantity that is to be divided by another quantity; a number that shows the amount of equal parts of a whole; the numerator (top number) that tells the number or quantity; a quantity to be divided
  - **division:** the splitting into equal parts or groups; the result of "fair sharing"
  - **divisor:** the quantity by which another quantity is to be divided
  - **factor:** to break into numbers or expressions that when multiplied together give you the original number or expression
  - **fraction:** a number that shows a part of a whole or part of a set
  - **improper fraction:** a fraction that has a numerator that is greater than or equal to the denominator
  - **mixed number:** a whole number and a fraction combined; number made up of a whole number and a fraction
  - **numerator:** the top number within a fraction, that represents the part of the whole
  - **product:** the solution when multiplying two or more numbers; the answer to a multiplication problem
  - **quotient:** the solution when dividing two numbers; the answer to a division problem; the result of the division of one quantity by another
  - **rational number:** a number that can be written as a fraction of integers a/b, where $b \neq 0$; a number that can be written as a ratio using two integers
  - **reciprocal:** one of the two numbers whose product is 1; also called the multiplicative inverse
  - **simplest form:** the smallest possible way to write an equivalent fraction for the fraction given

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Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Positive rational numbers operations are used all around our everyday lives. Chat about where you use operations with positive rational numbers in your everyday life. Below are a few examples:

- ★ Pizza is a great way to talk about fractions! Serve pizza for dinner. Cut the pizza in half. Cut one half into 4 pieces. Serve one of the pieces to your student. Ask your student what fraction of the total pizza has been served. This is another way of asking for the answer to $\frac{1}{2}$ divided into 4 ($\frac{1}{2} \div 4 = \frac{1}{8}$). Help your student understand that because fractions refer to equal pieces, the other half of the pizza must also be cut into fourths to really see the result.

- ★ Find the price of an item that your student is interested in, such as a video game. Have your student estimate the cost of buying 5 games to give away as presents. Talk about how estimation can be helpful when shopping. Now have your student actually multiply the cost of the game by 5 and use the estimated answer to be sure the decimal is in the correct place.

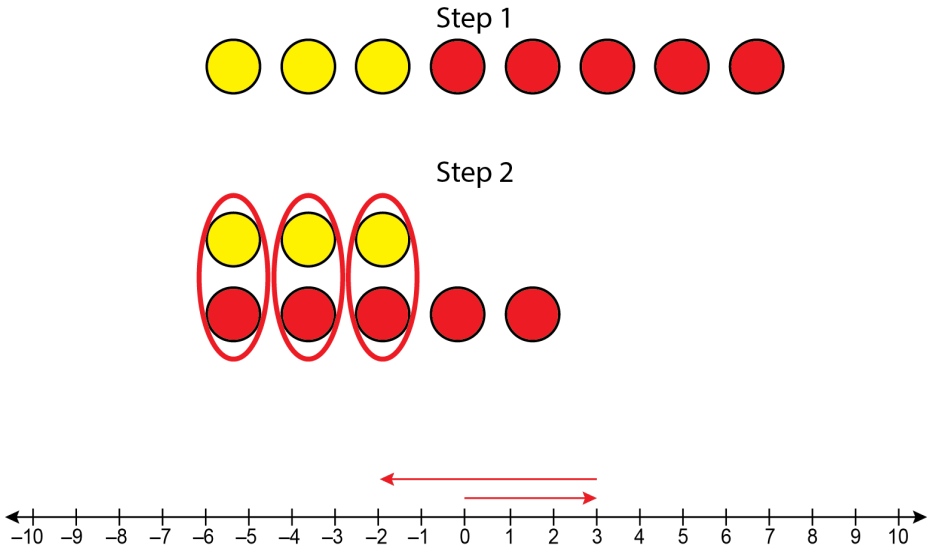
Sixth Grade – Add and Subtract Integers

In math class, your student is about to explore adding and subtracting integers. To master this skill, they will build on their knowledge of addition and subtraction of positive numbers from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Positive and negative integers can be added using models and rules that connect to standardized algorithms. Two color counters and number lines help students understand the meaning behind the rules.

Rules for Adding Integers	
If the integers have the same signs	• Add the absolute values. • Keep the sign.
If the integers have different signs	• Subtract the smaller absolute value from the larger absolute value. • Keep the sign of the number with the greater absolute value.
A number and its opposite	• The sum is 0. • The opposite of any number is called its additive inverse.

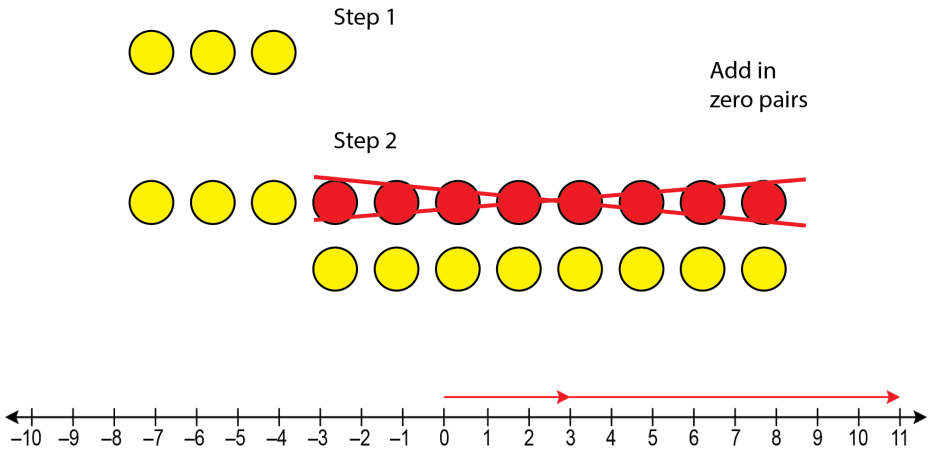
Example: Maria wanted to make a cake for her family. She got out the eggs and noticed that the egg carton only had 3 eggs left in it. The recipe calls for 5 eggs. How many more eggs does she need to be able to make the cake?



Maria needs 2 more eggs. Students can add positive and negative integers together using models to find that $3 + -5 = -2$. Since the integers have different signs, students will subtract the smaller absolute value from the larger absolute value and keep the sign of the number with the greater absolute value.

- Positive and negative integers can be subtracted using models and rules that connect to standardized algorithms. Two color counters and number lines help students understand the meaning behind the rules.

  Example: The temperature in Anchorage, Alaska, was 3 degrees at 9:00 p.m. Overnight, the temperature dropped down to −8 degrees. By how many degrees did the temperature fall?



  The temperature fell 11 degrees. Students can subtract positive and negative integers by models to find that 3 – (−8) = 3 + 8 = 11. To subtract integers, rewrite the subtraction problem as an addition problem. Subtracting a number is the same as adding its opposite, or additive inverse.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about adding and subtracting integers. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **absolute value:** the distance a number is from zero on a number line; also called the magnitude of a number; never negative
    - **additive inverse:** what must be added to a number in order for the sum of the two numbers to be zero
    - **algorithm/standard algorithm:** a step-by-step method for a solution
    - **concrete model:** a model that uses physical objects to represent numbers or ideas
    - **difference:** a number that is the result of subtraction
    - **integer:** any one of the positive whole numbers, negative whole numbers, and zero; any member of the set of all whole numbers and their opposites
    - **negative number:** a number that is less than zero
    - **positive number:** a number that is greater than zero
    - **sum:** the solution when adding two or more numbers; the answer to an addition problem

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Math outside the Classroom!

Adding and subtracting integers is used all around our everyday lives. Chat about where you use addition and subtraction of integers in your everyday life. Below are a few examples:

- ★ Students are often motivated to understand math when it applies to their lives, especially when money is involved. Talk through some situations with your student that require them to add and subtract integers. For example, if your student has $50 of birthday money but wants to buy a game that is $60, what are the options to purchase the game?

- ★ Did you know that Black Friday is actually a reference to positive and negative integers? Talk with your child about the meaning behind Black Friday. The color red in accounting represents negative balances, while the color black represents positive balances. Stores often operate "in the red" for much of the year, meaning that stores are actually operating at a loss. Many stores start turning profits at the end of November as Christmas shopping gets into full swing. Black Friday, sometimes considered the biggest shopping day of the year, is a day when many stores begin to see profits, or operate "in the black."

Sixth Grade – Multiply and Divide Integers

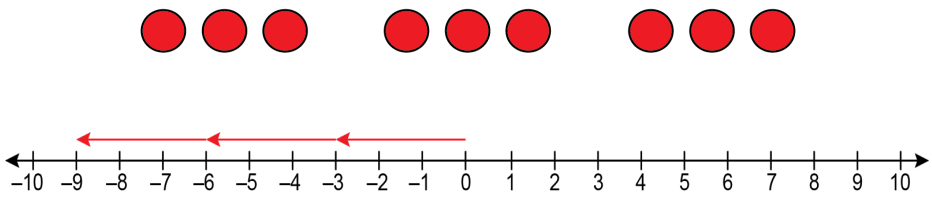
In math class, your student is about to explore multiplying and dividing integers. To master this skill, they will build on their knowledge of multiplication and division of positive numbers from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Positive and negative integers can be multiplied using models and rules that connect to standardized algorithms. Two color counters and number lines help students understand the meaning behind the rules.

Rules for Multiplying Integers	
If the factors have the same signs	The product is positive.
If the factors have different signs	The product is negative.

Example: Walter withdrew $3 every week for 3 weeks from his bank account. How much is Walter's bank account down from its original amount?

Solve the multiplication problem using a model and a number line. Explain your answer.



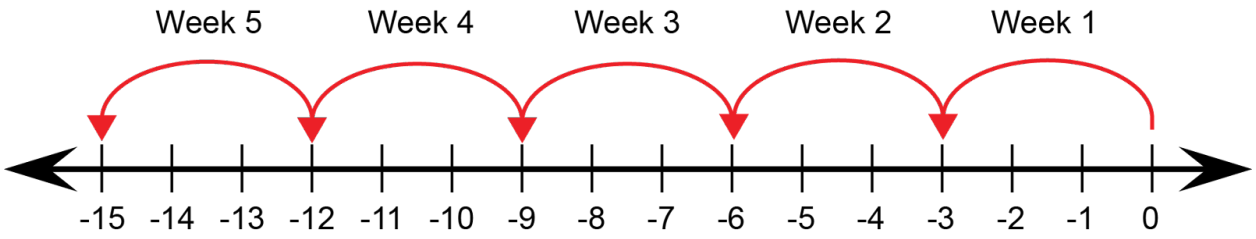
Walter's bank account went down $9. Students can multiply positive and negative integers together using models to find that $-3 \times 3 = -9$. Walter withdrew, or took away money, so three groups of negative 3 are negative 6. When the factors have different signs, the answer is negative.

Example: John is a mountain climber and climbed down a cliff on Mount Everest, 40 feet at a time. He did this 4 times in one day. What was the overall change in his elevation?

John's change in elevation was −160 feet. Students can use rules for multiplying integers to find that −40 (4) = −160.

- Positive and negative integers can be divided using models and rules that connect to standardized algorithms. Two color counters and number lines help students understand the meaning behind the rules.

  Example: Steven lost a total of 15 pounds. If he lost 3 pounds each week, how many weeks did it take Steven to lose 15 pounds?



It took Steven 5 weeks. Students can divide positive and negative integers by using a number line to find that −15 ÷ −3 = 5. When the signs for the divisor and dividend are the same, the answer is positive.

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- **Terms to Know**
    - **algorithm/standard algorithm:** a step-by-step method for a solution
    - **concrete model:** a model that uses physical objects to represent numbers or ideas
    - **dividend:** the number you divide into; a quantity that is to be divided by another quantity; a number that shows the amount of equal parts of a whole; the numerator (top number) that tells the number or quantity; a quantity to be divided
    - **division:** the splitting into equal parts or groups; the result of "fair sharing"
    - **divisor:** the quantity by which another quantity is to be divided
    - **factor:** to break into numbers or expressions that when multiplied together give you the original number or expression
    - **integer:** any one of the positive whole numbers, negative whole numbers, and zero; any member of the set of all whole numbers and their opposites
    - **negative number:** a number that is less than zero
    - **positive number:** a number that is greater than zero
    - **product:** the solution when multiplying two or more numbers; the answer to a multiplication problem
    - **quotient:** the solution when dividing two numbers; the answer to a division problem; the result of the division of one quantity by another

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Math outside the Classroom!

Multiplying and dividing integers are used all around our everyday lives. Chat about where you multiply and divide integers in your everyday life. Below are a few examples:

- ★ Ask a friend or family member how they use multiplying rational numbers when taking a road trip. How might they use rational number operations to calculate the distance traveled or the amount of miles the car could travel before needing more gas? What operations do they use more frequently when traveling?

- ★ If friends or family members split the cost of the trip, how would this be represented using division of rational numbers?

Sixth Grade – Order of Operations

In math class, your student is about to explore order of operations. To master this skill, they will build on their knowledge of order of operations learned in fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Use reasoning and manipulatives to develop a deeper understanding of exponents and identify patterns.

  Example: Rewrite this equation using exponents.
  $6 \times 6 \times 6 = 216$
  $6^3 = 216$

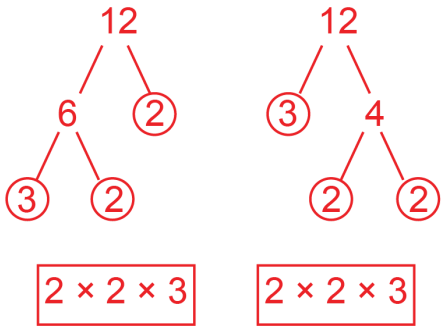
  Example: Solve.
  $12^1 = 12$

- All composite numbers can be shown as a product of prime factors. Students may utilize strategies such as the tree method to ensure the factors are broken down into prime factors.

  Example: Express the number 12 as a product of its prime factors. Answer in the form of an expression, using exponents as appropriate.

  The prime factorization of 12 is $2^2 \times 3$.

  The factor trees below demonstrate the process of prime factorization. Each time a prime number has been factored out, it is circled. Notice that each example begins differently but results in the same set of prime factors. It is also important to note that the number one is never used in a factor tree because it is neither prime nor composite.



- Generate and solve equivalent numerical expressions using order of operations. Solving equations depends on the precise application of the order of operations. Expressions and equations must be solved in this order:

Order of Operations
1. Perform operations in parentheses.
2. Find the value of numbers with exponents.
3. Multiply or divide from left to right.
4. Add or subtract from left to right.

Take care not to misinterpret this list to mean multiply and then divide. Multiplication and division are opposites and should be solved in the order they appear in the equation from left to right. The same is true for addition and subtraction.

Example: Which expression is equivalent to $5(2 + 4) - 3 \times 2^3$?

A. $30 - 6$
B. $7 \times 4 \times 18$
C. $5 \times 6 - 2$
D. $30 - 24$

Answer choice D is correct. Order of operations indicates to solve parentheses, then exponents, then multiplication, and then subtraction. Distractor choices demonstrate ways that students did not correctly follow the order of operations or did not evaluate the exponent appropriately.

$5(2 + 4) - 3 \times 2^3$
$5(6) - 3 \times 2^3$
$5(6) - 3 \times 8$
$30 - 3 \times 8$
$30 - 24$
6

Example: Evaluate the expression $5 + 2^4 \times 6$.

The answer is 101. Order of operations indicates to solve exponents, then multiply, and then add. Distractor choices demonstrate ways that students did not correctly follow the order of operations or did not evaluate the exponent appropriately.

$$5 + 2^4 \times 6$$
$$5 + (2 \times 2 \times 2 \times 2) \times 6$$
$$5 + 16 \times 6$$
$$5 + 96$$
$$101$$

While working with your student at home, you may find the following vocabulary terms helpful in your communication about order of operations. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **composite number:** a number with more than two factors
    - **equivalent expressions:** expressions that name the same number no matter what value is substituted for the variable
    - **exponent:** a mathematical notation that indicates the number of times the base number is multiplied by itself; also called power
    - **factor:** a number that divides into another number without having a remainder
    - **factor tree:** a mathematical tool to help break down a number into its prime factorization
    - **grouping symbols:** symbols that help to organize mathematical expressions; braces { }, brackets [ ], and parentheses ( )
    - **order of operations:** a set of rules that dictate which mathematical operation to perform first, second, and so on when evaluating a mathematical expression
    - **parentheses ( ):** a pair of symbols used to enclose sections of a mathematical expression that indicate where to start within the mathematical order of operations
    - **prime factorization:** a given set of prime numbers that when multiplied together equals the original number
    - **prime number:** a number with exactly two factors; one and itself

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Order of operations are used all around our everyday lives. Chat about where you use order of operations in your everyday life. Below are a few examples:

- ★ Math class isn't the only place that order matters. Talk with your student about tasks that must be done in a certain order for success (like a recipe) and tasks where order is less important (like running errands). Encourage your student to think of their own real-world examples where order is very important.

- ★ Order of operations is an agreement within the math community of what order must be followed to solve equations. Brainstorm situations in real life where the community has formed an agreement about the order of things and the reasons behind the order. For example, people normally eat dinner before dessert because the important nutrients that our bodies need are usually in dinner, and it's a bad health choice to fill up on dessert and skip vegetables. What other orders seem to be true in society? Why?

Sixth Grade – Equivalent Expressions

In math class, your student is about to explore equivalent expressions. To master this skill, they will build on their knowledge of order of operations and numerical expressions from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

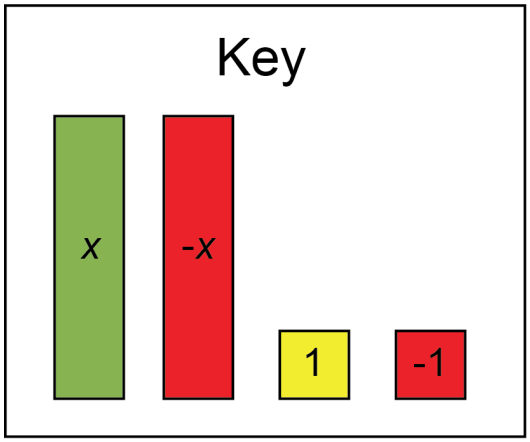
- Compare expressions and equations verbally, numerically, and algebraically. Students may use substitution to justify their answers.

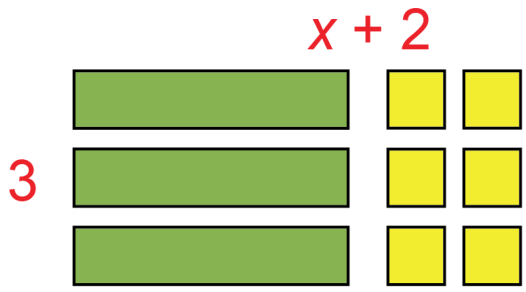
  Example: Identify whether the information in the table represents an expression or equation. Explain your reasoning.

Jeff's brother is twice as old as Jeff.	Equation; the word "is" corresponds to "=" in an equation.
Two more than 4 times the number of bears	Expression; this is a phrase.
7×3	Expression; this is a numerical phrase that can be simplified into a single number.
$2 + 15 = 21 - 4$	Equation; this is an equation because it includes an equal sign.
$3m + 9 = -12$	Equation; this is an equation because it includes an equal sign.
$7x - 5$	Expression; this does not include an equal sign.

- Add and subtract like terms to find equivalent expressions using models. Students may use concrete models such as color rods, algebra tiles, or grid paper as well as pictorial models.

  Example: Use models to determine if $3x + 6$ is equivalent to $3(x + 2)$.



Model	Algebraic Representation
	$3x + 6$ $3(x) + 3(2)$ $3(x + 2)$ $x + x + x + 2 + 2 + 2$

The expressions are equivalent.

- Identify equivalent expressions, and generate equivalent expressions using properties, including the commutative, associative, and distributive properties.

  Example: Are the expressions equivalent? Justify your answer.

  $12 \cdot (2 + 3) = 12(2) + 12(3)$
  They are equivalent. The distributive property states that multiplying the sum of a group of terms by a number or variable is the same as multiplying each term by a number or variable and then adding the products.

  $5 \cdot 7 \cdot 3 = 3 \cdot 5 \cdot 7$
  They are equivalent. The commutative property of multiplication states that when multiplying numbers, the order of the factors does not affect the product.

  $2 \cdot (2 \cdot 3) = (2 \cdot 2) \cdot 3$
  They are equivalent. The associative property of multiplication states that when multiplying three numbers, the grouping does not affect the product.

  $(2 + 3) + (4 + 5) = (3 + 4) + (2 + 5)$
  They are equivalent. The associative and commutative properties of addition state that when adding numbers, the order of the addends and the grouping of the addends do not affect the sum.

  Use the distributive property to write an equivalent expression for $4(2 + x)$.
  $8 + 4x$

While working with your student at home, you may find the following vocabulary terms helpful in your communication about equivalent expressions. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **additive identity property:** a number that, when added to any number, gives the sum as the number itself
  - **additive inverse:** what must be added to a number in order for the sum of the two numbers to be zero
  - **algebraic representation:** a mathematical phrase in which variables and constants are combined using the operational symbols (+, −, × & ÷)
  - **associative property of addition:** the mathematical property which states that when adding three numbers, the placement of the grouping symbols does not affect the sum, for example, $(a + b) + c = a + (b + c)$
  - **associative property of multiplication:** the mathematical property which states that when multiplying three numbers, the placement of the grouping symbols does not affect the product, for example, $(a \times b) \times c = a \times (b \times c)$
  - **commutative property of addition:** the mathematical property which states that when adding two numbers, the order of the addends does not affect the sum; $a + b = b + a$
  - **commutative property of multiplication:** the mathematical property which states that when multiplying two numbers, the order of the factors does not affect the product; $a \times b = b \times a$
  - **distributive property:** the mathematical property which states that multiplying the sum or difference of a group of terms by a number or variable is the same as multiplying each term by a number or variable and then adding or subtracting the products
  - **equation:** a mathematical statement that shows that two expressions are equal to each other; a mathematical sentence that uses numbers, one or more operation symbols, and an equal sign
  - **equivalent expressions:** expressions that name the same number no matter what value is substituted for the variable
  - **expression (algebraic expression):** numbers, variables, and symbols grouped together without an equal sign to show a relationship
  - **multiplicative identity property:** the mathematical property which states that the resulting product of any number and 1 is equal to the original number

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Equivalent expressions are used all around our everyday lives. Chat about where you use equivalent expressions in your everyday life. Below are a few examples:

- ★ Expressions and equations are often used in real life to solve problems. Imagine you need the plumbing repaired. The first plumber you call has a $50 travel charge for any job plus $50 per hour. The second plumber does not charge for travel but does charge $75 per hour. You estimate the job will take two hours. If the job actually takes two hours, the price will be the same for either plumber. Talk about how you might choose a plumber in this scenario. Why?

- ★ Combo meals are a perfect real-world example of equivalent expressions: 3 combo meals of a burger, fries, and drink are equivalent to an order of 3 burgers, 3 fries, and 3 drinks. Talk about the reasons someone might choose to order combo meals or why they might choose to order items separately. Take a trip to your favorite fast food location, and check their math. What is the actual difference in price between ordering each item separately and ordering the combo?

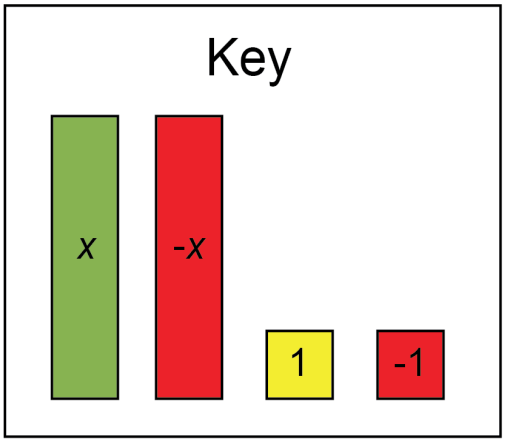
Sixth Grade – Equations and Inequalities

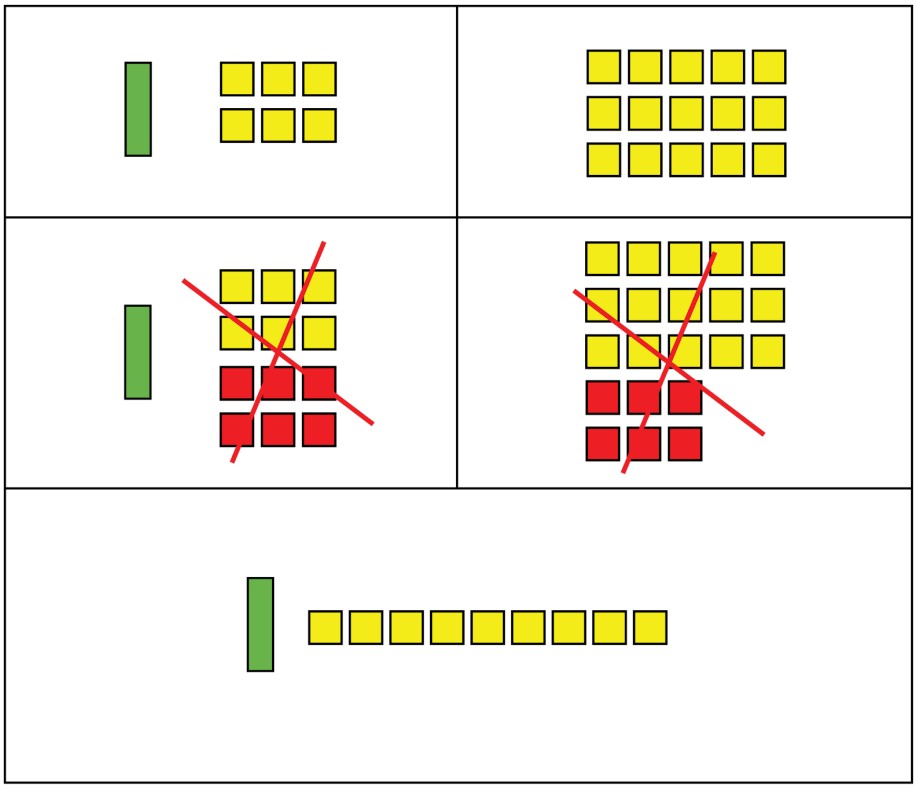
In math class, your student is about to explore equations and inequalities. To master this skill, they will build on their knowledge of solving multistep problems using equations with a letter standing for the unknown quantity from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Use concrete models and substitution to solve equations. Solutions can be represented on a number line or other model.

  Example: The math club donated some cupcakes to sell at the school's bake sale. The student council donated 6 cupcakes to sell. The school has 15 cupcakes that will be sold at the school's bake sale. How many cupcakes did the math club donate to the school's bake sale?

$c + 6 = 15$

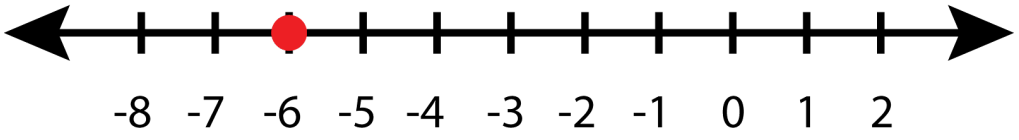




$c + 6 = 15$
$\underline{-6 \quad -6}$
$c \quad = 9$

Example: Solve the equation, and represent the solution on a number line.

$$w + 4 = -2$$

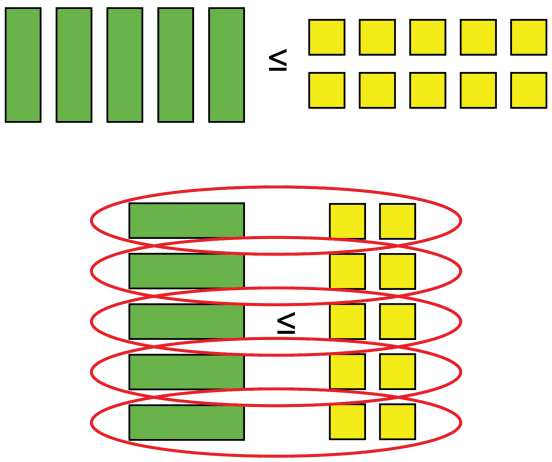


$w + 4 = -2$
$\underline{-4 \quad -4}$
$w \quad = -6$

Students can use inverse operations to determine the value of w. The inverse of addition is subtraction. By subtracting 4 from both sides of the equation, it can be determined that $w = -6$.

- Use concrete models and substitution to solve inequalities. Students will model and solve real-world inequalities and graph solutions on a number line. Because the solution to an inequality may contain more than one number, an inequality is often solved with a solution set.

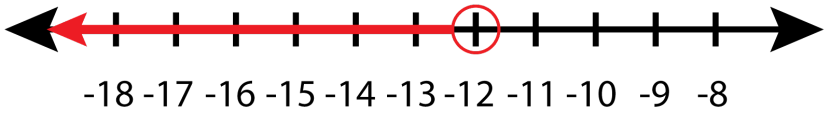
  Example: At the math club's bake sale, cookies are packed in boxes of 5. The price of each box depends on the flavor. The most expensive box is $10. *p* represents the price of each cookie. These tiles model the scenario.



  Write an inequality to match the scenario and the tiles.
  $5p \leq 10$

Example: Solve the inequality and represent the solution on a number line.

$$-\frac{g}{4} > 3$$



$$-\frac{g}{4} > 3$$
$$(-4)-\frac{g}{4} > 3(-4)$$
$$g < -12$$

Students can use the inverse of division and multiply to determine the value of *g*. By multiplying both sides of the equation by −4, it can be determined that g < −12. The inequality sign in the problem was reversed since we multiplied both sides of the equation by −4. The solution can be plotted on a number line using an open circle on −12 since 12 is not a solution because the solution includes all numbers less than −12.

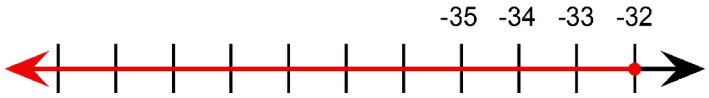
- Write expressions that represent real-world scenarios, and identify the variable. Solutions may be represented on a number line.

  Example: Marilyn has a bag that contains marbles. She gave away 11 blue marbles and now has 17 marbles. Write an equation, and identify the variable.

  $m - 11 = 17$ *m* represents marbles.

- Write inequalities that represent real-world scenarios, and identify the variable. Solution sets may be represented on a number line.

  Example: Water freezes at 32 degrees Fahrenheit. Write an inequality to show the temperature of water when it is in a frozen state. Use words to explain your inequality, and define the variable. Use a number line to represent the inequality you wrote.



  $t \leq 32°$ t = temperature of water when in a frozen state.

  Water is in a frozen state when it is equal to 32°F or less than 32°F.

- Write real-world problems that represent equations and inequalities.

  Example: Write a real-world problem that represents the inequality below.

$$3x > 36$$

  Following is a sample answer: Leo buys 3 basketballs and spends more than $36. How much did he spend on each basketball?

While working with your student at home, you may find the following vocabulary terms helpful in your communication about equations and inequalities. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **coefficient:** the number placed directly before a variable that tells you to multiply that number by the variable
  - **constant:** a fixed number that stands alone
  - **equation:** a mathematical statement that shows that two expressions are equal to each other; a mathematical sentence that uses numbers, one or more operation symbols, and an equal sign
  - **greater than (>):** more than another (for example, 49 > 12)
  - **greater than or equal to (≥):** more than or the same as another
  - **inequality:** a mathematical sentence that uses symbols such as <, ≤, >, or ≥ to compare two quantities
  - **less than (<):** smaller than another (for example, 432 < 501)
  - **less than or equal to (≤):** smaller than or the same as another
  - **maximum:** the greatest or highest amount possible or attained
  - **minimum:** the least or smallest amount or quantity possible, attainable, or required
  - **number line diagram:** a line on which numbers are marked at intervals
  - **real-world problem:** a contextual-based problem that can be interpreted, represented, and analyzed through the application of mathematics
  - **solution set:** a set of numbers that makes an inequality statement true
  - **variable:** a letter or symbol that takes the place of a number that can change; a letter that can stand for an unknown number or a set of numbers

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Equations and inequalities are used all around our everyday lives. Chat about where you use equations and inequalities in your everyday life. Below are a few examples:

- ★ Inequalities are more common than you might realize. Think about these real-life situations: You have $50 and are going to the store. You can spend $50 or less. Children under three are admitted free. Riders must be 42” or taller to ride. Look for inequalities in action, and point them out to your student. Challenge your student to do the same. Talk about all the possible solutions for the inequality.

- ★ Equations have exactly one answer. The total you spend at a store is determined by an equation. Look for equations in action, and talk about them with your student. Talk about creating an equation for certain situations, like filling your car with gas, and how that equation can be solved. If you were to draw a picture of the equation, what would it look like?

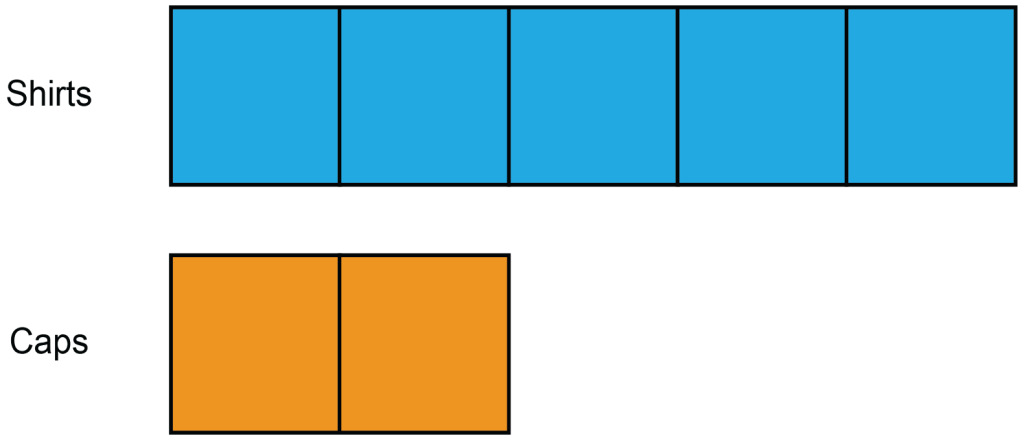
Sixth Grade – Proportionality with Ratios and Rates

In math class, your student is about to explore proportionality with ratios and rates. To master this skill, they will build on their knowledge of patterns and equivalent fractions in fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Represent ratios using models, words (including the word *to*), numbers, fractions, and colons. Ratios include part-to-part and part-to-whole comparisons. Models can help determine equivalent ratios. A ratio of 1-to-2 can be written as 1-to-2, $\frac{1}{2}$, or 1:2.

  Example: Jason has 5 shirts and 2 baseball caps. Express this ratio using a sentence and a colon. Represent your answer with a diagram.

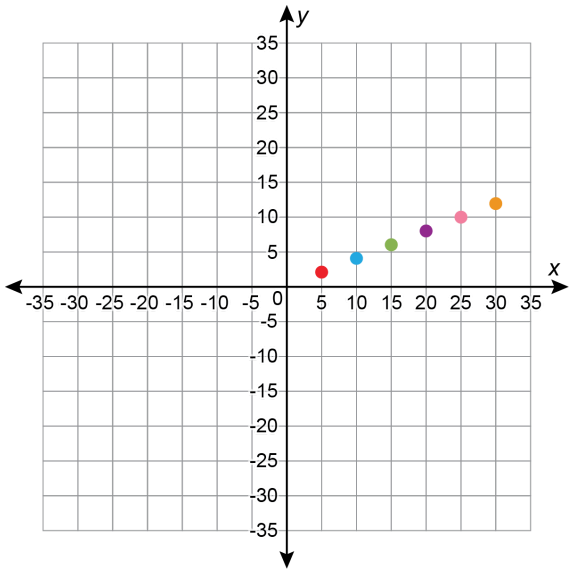
  The ratio of shirts to baseball caps is 5 to 2.
  5:2



- Use ratio tables to determine equivalent ratios, to scale up and scale down to determine equivalent ratios, and to find a multiplicative scale factor to determine equivalent ratios.

  Example: Megan is baking chocolate chip cookies and sugar cookies in the ratio of 5-to-2. She has 30 chocolate chip cookies. How many sugar cookies did she bake? Solve the problem using scale factors, tables, graphs, and proportions.

<table>
<tr><td>Scale Factor</td><td>We know there are 30 chocolate chip cookies. We need to find the number of sugar cookies. The ratio is 5:2. For every 5 chocolate chip cookies, there are 2 sugar cookies. If there are 30 chocolate chip cookies, then there are 6 sets of 5. This means that the scale factor is 6. To find the number of sugar cookies, multiply 2 and 6 to get 12.</td></tr>
<tr><td>Table</td><td>The table shows all the possible combinations of chocolate chip cookies and sugar cookies until a ratio of 5:2 is reached.
<table>
<tr><th>Chocolate Chip Cookies</th><th>Sugar Cookies</th></tr>
<tr><td>5(1) = 5</td><td>2(1) = 2</td></tr>
<tr><td>5(2) = 10</td><td>2(2) = 4</td></tr>
<tr><td>5(3) = 15</td><td>2(3) = 6</td></tr>
<tr><td>5(4) = 20</td><td>2(4) = 8</td></tr>
<tr><td>5(5) = 25</td><td>2(5) = 10</td></tr>
<tr><td>5(6) = 30</td><td>2(6) = 12</td></tr>
</table></td></tr>
<tr><td>Graph</td><td>Students will graph the ordered pair (5, 2), which is the ratio with a scale factor of 1. Next, they will follow the pattern of 5 right and 2 up to the next point, which corresponds to the ordered pair (10, 4) in the table. In other words, (5, 2)—which has been scaled by a factor of 2. Students can continue to create the graph until they get to the ordered pair (30, 12). When there are 30 chocolate chip cookies, there are 12 sugar cookies.</td></tr>
</table>

	
Proportion	Students may also use proportions (equivalent ratios) to solve the problems. Be sure students can use several methods to solve proportions. When writing proportions, keep the 5:2 ratio constant. It is recommended that students include labels when writing proportions; this will assist them in writing proportions correctly. $\frac{5\ chocolate\ chip\ cookies}{2\ sugar\ cookies} = \frac{30\ chocolate\ chip\ cookies}{x}$ $x = 12$ There are 12 sugar cookies.

- Represent a rate as a quotient, and explain how a rate is a comparison of two quantities. Students will determine the rate in a given problem, which may include unit rates, unit price, and constant speed.

  Example: $\frac{300\ miles}{5\ hours} = \frac{60\ miles}{1\ hour}$

  What is the scale factor?

  5. To find the mile per hour divide 300 and 5.
  $\frac{300}{5} = \frac{300 \div 5}{5 \div 5} = \frac{60}{1}$

  Example: $\frac{\$2.40}{6\ pounds}$

  The scale factor is 6. To find the price per pound divide 2.40 and 6.

  $\frac{2.40}{6} = \frac{2.40 \div 6}{6 \div 6} = \frac{0.40}{1}$

  $0.40 per pound

  Example: A movie theater offers a special ticket package of 5 tickets for $20. Write the package price as a rate and unit rate.

  The rate is 20 dollars: 5 tickets, 20 to 5, 20:5, or $\frac{20}{5}$.

  $\frac{Price}{Tickets}\ \frac{20}{5} = \frac{20 \div 5}{5 \div 5} = \frac{4}{1}$

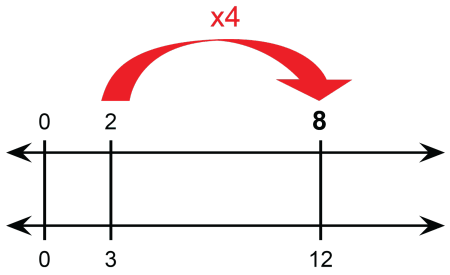
  The unit rate is 4 dollars:1 ticket. The cost of one ticket is $4.

Tickets	1	2	3	4	5
Price	4	8	12	16	20

- Compare ratios or rates to determine which ratio or rate is greater, less, or better in context of the situation. Students will use proportions to make predictions and comparisons involving ratios and rates of an unknown value using real-world word problems.

  Example: Mary is making a batch of pancakes for breakfast. The recipe calls for 2 cups of pancake mix for every 3 cups of milk. She has 12 cups of milk and wants to use it all. How many cups of pancake mix should she use?

  The ratio of pancake mix to milk is 2:3, so 8 cups of mix are needed for 12 cups of water.



$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$

While working with your student at home, you may find the following vocabulary terms helpful in your communication about proportionality with ratios and rates. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **comparison:** the process or results of looking for similarities and/or differences among sets of objects or numbers
  - **concrete model:** a model that uses physical objects to represent numbers or ideas
  - **decimal:** a number that uses a decimal point followed by digits that show a value smaller than one, in powers of ten that decrease; a number with one or more digits to the right of the decimal point
  - **fraction:** a number that shows a part of a whole or part of a set
  - **graph:** a visual representation of data
  - **part-to-part ratio (comparison):** a relationship between one part of a whole and another part of a whole
  - **part-to-whole ratio (comparison):** a relationship between one part of a whole and the total number of parts in the whole
  - **percent:** a special ratio that compares a number to 100 using the percent symbol, %; a rate per 100
  - **proportion:** two fractions or ratios that are equal in value; a type of equation that shows that two ratios are equal
  - **rate:** a type of ratio where the quantities have two different units
  - **ratio:** a comparison of two quantities that shows their sizes in relation to one another
  - **scale factor:** ratio of corresponding side lengths in a scale drawing to those of the original figure
  - **table:** a chart that uses rows and columns to organize information
  - **quantity:** a number or amount; an amount that tells how much
  - **quotient:** the solution when dividing two numbers; the answer to a division problem; the result of the division of one quantity by another
  - **real-world problem:** a contextual-based problem that can be interpreted, represented, and analyzed through the application of mathematics
  - **unit rate:** a rate with a denominator of 1 that shows how many units of the first type corresponds to one unit of the second type

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Proportionality with ratios and rates are used all around our everyday lives. Chat about where you use proportionality with ratios and rates in your everyday life. Below are a few examples:

- ★ Now is a great time to pull out a favorite family recipe! Double or triple the recipe and stock your freezer or have friends over. As you prepare the recipe, explain that doubling or tripling a recipe is really a proportion. How would the flavor be changed if you incorrectly calculated the new amount of salt needed?

- ★ Did you know that cooking and baking are very different because of the science and math involved in the two processes? Cooking is considered an art, where ratios are mostly about balancing flavors. Most cooking ratios can be adjusted, substitutions can be made, and ingredients can be added or deleted easily to suit the taste of the chef. In baking bread or cakes, ratios are about chemistry and precise measurements. In order to get the final product to have a certain rise or consistency, very little can be changed. Temperatures and cook times are precise as well. To illustrate this idea, make two small batches of pancakes. Pancakes are not as precise as other forms of baking, but they are simple and inexpensive to make. For one batch, provide all of the ingredients without measurements and have your child make up the ratios. In the second batch, provide the ratios according to the recipe. Cook and compare the two batches.

Sixth Grade – Measurement Conversions

In math class, your student is about to explore measurement conversions within the same measurement system. To master this skill, they will build on their knowledge of converting measurements developed in fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Convert measurements using unit rates. Students can use a model or make a table to show the relationship between measurements and convert from one unit to another within the same measurement system.

  Example: Sarah is making 2 gallons of lemonade for a picnic with her family. Before she pours lemonade for her family, she needs to set aside 3 quarts of lemonade. How many gallons of lemonade are equal to 3 quarts?

  There are $\frac{3}{4}$ of a gallon in 3 quarts of lemonade.

  Conversion: 1 gallon = 4 quarts

Gallon	1	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
Quarts	4	3	2	1

  Since 1 gallon = 4 quarts, you can divide 1 by 4. So, 1 quart = $\frac{1}{4}$ gallon. Multiply by 3 to get the number of gallons in 3 quarts. $\frac{1}{4} \times 3 = \frac{3}{4}$.

- Use proportions to convert measurement units.

  Example: The height of a statue is 3 yards. What is the height of the statue in inches?

  There are 108 inches in 3 yards.

  $$\frac{36\ inches}{1\ yard} = \frac{x}{3\ yards} \qquad \frac{36\ inches}{1\ yard} \times \frac{3}{3} = \frac{108}{3\ yards}$$

  Students should use the conversion rate of 36 inches = 1 yard to set up a proportion using inches and yards. Since 1 × 3 = 3, we will multiply 36 × 3, which equals 108. There are 108 inches in 3 yards.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about measurement conversions. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **convert:** to change from one unit of measure to another while keeping the same value
    - **customary system:** a system of measurement used in the United States that includes units for measuring length, capacity, weight, and temperature
    - **measurement system:** one of two main systems of measurement–the metric system and the standard or customary system, each of which uses different units to measure distance, mass, and volume
    - **metric system:** a measurement system used worldwide and in the field of science, based on powers of ten
    - **proportion:** two fractions or ratios that are equal in value; a type of equation that shows that two ratios are equal
    - **unit of measurement:** a standard amount that is used to measure
    - **unit rate:** a rate with a denominator of 1 that shows how many units of the first type corresponds to one unit of the second type

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Measurement conversions are used all around our everyday lives. Chat about where you use measurement conversions in your everyday life. Below are a few examples:

- ★ A practical application of measurement conversions is in construction. Find the plans for a simple do-it-yourself project (like a birdhouse) online. Show your student the measurements, which are likely in inches. Then, find the needed lumber online from a home improvement store. Show your student that in order to purchase the correct amount of lumber, conversions will be necessary.

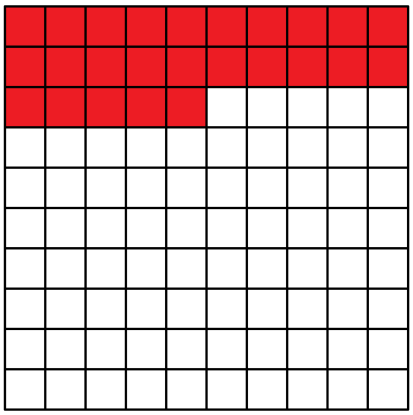
- ★ Did you know that there are 16 tablespoons in a cup? Imagine that you are in the middle of baking a cake from scratch and you accidentally break your measuring cup. You need to add $\frac{1}{2}$ cup of oil to the recipe but only have tablespoons. Can you still measure accurately? Using measurement conversions, you can determine that you will need 8 tablespoons of oil. Brainstorm other instances where you might need to convert measurements while cooking.

Sixth Grade – Fraction, Decimal, and Percent Equivalence

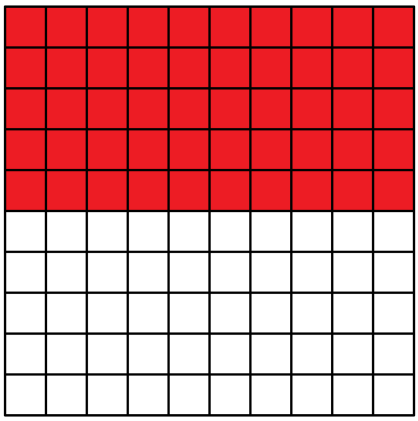
In math class, your student is about to explore fraction, decimal, and percent equivalence. To master this skill, they will build on their knowledge of fractions and decimals from previous grades. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Represent fractions, ratios, decimals, and percents with 10 × 10 grids. The models make it easier to visualize numbers and determine if they are equivalent. The word *percent* means per one hundred.

  Example: Identify the fraction, decimal, and percent shown in each grid.



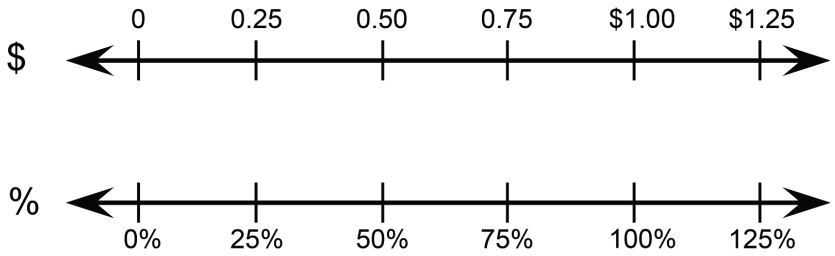
0.25, $\frac{25}{100}$, $\frac{1}{4}$, 25%



0.50, $\frac{50}{100}$, $\frac{1}{2}$, 50%

- Model equivalence of fractions, decimals, and percents using number lines. Some commonly used benchmark fractions and decimal equivalents are $\frac{1}{4}$ = 0.25, $\frac{1}{2}$ = 0.5 and $\frac{3}{4}$ = 0.75. Double number lines are used for comparisons.

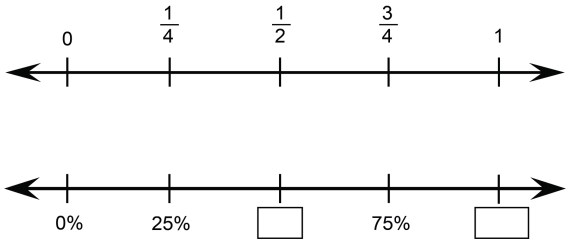
  Example: Use the double number line to answer the questions.



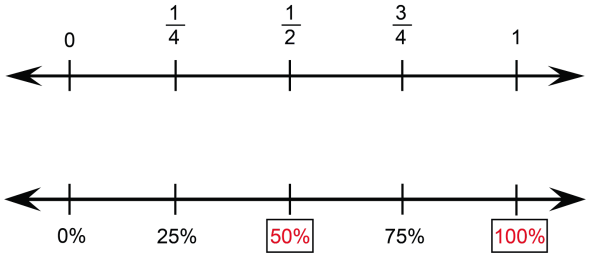
What percentage of a dollar is $0.25? 25%
What percentage of a dollar is $1.00? 100%
What percentage of a dollar is $1.25? 125%

Example: Complete the missing values on each set of double number lines.

Set A

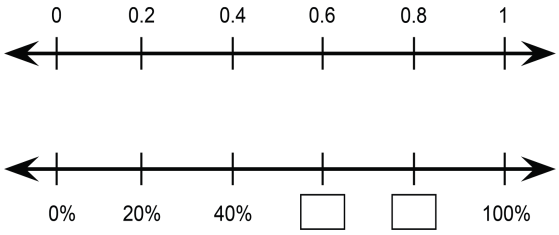


Answer:

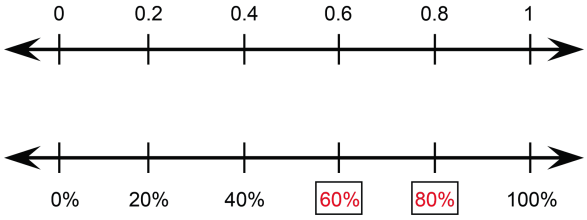


Set A: Missing values include 50% and 100%. Each number line is partitioned into 4 sections, and each section is valued at $\frac{1}{4}$, or 25%. Students can skip count by 25%: 25, 50, 75, 100.

Set B



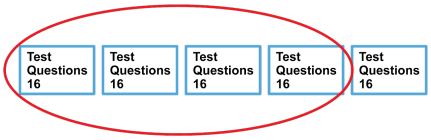
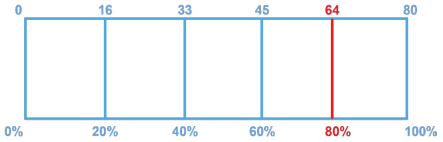
Answer:



Set B: Missing values include 60% and 80%. Each number line is partitioned into 5 sections, and each section is valued at $\frac{1}{5}$ or 20%. Students can skip count by 20%: 20, 40, 60, 80, 100.

- Represent fractions and percents using strip diagrams, including part-to-whole and equal parts of the same whole.

  Example: There were 80 questions on Jacob's science test. He answered $\frac{4}{5}$ of the test questions correctly. How many test questions were correct?

Fraction	Decimal	Percent
80 questions can be divided into five parts. 	An equation with decimals is used to find 0.80 of the test questions. $0.80 \cdot 80 = 64$	A percent bar is used to figure out that 64 questions are 80% of the questions that were correct. 

While working with your student at home, you may find the following vocabulary terms helpful in your communication about fraction, decimal, and percent equivalence. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **10-by-10 grid:** a model that shows percent and fraction benchmarks
  - **benchmark fraction:** a familiar fraction used as a reference point in order to measure, compare, and assess the reasonableness of a fractional value
  - **benchmark percents:** familiar percents used as reference points in order to measure, compare and assess the reasonableness of a percent value
  - **decimal:** a number that uses a decimal point followed by digits that show a value smaller than one, in powers of ten that decrease; a number with one or more digits to the right of the decimal point
  - **equal part:** a piece of something that is the same size or value as other parts of a whole
  - **equivalent:** equal in value or amount
  - **fraction:** a number that shows a part of a whole or part of a set
  - **number line diagram:** a line on which numbers are marked at intervals
  - **percentage:** a special ratio that compares a number to 100 using the percent symbol, %; a rate per 100
  - **strip diagram:** a rectangular model used to show numerical relationships

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Fraction, decimal, and percent equivalence is used all around our everyday lives. Chat about where you use fraction, decimal, percent equivalence in your everyday life. Below are a few examples:

- ★ A real-life example of fraction and percent equivalence is as close as the nearest graded assignment. Ask your student to locate a graded assignment. Together, determine the fraction of correctly answered questions over the total number of questions. Convert that fraction to a decimal and to a percent. Which is easier to understand: a score of 12/15 or a score of 80%?

- ★ Percentages are also as close as your phone. Think about how battery life is displayed. A battery charged to 75% could also be expressed as 0.75 or $\frac{3}{4}$. Ask your student why they think a percentage is used as a measurement of battery charge instead of a fraction or decimal.

- ★ Fuel tanks are a common usage of fractions. We usually say our tanks are $\frac{1}{2}$ full, for example, instead of 50% full or 0.5 full. Ask your student why they think a fraction is used as a measurement for fuel tanks instead of a percent or decimal.

Sixth Grade – Fraction, Decimal, and Percent Application

In math class, your student is about to explore fraction, decimal, and percent application. To master this skill, they will build on their knowledge of fractions and decimals. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Convert between fractions, decimals, and percents using these strategies:
  - To write a decimal as a fraction, identify the place value of the last digit of the decimal. Write the decimal number (without the decimal) as the numerator and the place value identified as the denominator. Simplify.
  - To write a fraction as a decimal, divide the numerator by the denominator.
  - To write a percent as a decimal, move the percent sign and divide the number by 100. (Percent means per hundred.)
  - To write a decimal as a percent, multiply the decimal by 100 and add a percent sign.
  - To write a fraction as a percent, convert the fraction to a decimal and then convert the decimal to a percent.

Example: Fill in the missing parts of the table.

Fraction	$\frac{1}{10}$	$0.2 = \frac{2}{10} = \frac{1}{5}$	$25 = \frac{25}{100} = \frac{1}{4}$
Decimal	$\frac{1}{10} = 1 \div 10 = 0.1$	$20 \div 100 = 0.2$	0.25
Percent	$0.1 \times 100 = 10\%$	20%	$0.25 \times 100 = 25\%$

Example: Jamere goes to the gym on 12 of the 30 days in April. How would you write the number of days in April that Jamere went to the gym as a fraction, decimal, and percent?

$\frac{12}{30} = \frac{2}{5}$, 0.40, 40%

First, write 12 out of 30 as a fraction and simplify. Then, use division to convert the fraction to a decimal and multiply the number by 100 and add a percent sign.

- Use models to find the part, whole, and percent in a variety of situations. There are many ways to create models to help visualize and understand percents.

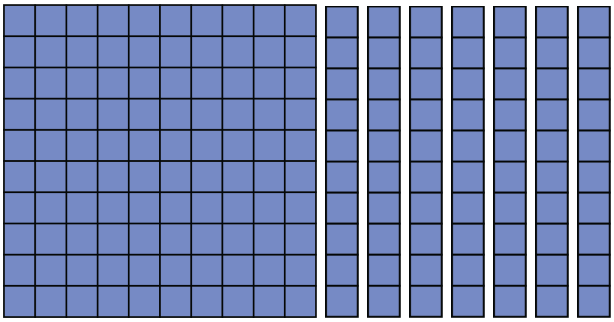
$$\frac{part}{whole} = \frac{percent}{100}$$

Example: Jessica is baking cakes for her school carnival. She plans to bake 10 cakes and has finished baking 70% of the cakes. How many cakes has Jessica baked?

$$\frac{x}{10} = \frac{70}{100}$$

How can Base ten blocks be used to represent this problem?

Since percents are out of 100, we can start with a flat that represents 100 units. We can use the given percent and whole to find the part. Jessica baked 70% of cakes so 70 out of 100 units represents the amount of cakes Jessica has baked. There are 10 rows in the flat and 7 rows represent 70 units, so the part would be 7. Jessica baked 7 cakes.

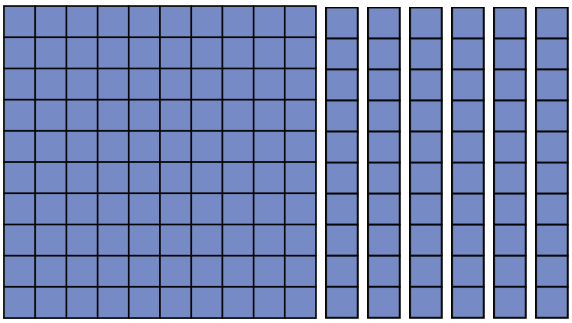


Example: Sai is washing cars for the football team's fundraiser. He has washed 6 cars and has washed 60% of the cars that he scheduled to wash. How many cars did Sai schedule to wash for the fundraiser?

$\frac{6}{x} = \frac{6}{100}$

How can Base ten blocks be used to represent this problem?

Since percents are out of 100, we can start with a flat that represents 100 units. We can use the given percent and part to find the whole. Sai washed 60% of cars so 60 out of 100 units represents the amount of cars Sai has washed. There are 10 rows in the flat and 6 rows represents 60 units, so the whole would be 10. Sai scheduled to wash 10 cars.



Example: There are 13 out of 50 students at Clear View Middle School that are members of the band and choir. What percentage of the students are members of the band and the choir?

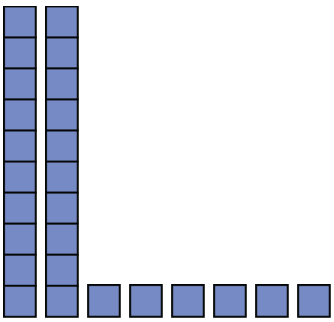
26% of the students are in the band and choir.

$$\frac{13}{50} = \frac{x}{100}$$

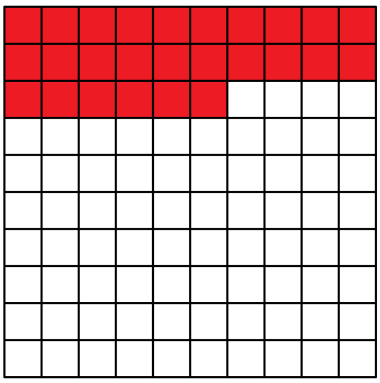
$$\frac{13}{50} \cdot \frac{2}{2} = \frac{26}{100} \quad 50 \cdot 2 = 100, \text{ so } 13 \cdot 2 = 26.$$

How can Base ten blocks be used to represent this problem?

Since percents are out of 100, we can start with a flat that represents 100 units. We can use the given part and whole to find the percent. For every 50 units in the flat we can use 13 units to get a total of 26 units out of 100 units.



Using the grid below, shade 13 blocks out of 50, then shade an additional 13 blocks out of 50. 26 out of 100 blocks are shaded.



- Solve real-world problems involving percentages. Problem types include percent discounts, taxes, and tips.

  Example: A bookstore has some of the books on sale for 30% off. If a customer buys a book that was originally $20, how much will the customer pay?

  $$\frac{part}{whole} = \frac{percent}{100} \text{ or } \frac{amount\ of\ discount}{original\ cost} = \frac{percent\ of\ discount}{100}$$

  The customer will pay $14.

  The books are on sale for 30% off, and 100% – 30% = 70%. A customer will end up paying 70% of the price.

  $\frac{x}{20} = \frac{70}{100}$

  $\frac{14}{20} \cdot \frac{5}{5} = \frac{70}{100}$

  20 · 5 = 100, and a number times 5 equals 70. To find that number, you can use division. 70 ÷ 5 = 14; 14 · 5 = 70. The customer will pay $14.

  Example: A customer spends $50 on groceries. Sales tax is 8%. How much will the customer pay in sales tax? What will be the total cost for the groceries?

  The sales tax is $4, and the total cost is $54.

  The sales tax is 8%. A customer will pay 108% as the total cost.

  $\frac{x}{50} = \frac{8}{100}$

  $\frac{x}{50} \cdot \frac{2}{2} = \frac{8}{100}$

  $x = 4$

  $50 + $4 = $54

While working with your student at home, you may find the following vocabulary terms helpful in your communication about fraction, decimal, and percent application. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **decimal:** a number that uses a decimal point followed by digits that show a value smaller than one, in powers of ten that decrease; a number with one or more digits to the right of the decimal point
    - **equivalent:** equal in value or amount
    - **fraction:** a number that shows a part of a whole or part of a set
    - **percent:** a special ratio that compares a number to 100 using the percent symbol, %; a rate per 100
    - **proportion:** two fractions or ratios that are equal in value; a type of equation that shows that two ratios are equal
    - **real-world problem:** a contextual-based problem that can be interpreted, represented, and analyzed through the application of mathematics

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Fractions, decimals, and percents are used all around our everyday lives. Chat about where you apply fractions, decimals, and percents in your everyday life. Below are a few examples:

- ★ Grades are a very practical application of fractions and percents. Ask your student to pull out a few recent assignments. Have your student determine the fraction of the problems that have been completed and determine the percent that are correct by converting the fraction to a decimal and a decimal to a percent.

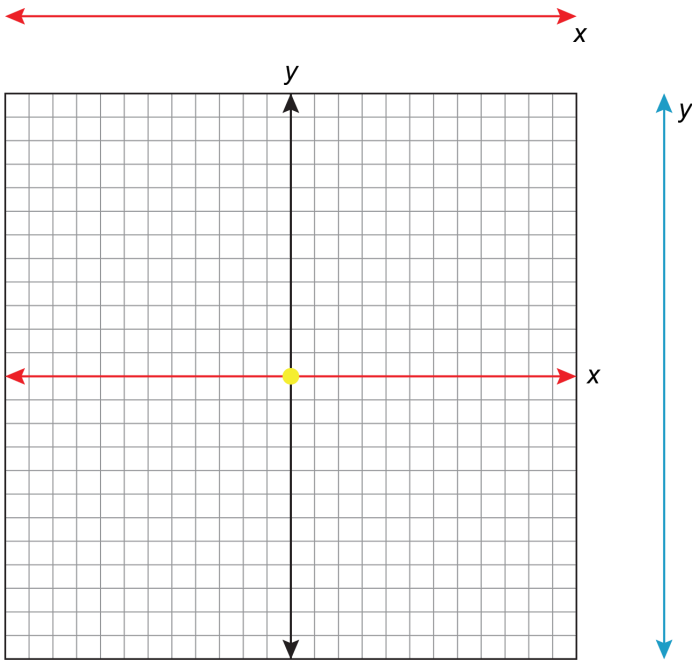
- ★ Tips are another common application for percents. Next time you are out to dinner, show your student the bill. Talk about how good the service was and what an appropriate percentage of the bill the server has earned. A lot of restaurants even provide suggested tip amounts. Together with your student, determine an appropriate tip, and add it to the bill.

Sixth Grade – Coordinate Planes

In math class, your student is about to explore coordinate planes. To master this skill, students will build on their knowledge of number lines and the first quadrant of the coordinate plane from fifth grade. As your student extends their knowledge throughout sixth grade, they will learn the following concepts:

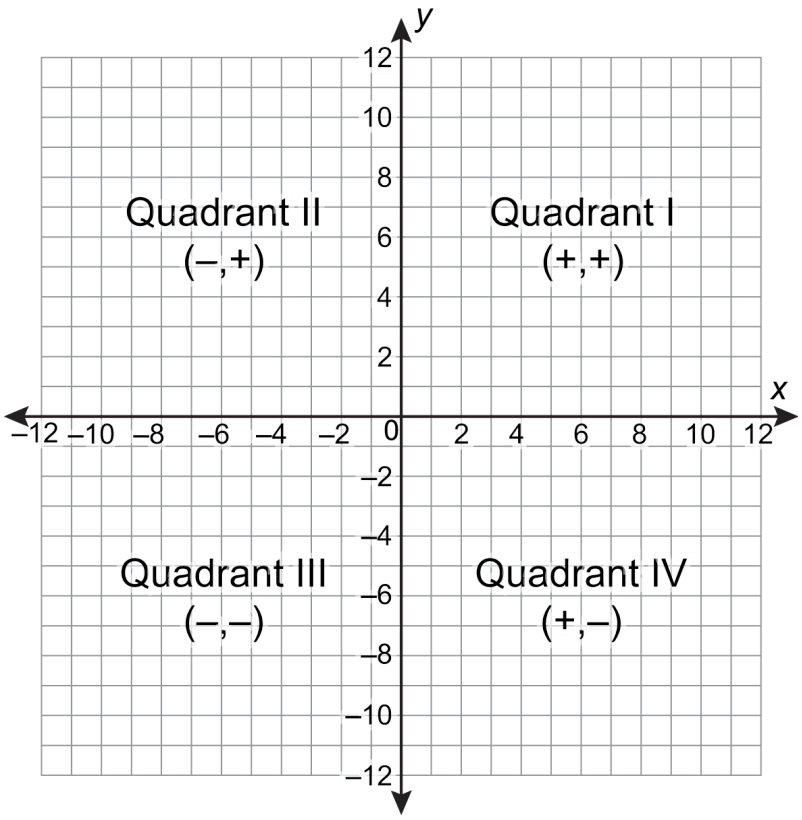
- Coordinate planes are the combination of a vertical number line and a horizontal number line. The vertical line is called the *y*-axis, and the horizontal line is called the *x*-axis. The two lines meet together at the origin, located at the point (0, 0) on the coordinate plane.

  Example:



Identify the Four Quadrants

- There are four quadrants in a coordinate plane. Each quadrant holds a specified set of coordinate pairs.



Graph in All Four Quadrants

- Each quadrant has ordered pairs that share the same positive and/or negative signs that are associated with it.

  Example: Which point on the coordinate plane shows point (−7, −7.5)?
  Point F is located at (−7, −7.5).

  Example: Graph and label the following points on the coordinate plane:
  Point A: (−9, 8.5)
  Point B: (0, −4)
  Point C: (7, 3)
  Point D: (4, 0)
  Point E: (8, −10)

While working with your student at home, you may find the following vocabulary terms helpful in your communication about coordinate planes. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **coordinate plane:** two perpendicular number lines called the *x*-axis and the *y*-axis, that intersect at the point (0, 0) and create four quadrants; also called a graph, coordinate grid, or Cartesian plane
  - **coordinates:** a pair of numbers that provides the location of a point along the coordinate plane using the values of the *x*-axis and *y*-axis
  - **ordered pair:** the location of a single point on a coordinate plane where the first and second values represent the position relative to the *x* axis and *y* axis, respectively (*x*, *y*); also known as coordinate pair
  - **origin:** the centerpoint of a coordinate plane, where the *x*-axis and *y*-axis intersect, located at (0, 0)
  - **point:** a dot that represents a specific spot on a number line or coordinate plane; a geometric object with no dimension used to indicate a location
  - **quadrant:** one of four sections of the coordinate plane, formed by the intersection of the *x*-axis and *y*-axis
  - **rational number:** a number that can be written as a fraction of integers a/b, where $b \neq 0$; a number that can be written as a ratio using two integers
  - ***x*-axis:** a horizontal number line on a coordinate plane
  - ***x*-coordinate:** the first term in an ordered pair; provides the location along the *x*-axis within the coordinate plane
  - ***y*-axis:** a vertical number line on a coordinate plane
  - ***y*-coordinate:** the second term in an ordered pair; provides the location along the *y*-axis within the coordinate plane

We will do many explorations in class to help your child learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what they have learned. Ask your student to identify examples of what they are learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Coordinate planes are used all around our everyday lives. Chat about where you use coordinate planes in your everyday life. Below are a few examples:

- ★ Look at train or subway mapping systems. Where do you see coordinate planes used? How would understanding coordinate planes be helpful when navigating the subway in a new city?

- ★ Open a map application on your phone, tablet, or computer. Find a neighborhood that looks like a coordinate plane. Discuss how the coordinate system is beneficial when planning neighborhoods. Then, plot a few locations in the neighborhood on a graph.

- ★ Did you know that coordinate planes are used to create video games? What is your favorite video game? Discuss how the designer used the coordinate system to help navigate the world of the video game.

Sixth Grade – Two-Variable Relationships

In math class, your student is about to explore two-variable relationships. To master this skill, they will build on their knowledge of numerical patterns from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Analyze comparisons to determine if the relationships are the result of additive or multiplicative patterns.

  Example: Identify the pattern, and write the rule in the form of $y = ax$ or $y = x + a$. Complete the table.

x	***y***
2	6
4	12
6	18
7	21
12	36

  $3x = y$ (multiplicative pattern)

  Students find the pattern by looking at the relationship between x and y. In this table, x times 3 equals y. Always check the pattern for every value given.

Example: Rita went to the store to purchase some notebooks. For every 3 notebooks she purchases, she will receive 2 free notebooks.

Identify the pattern, and write the rule in the form of $y = ax$ or $y = x + a$.

Complete the table.

x	3	6	9	12	15
y	5	8	11	14	17

$x + 2 = y$ (additive pattern)

- Understand, identify, and define the differences between independent variables and dependent variables.

  Example: At Laura's craft booth, she makes $5 for every bracelet she sells. Write an equation to find how much money Laura makes when she sells bracelets. Let x represent how many bracelets Laura sells, and let y represent the total money earned.
  $y = 5x$

  Identify the independent and dependent variable.
  The dependent variable is the number that is affected when you change the independent variable—it *depends* on the independent variable. In this situation, y is the total money earned and depends on x, on how many bracelets are sold.

- Recognize that a change in one variable results in a change in the other variable. Students will use tables, graphs, and equations to represent and analyze relationships.

  Example: Which table correctly represents $y = 5x$?

○

x	3	4.5	8	12
y	2	3	4	8

○

x	1	4	5	10
y	15	60	70	120

○

x	8	12	14	16
y	2	3	4	5

●

x	1	2	5	7
y	5	10	25	35

  The last one is correct because every x value multiplied by 5 results in the y value shown on the table.

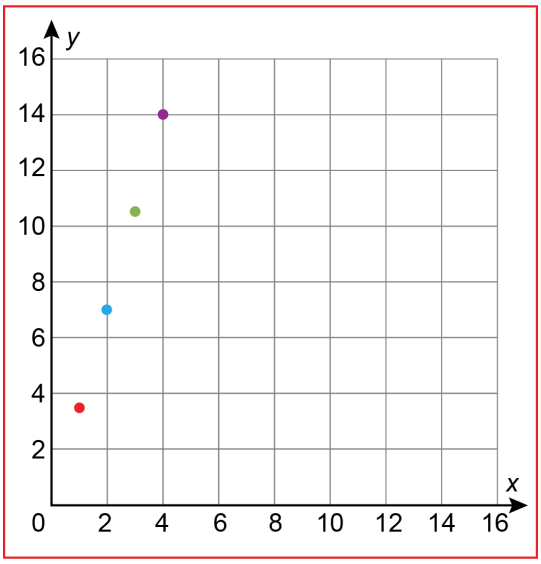
Example: Each sandwich at the deli counter costs $3.50.

Part A. Complete the information within the table to represent the amount of money, *y*, that the deli collects for every sandwich, *x*, sold.

x	*y*
1	$3.50
2	$7
3	$10.50
4	$14

Part B. Write an equation using the variables *x* and *y* to help the deli know how much money they will collect at the end of the day.
$y = \$3.50x$

Part C. Graph the information from the table.



While working with your student at home, you may find the following vocabulary terms helpful in your communication about two-variable relationships. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **addition:** the process of joining two or more numbers (or things) together to make a new total
  - **additive comparison:** shows the relationship between two amounts by showing how much more or less one is compared to the other; shows the difference between two quantities
  - **dependent variable (*y*):** a variable, often *y*, that relies on the value of the independent variable
  - **equation:** a mathematical statement that shows that two expressions are equal to each other; a mathematical sentence that uses numbers, one or more operation symbols, and an equal sign
  - **graph:** a visual representation of data
  - **independent variable (*x*):** a variable, often *x*, that does not rely on the value of another variable
  - **multiplication:** a mathematical operation consisting of obtaining a product or result by joining equal groups, repeated addition, or forming arrays
  - **multiplicative comparison:** a situation in which one quantity is a certain number of times as large as another quantity; a specified number is multiplied by another number to result in a greater or lesser quantity
  - **relationship:** the rule in a pattern
  - **table:** a chart that uses rows and columns to organize information

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Two-variable relationships are used all around our everyday lives. Chat about where you use two-variable relationships in your everyday life. Below are a few examples:

- ★ Two-variable equations can be useful in real life. Suppose you go tubing. The tube rental is $5 plus $2 per hour. You could write that as the equation $y = 5 + 2x$. If you would like to rent the tube for 6 hours, how much will it cost? If you only have $16 for rentals, how long can you keep the tube? Work through the problem with your student. Encourage your student to come up with other similar real-life examples.

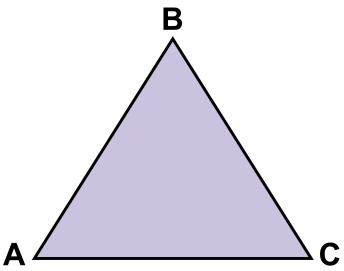
- ★ Two-variable equations can help with budgeting. You can predict the total cost of school lunches for a month if you know how many days of school are in the month and how much the lunch costs. The monthly cost is dependent on the number of days in the month, so the monthly cost is the dependent variable. Brainstorm some situations that involve dependent and independent variables with your student. Identify each variable as dependent or independent.

Sixth Grade – Triangle Properties

In math class, your student is about to explore triangle properties. To master this skill, they will build on their knowledge of classifying triangles by their angles and side lengths from fifth grade. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

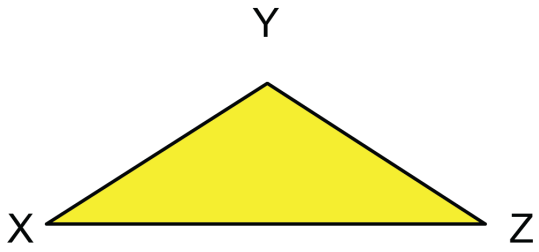
- Understand that the sum of the three angles in a triangle equals 180°. Students will solve problems, draw triangles when given specific angle measures, and determine missing angle measures.

  Example: ΔABC is an equilateral triangle.
  What are the measures of each angle? Explain your reasoning.



  The measure of each angle is 60°. An equilateral triangle has 3 equal sides, which means it also has 3 equal angles. The sum of the angles of a triangle is 180°; 180 ÷ 3 = 60, so each angle is 60°.

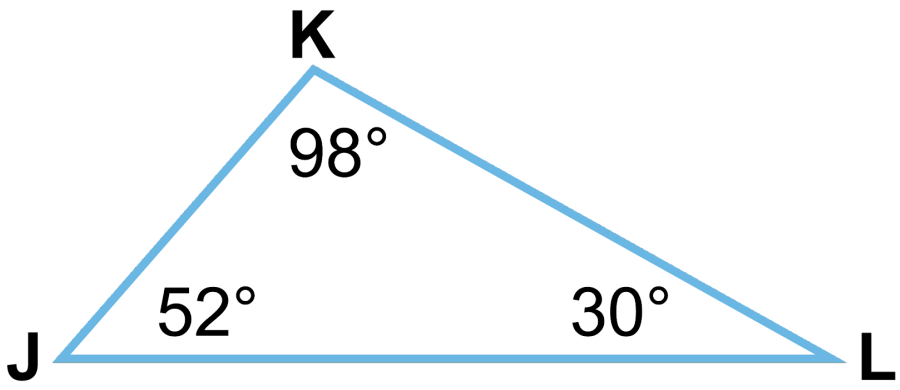
Example: ΔXYZ is an isosceles triangle; ∠Y is 110°. What are the measures of ∠X and ∠Z?



The measures of ∠X and ∠Z are both 35°.
If one angle is 110°, the other 2 angles together will be 70° because 180 – 110 = 70. An isosceles triangle has 2 congruent sides, which means it has 2 congruent angles. If the congruent angles were ∠Y and one of the other angles, the 2 angles would add up to 220°, which is more than the sum of 3 angles in a triangle. That means that the 2 congruent angles must be ∠X and ∠Z. Divide 70 by 2 to get the measures of ∠X and ∠Z, which are both 35°.

- Understand the relationship between the side lengths and angles of a triangle. The shortest side of a triangle is always opposite the smallest angle of the triangle. The longest side is always opposite the largest angle.

  Example: ΔJKL has side lengths of 7 cm, 9 cm, and 4.5 cm. Use the relationship between the sides and angles of a triangle to match each side with its correct length.



JL = _____

JK = _____

KL = _____

JL = 9 cm The longest side is opposite the largest angle.
JK = 4.5 cm The shortest side is opposite the smallest angle.
KL = 7 cm The midsize side is opposite the midsize angle.

- Determine when three sides can form a triangle. The triangle inequality theorem states that the sum of any two side lengths of a triangle will always be greater than the third side length.

  Example: Determine if these side lengths can make a triangle, and explain your answer.

  4 cm, 9 cm, 3 cm
  No. The sum of any two sides of a triangle will always be greater than the third side length. $4 + 3 = 7$ and $7 < 9$, so these sides cannot make a triangle.

  5 in., 5 in., 4 in.
  Yes. The sum of any two sides of a triangle will always be greater than the third side length. $5 + 5 = 10$, $10 > 4$ and $5 + 4 = 9$ and $9 > 5$, so these sides can make a triangle.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about triangle properties. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **triangle:** a polygon with exactly three straight sides and three angles
    - **side:** the line segment that connects two vertices in a figure
    - **property:** any attribute or characteristic
    - **length:** the measure of an object from end to end; the distance from one end to the other end of an object
    - **acute angle:** an angle that measures less than 90°
    - **obtuse angle:** an angle that measures greater than 90°
    - **right angle:** an angle that measures 90°
    - **adjacent angles:** two angles that have the same vertex and a common array but no interior common points
    - **interior angle:** an angle inside a shape, between two joined sides

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Triangle properties are used all around our everyday lives. Chat about where you use triangle properties in your everyday life. Below are a few examples:

- ★ In some buildings and towers, triangles are part of the design. Look for examples of triangles being used in architecture in your area. Check out buildings with triangles from all over the world on the internet. Do the triangles improve the aesthetics of the buildings?

- ★ You already know that first responders use ladders for some rescues. Use a ruler and the wall to demonstrate a rescue operation. Point out the triangle that is created. Ask your student to make the ladder reach a higher or lower elevation. How does changing the elevation impact the rescue? Which other side of the triangle changes when the height changes?

Sixth Grade – Area and Volume

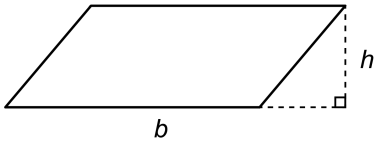
In math class, your student is about to explore area and volume. To master these skills, students will build on their knowledge of perimeter, area, and volume. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

Area

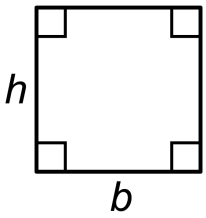
- You can find the area of 2-D figures by composing, decomposing, and rearranging the figures. You must identify the bases and heights of parallelograms in order to derive and apply formulas. Any side of a parallelogram can be the base, but the base and height must be perpendicular. The formula for the area of a parallelogram is $A = bh$, and the formula for the area of a triangle is $A = \frac{bh}{2}$.

Examples: Which of the following parallelograms is labeled incorrectly?

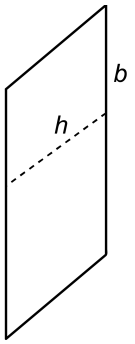
A.



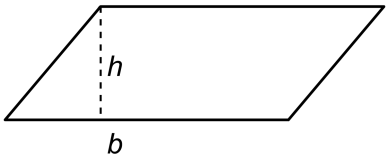
B.



C.



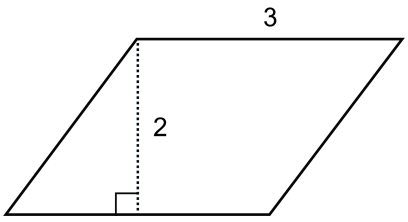
D.



The correct answer is C. This is not labeled correctly because the base and height are not perpendicular.

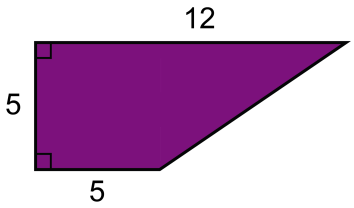
Any side of a parallelogram can be a base, but the base and its corresponding height must be perpendicular to one another. Sometimes the height is drawn outside of the parallelogram. The height is the shortest distance from a base to its opposite side.

What is the area of this parallelogram?



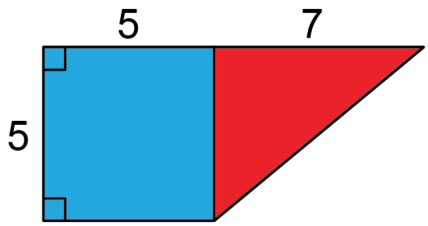
For a parallelogram, $A = bh$. So, $A = 2 \times 3 = 6$; 6 square units.

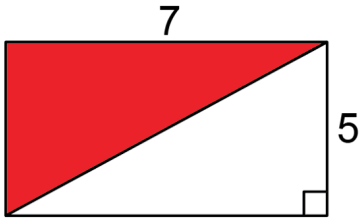
What is the area of this trapezoid?



Area of a square: $A = 5 \times 5 = 25$; 25 square units
Area of a triangle: $A = \frac{1}{2}(7 \times 5) = 17.5$; 17.5 square units
A = 25 square units + 17.5 square units
A = 42.5 square units

Apply the formula for the area of a square and the area of a triangle to find the areas of each decomposed part of the parallelogram. The area of the square would be 25 square units, and the area of the triangle would be 17.5 square units. Add these two parts together to get the total area of the parallelogram, 42.5 square units. The images show the decomposition and how students may determine the area.

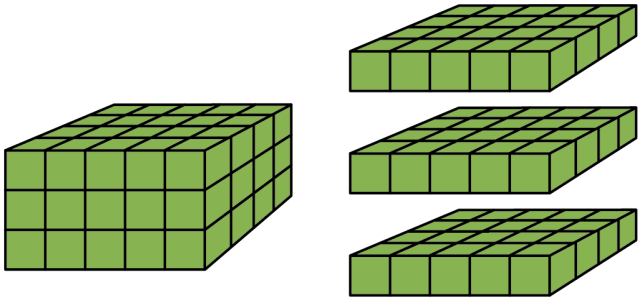




Volume

- Find the volume of right rectangular prisms by applying formulas. Shapes may have side lengths in whole numbers and rational numbers.

  You can find the volume of right rectangular prisms by packing them with unit cubes. A unit cube has a side length of one. The first layer of the prism is called the base. You can multiply the area of the base by the height to determine the volume. The volume formula is $V = Bh$. For example, you can see that this prism has a base of 5 units by 4 units, and its area is 5×4, or 20 square units. There are 3 layers, and $20 \times 3 = 60$, so the volume is 60 cubic units.



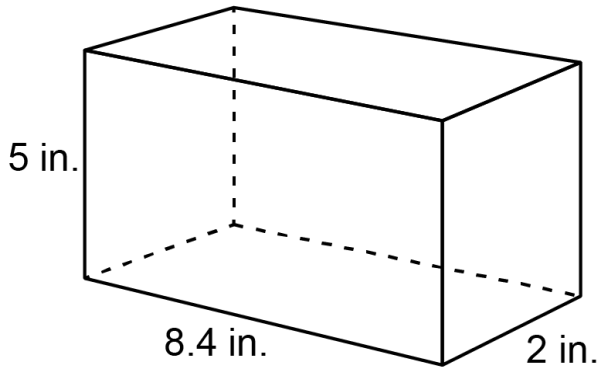
- The volume of a right rectangular prism is also the product of its three dimensions, $V = lwh$. In the example featured above, the length is 5, the width is 4, and the height is 3. $5 \times 4 \times 3 = 60$ cubic units
- Students in sixth grade determine the volume of right rectangular prisms with side lengths that include rational numbers.

  Example: What is the volume of a cube that is 2 units across?

  A. 6 cubic units
  B. 8 cubic units
  C. 12 cubic units
  D. 4 cubic units

  The correct answer is B. In a cube, all 3 dimensions are the same, and $2 \times 2 \times 2 = 8$ cubic units.

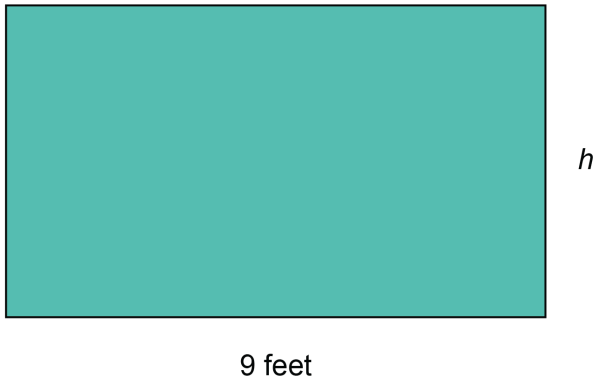
Example: Find the volume of the rectangular prism below.



$V = Bh$ or $V = (16.8)(5)$
$V = (16.8)(5) = 84$ cubic inches

Area and Volume Equations

Example: The area of the rectangle below is 54 square feet. Find the height of the rectangle.



$A = bh$
54 square feet $= 9h$
$h = 6$ feet

While working with your student at home, you may find the following vocabulary terms helpful in your communication about area and volume. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **area:** the number of square units it takes to cover the two-dimensional surface of an object
  - **base:** the surface a solid object stands on
  - **dimension:** something measurable (such as length, width, and height)
  - **equation:** a mathematical statement that shows that two expressions are equal to each other; a mathematical sentence that uses numbers, one or more operation symbols, and an equal sign
  - **formula:** a mathematical statement or rule written with symbols
  - **height:** the perpendicular distance from a vertex to the opposite side of a figure
  - **parallelogram:** a quadrilateral with two sets of parallel sides
  - **problem:** a question to solve
  - **rational number:** a number that can be written as a fraction of integers a/b, where $b \neq 0$; a number that can be written as a ratio using two integers
  - **rectangle:** a parallelogram with opposite equal sides and four right angles
  - **rectangular prism:** a 3-D shape with two parallel and congruent rectangular or square bases connected by parallelogram faces
  - **solution:** any number that makes an equation true
  - **trapezoid:** a quadrilateral with one set of parallel sides
  - **triangle:** a polygon with exactly three straight sides and three angles
  - **volume:** the amount of space an object occupies; the measured amount of cubic units that fit inside a solid figure

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Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Area and volume are used all around our everyday lives. Chat about where you use area and volume in your everyday life. Below are a few examples:

- ★ Look at your backyard with your child. Talk about how the edge, possibly marked with a fenceline, is the perimeter. The area is the ground, any decking, etc. Does a backyard have a volume? That's fun to think about. After all, at what height does your backyard end? Volume is a measurement that requires length, width, and height. Identify some common items that have volume, such as an ice chest or suitcase.

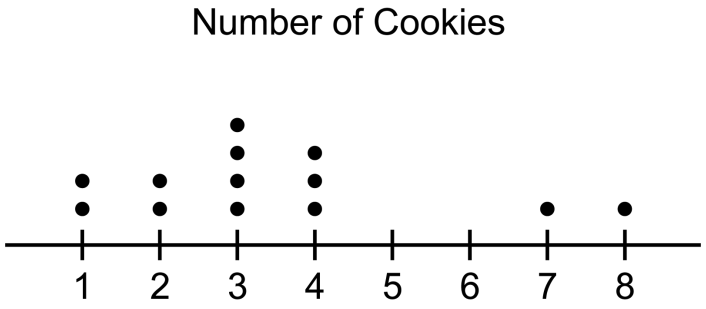
- ★ Did you know that the capacity of a refrigerator is measured in cubic feet? Try measuring the three dimensions (width, length, and height) of the refrigerator and determining its volume. Talk about why volume is an important factor when purchasing a refrigerator.

Sixth Grade – Represent and Interpret Data

In math class, your student is about to explore representing and interpreting data. To master this skill, they will build on their knowledge of analyzing data from previous grades. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Understand how numeric data (mean, median, mode, range, and interquartile range) is key to discussing and analyzing the shape of the data distribution.

  Example: This dot plot shows the number of cookies eaten by students in Mr. Williams's class in the last week.



  If all the cookies were shared evenly between every student, how many cookies would each student have eaten, and which mathematical measure does this represent? Explain your reasoning.

  Each student would have eaten approximately 3.5 cookies if they were shared equally.
  (1 + 1 + 2 + 2 + 3 + 3 + 3 + 3 + 4 + 4 + 4 + 7 + 8) ÷ 13 = 3.5
  This value represents the mean or average amount of cookies eaten by the students.

What is the middle value on this dot plot, and which mathematical measure does this represent? Explain your reasoning.

The middle value is 3, and this measures the median. I can tell that 3 cookies is the middle value because there are 5 dots to the right of 3, 4 dots that represent 3, and 4 dots to the left of 3.

Mr. Williams wants to know the typical amount of cookies that his students ate last week. Do you think that the mean or median is a better measure of the center? Explain your reasoning.

I think the median provides a better description of the typical amount of cookies the students ate last week. The shape of the graph shows that the majority of students ate 4 cookies or fewer, and most (the mode) of the students ate 3 cookies. The reason why the mean results in greater value than the median is because only two students ate more than 6 cookies. Students who ate 7 and 8 cookies are outliers because they are much greater values than all the others in this data set.

- Discuss and understand the concepts of center, spread, and overall shape of given data.

  Example: The list below shows the scores from Mrs. Tao's science test. What is the center, spread, and shape of the data? Explain your answer.

  50, 58, 64, 68, 70, 74, 76, 82, 82, 82, 86, 86, 86, 87, 89, 90, 90, 90, 90, 90, 92, 94, 95, 98

Stem	Leaf
5	0 8
6	4 8
7	0 4 6
8	2 2 2 6 6 6 7 9
9	0 0 0 0 0 2 4 5 8

  The distribution of the data is skewed to the left; the center of the data is at 86. There are 24 total numbers in the data set. The number 86 is the median.

- Match graphs to explanations and/or analysis of the data. Students will determine the best graph for a set of data. They will represent and interpret data on stem-and-leaf plots, box plots, dot plots, and histograms.

  Stem-and-leaf plot: In a stem-and-leaf plot, the stem typically is the first digit of the data set.

  Example: The stem-and-leaf plot below shows grades from a science test. The number in the tens place makes up the stem, and the number in the ones place represents the leaf.

Stem	Leaf
5	0 8 9
6	4 8
7	0 4 6
8	2 2 2 6 6 6
9	0 0 0 0 0 2 4 6 6 8

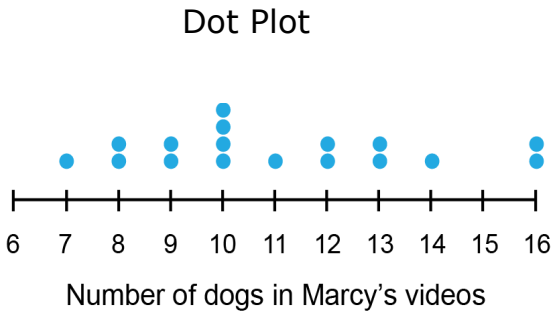
  Which statement is true?

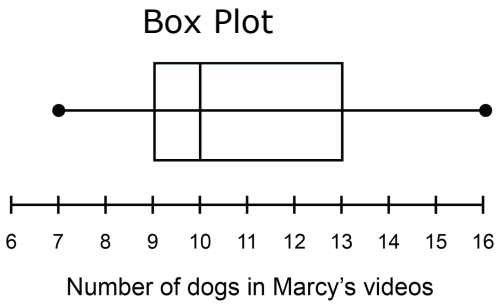
  A. Ten students scored 75 or above.
  B. More than half of the students scored 80% or above.
  C. Seven students scored less than 80%.
  D. Five students scored at least 90.

  Answer choice B is correct. There are 24 students' scores listed in the stem-and-leaf plot; 16 students out of 24 students scored 80 or above. About 70% of the class scored 80% or above.

Dot plot and box plot: Dot plots are used for numeric data. Box plots do not show each individual data point but provide a five-number summary of a data distribution.

Example: Marcy watched several videos of dogs. Then, she created a dot plot and a box plot to display the number of dogs in each video. Which display allows us to see that the mode is 10? Explain your reasoning.

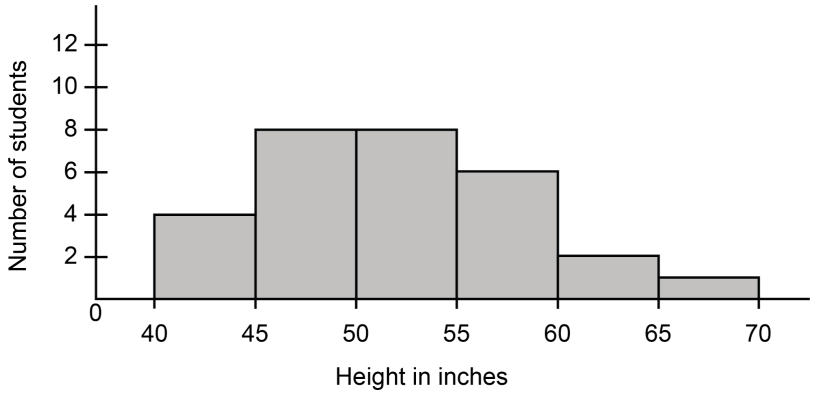




Dot plots show the mode clearly; box plots show the median clearly.

Histogram: Histograms display data along a number line like a dot plot. But, a histogram is organized to show the frequencies of ranges of values, rather than individual data points.

Example: The heights of students in a sixth-grade class at Newbury Elementary School are shown on the histogram.



Which statements are true? Select all correct answers.

A. It is impossible to tell the exact height of the tallest sixth grader.
B. The majority of students have a height between 45 and 54 inches.
C. Four students have a height of 45 inches or less.
D. There are no outliers in the data set.

Answer choices A and B are correct. We know that the tallest person has a height that lies between 65 and 69 inches, but we don't know what the exact height is. We can see that most heights are between 45 and 55 inches because the tallest bars are next to one another and fall within that range.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about representing and interpreting data. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **asymmetrical:** having two sides or halves that are not the same
  - **box plot/box-and-whisker plot:** a diagram that shows the five-number summary of a distribution
  - **data:** a collection of organized facts, usually in numerical form, words, measurements, or descriptions
  - **data distribution:** a function or a listing that shows all the possible values (or intervals) of the data
  - **dot plot (line plot):** a method of visually displaying a distribution of data values, where each value is shown as a dot or mark above a number line
  - **histogram:** a special type of bar graph with numerical intervals as its labels
  - **mean (average):** the average of a set of numbers calculated by finding the sum of all data and dividing by the number of data values
  - **measure of center:** a single value used to represent or summarize a collection of data; three commonly used types are mode, median, and mean; also called measures of central tendency or measures of average
  - **measure of spread:** measures of how data is spread out, usually including range, interquartile range, variance, and standard deviation
  - **median:** the middle number of a set of numbers when the numbers are arranged from least to greatest, or the mean of the two middle numbers when the set has two middle numbers
  - **mode:** the number or value that appears the most frequently in a data set
  - **outlier:** a number in a set of data that is much larger or smaller than other numbers in the set
  - **quartile:** the values that divide a list of numbers into quarters
  - **range:** the difference between the maximum and minimum values within a data set
  - **shape:** a description of the type of graph seen, as symmetrical, peaks, skewed, or uniform
  - **skewed data:** when data on a graph is not symmetrical; when the graphed data shows a tail on one side or the other
  - **spread:** a measure of how far the numbers in a data set are from the mean or median; including the commonly used types range and quartiles; also known as measures of variation or dispersion

- **stem-and-leaf plot:** a plot where each data value is split into a “leaf” (usually the last digit) and a “stem” (the other digits)
- **symmetrical:** the relationship between objects that are the same size and shape after a flip, slide, or turn

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Representing and interpreting data is used all around our everyday lives. Chat about where you represent or interpret data in your everyday life. Below are a few examples:

- ★ Thanks to the internet, data is just a click away. It's a real challenge to sort out what data is necessary and what data is accurate. Weather data can be helpful in making plans, but it is only a very good prediction. Ratings, reviews, and statistics can be carefully selected or even falsified. Talk with your student about the ways data can be skewed. Multiple resources are always needed when verifying data.

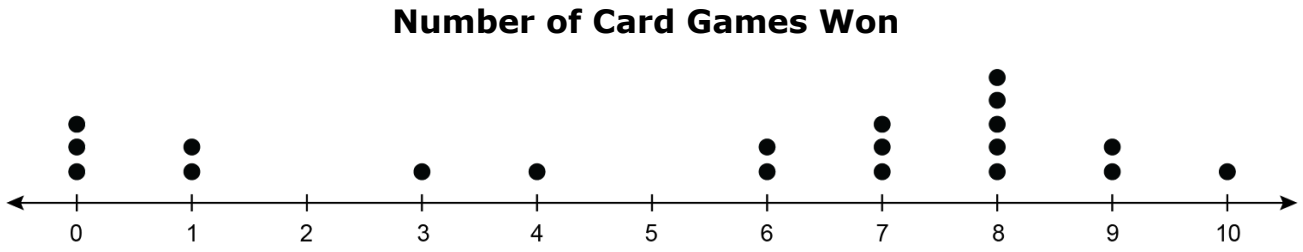
- ★ Do you know how much of your personal data might be available on the internet? Marketers buy your data and then use it to target certain audiences for their products. Why would a company pay for your data? Talk about the negative and positive aspects of online data tracking.

Sixth Grade – Measures of Data

In math class, your student is about to explore measures of data. To master this skill, they will build on their knowledge of analyzing data developed for many years. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Determine numerical summaries of data by calculating the mean, median, range, and interquartile range (IQR) of numeric data. Students will describe the shape of a data distribution using vocabulary such as skewed, left-skewed, right-skewed, symmetrical, and uniform.

  Example: The dot plot shows the number of card games won by each student in Mr. Chen's class. Describe the center, shape, and spread of the data in the dot plot.



Center: mean = 5.5; median = 7

Shape: The data is skewed to the left.

Spread: range = 10; Q1 = 2 and Q3 = 8

Interquartile range: 8 – 2 = 6

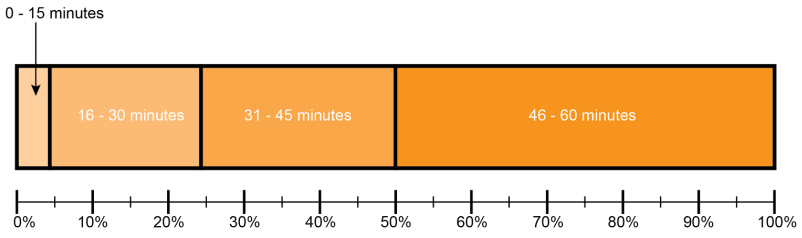
- Summarize categorical data with numerical and graphical summaries, including the mode, the percent of values in each category (relative frequency table), and the percent bar graph. Use these summaries to describe the data distribution.

  Example: This frequency table shows the amount of time some students spent doing homework. Use it to determine the percentage of students in each category.

Time Spent on Homework	
Minutes	**Students**
0–15	2
16–30	10
31–45	13
46–60	25

A total of 50 students are represented in the data. Divide the number of students by 50, and convert the decimal to a percent to determine the percentage of students in each category. The percentages should add to 100 and can be represented graphically using a percent bar graph.

Time Spent on Homework	
Minutes	**Students**
0–15	$2 \div 50 = 0.04 = 4\%$
16–30	$10 \div 50 = 0.2 = 20\%$
31–45	$13 \div 50 = 0.26 = 26\%$
46–60	$25 \div 50 = 0.50 = 50\%$



- Distinguish between situations that yield data with and without variability.

  Example: Identify the situations in the table below that yield data with variability and without variability.

Real-World Situations	Variability in Data
How much did the beef taco cost at Taco City?	No variability
How much are tacos?	Variability
Do students at Spring Valley Middle School do well on math tests?	Variability
How many students passed last Friday's math test in Ms. Azeem's 4th-period class?	No variability

While working with your student at home, you may find the following vocabulary terms helpful in your communication about measures of data. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
  - **asymmetrical:** having two sides or halves that are not the same
  - **categorical data:** a type of data that can be divided into groups
  - **data:** a collection of organized facts, usually in numerical form, words, measurements, or descriptions
  - **dot plot (line plot):** a method of visually displaying a distribution of data values where each data value is shown as a dot or mark above a number line
  - **histogram:** a special type of bar graph with numerical intervals as its labels
  - **interquartile range (IQR):** the difference between the upper quartile (Q3) and the lower quartile (Q1)
  - **mean (average):** the average of a set of numbers calculated by finding the sum of all data and dividing by the number of data values
  - **measure of center:** a single value used to represent or summarize a collection of data; three commonly used types are mode, median, and mean; also called measures of central tendency or measures of average
  - **measure of spread:** measures of how data is spread out, usually including range, interquartile range, variance, and standard deviation
  - **median:** the middle number of a set of numbers when the numbers are arranged from least to greatest, or the mean of the two middle numbers when the set has two middle numbers
  - **mode:** the number or value that appears the most frequently in a data set
  - **percent bar graph:** compares the percentage that each item contributes to an entire category
  - **quartiles:** the values that divide a list of numbers into quarters
  - **range:** the difference between the maximum and minimum values within a data set
  - **relative frequency table:** a table that shows the popularity or mode of a certain type of data based on the population sampled
  - **shape:** a description of the type of graph seen, as symmetrical, peaks, skewed, or uniform
  - **skewed data:** when data on a graph is not symmetrical; when the graphed data shows a tail on one side or the other
  - **spread:** a measure of how far the numbers in a data set are from the mean or median; including the commonly used types range and quartiles; also known as measures of variation or dispersion

- **symmetrical:** the relationship between objects that are the same size and shape after a flip, slide, or turn
- **variability:** how spread out data is

We will do many explorations in class to help your child learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Measures of data are used all around our everyday lives. Chat about where you use measures of data in your everyday life. Below are a few examples:

- ★ Look at some racing data from an Olympic event, like swimming, skiing, or track. Talk about any part of the data that stands out, like how close the scores are between the fastest and slowest competitors. Is the range small or large? How might the range change if you and your child joined the competition?

- ★ Talk with your student about grades. Imagine a project where the class mean was 72. What does the mean tell you? Is it possible to know if the low score is because the project was really hard from only the mean? What if you found out a lot of students did not complete the project and scored a zero? Would that change your perspective?

Sixth Grade – Banking and Credit

In math class, your student is about to explore banking and credit. To master this skill, they will build on their knowledge of financial literacy from previous grades. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Understand checking account fees and features and understand how debit card fees and usage is connected to checking accounts.

  Example: The table below shows the fees for certain features at two banks.

	Best Bank	Smith Financial Credit Union
Checks	$0.50 per check	Free
ATM Transactions (nonbank ATM)	$1.50 per withdrawal	$3.00 per withdrawal
ATM Transactions (bank ATM)	Free	Free
Debit Cards	$2.50 per month	$0.50 per withdrawal

  Part A. Gabriella is shopping for a bank. She does not write checks or use the ATM. She uses her debit card 15 times each month. Which bank offers the best deal?

  Best Bank is $2.50 each month; Smith Financial Credit Union is $0.50 × 15 = $7.50. Best Bank would be the best option for Gabriella.

  Part B. Sai is shopping for a bank. He writes checks often and uses the bank's ATM. He uses his debit card 3 times each month. Which bank offers the best deal?

  Smith Financial Credit Union is the best option because checks are free, ATM transactions (bank) are free, and debit cards are $0.50 per withdrawal, $0.50 × 3 = $1.50; $1.50 < $2.50.

- Identify withdrawals and deposits, record them in a checkbook register, and balance a checkbook register.

  Example: Use the checkbook register to accurately record two additional transactions.
  - Utility bill payment of $197.45 on January 10
  - Paycheck of $1,412.66 on January 14
  - Transfer of $260 on January 17 to savings account
  - Deposit of $50 on January 18

Date	Description	Debit	Credit	Balance
1/7	Initial Deposit		1,700.00	1,700.00
1/8	Insurance	354.16		1,345.84
1/10	Utility bill	197.45		1,148.39
1/14	Paycheck		1,412.66	2,561.05
1/17	Transfer to savings account	260		2,301.05
1/18	Deposit		50	2,351.05

- List the features of debit and credit cards. Students will compare and contrast debit and credit cards.

  Example: Identify each key fact as a fact about debit cards or credit cards.

Facts	Debit Card or Credit Card
A form of debt	Credit card
Money comes instantly out of your bank account	Debit card
May cause extra fees in your bank account	Debit card
May cause extra expenses due to interest rates	Credit card
Usually provides the most fraud protection	Credit card
Usually requires a PIN number	Debit card
Easy access to cash	Debit card
May include a yearly fee	Credit card

  Example: Oliver wants to purchase a smartphone that costs $1,000. He has enough money in his account to purchase the smartphone but he is unsure if he wants to make a purchase using funds in his account. Should he use a debit card or a credit card? Explain your reasoning.

  Since he has enough money in his account, he should use the debit card. Credit cards charge interest, so by using the debit card, he would not have to pay interest on the purchase.

- Describe information in a credit report, including the length of time information remains on credit reports, how credit reports are used, and the consumer activities that create both positive and negative credit histories.

  Example: Identify if the activity listed will have a positive or negative effect on a person's credit.

Activity	Effect on Credit Report
Mortgage paid on time	Positive
Paid credit card balance on time	Positive
Missed rent payments	Negative
Late credit card payments	Negative
Foreclosure	Negative

Example: Credit histories for Taio and Hannah are given below.

Taio	Hannah
• Monthly income: $3,400 • Time at present job: 8 months • Monthly debt payments: $650 on car loan, $190 on credit card, $290 on student loan • Late payments: 4 times on credit card	• Monthly income: $2,350 • Time at present job: 4 years • Monthly debt payments: $50 on credit card • Late payments: 0 times
Credit score: 530	Credit score: 780

If Taio and Hannah are interested in buying a home, why would they need to be concerned about credit history?

Banks and other lenders use this information to decide whether they should loan you money for large purchases. Hannah has good credit history and Taio has poor credit history. Since Hannah has a good credit history, she will be able to take advantage of low interest rates on a home loan. Taio will most likely not be approved for a home loan.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about banking and credit. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **bankruptcy:** a legal proceeding involving a person or business that is unable to repay their outstanding debts
    - **borrower:** a person or company that has received money from another party with the agreement that the money will be repaid
    - **checking account:** an account at a bank against which checks can be drawn by the account depositor
    - **credit card:** a card issued by a bank, business, etc., allowing the holder to purchase goods or services on credit
    - **credit report:** a summary of how a person has handled their credit accounts
    - **debit card:** a card issued by a bank allowing the holder to transfer money electronically to another bank account when making a purchase
    - **deposit:** a sum of money that is put into a bank account
    - **interest:** money that is a percentage of an original amount typically owed as part of a debt
    - **lender:** a person or organization that lets others borrow money and expects to get repaid
    - **loan:** money given to another party in exchange for repayment of the loan principal amount plus interest
    - **transfer:** the movement of assets, monetary funds, and/or ownership rights from one account to another
    - **withdrawal:** a sum of money that is taken out of a bank account

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Banking and credit are used all around our everyday lives. Chat about where you use banking and credit in your everyday life. Below are a few examples:

- ★ Money management is a math topic that students are often very motivated to understand. Look up a fake checking account online or go look through yours with your child. Explain how the money flow happens. Talk about your financial goals and explain that careful planning is important.

- ★ Credit reports contain a lot of personal information. Look up a sample credit report, or perhaps your own. Point out things that get in the way of good credit and how those things can be avoided.

Sixth Grade – Future Planning

In math class, your student is about to explore future planning. To master this skill, they will build on their knowledge of financial literacy. As your student extends their knowledge of this concept throughout sixth grade, they will learn the following concepts:

- Explain various methods to pay for college. Scholarships, grants, loans, savings, and work-study are all ways to pay for higher education.

  Example: Fill in the table to explain and analyze two ways to pay for college.

Payment	Advantages	Disadvantages
Savings	No debt; account earns interest	Difficult to save enough money
Scholarship	Does not need to be repaid	Hard to qualify for; can be revoked
Grant	Does not need to be repaid	Competitive and hard to obtain
Student loan	Helps to build credit	Must pay back with interest and must meet requirements
Work-study	Earn money while attending school	Often limited hours; must meet requirements

  Example: One year of classes at the University of Houston costs $10,000. Marcella has received a grant that will pay $1,000 and a scholarship for $5,000. She wants to get a job to pay 15% of the remainder of the costs and hopes to get a loan to cover the rest of the costs for one year. How much does she need to earn on his job, and how much will she need to borrow?

  Total cost: $10,000; grant + scholarship = $6,000; $10,000 – $6,000 = $4,000

  There is $4,000 remaining.
  Job: $4,000 × 0.15 = $600; $4,000 – $600 = $3,400

  She would need to borrow $3,400 in student loans.

- Research jobs requiring various levels of education, and calculate the effects of the different annual salaries on lifetime income.

  Example: The table shows the annual income for two different construction jobs. Fill in the table to compare the long-term income associated with different salaries. How much more will a civil engineer earn than a construction manager over 30 years?

	Construction Manager	Civil Engineer
Description	Supervise construction projects, including planning, managing employees, and sticking to a budget	Design, build, and supervise infrastructure projects and systems
Educational requirements	Associate's degree	Bachelor's degree
Median income	$83,860 per year, $40.32 per hour	$87,060 per year, $41.86 per hour
Other facts	Many are self-employed.	Most work full-time.

Job	10-Year Total Earnings	20-Year Total Earnings	30-Year Total Earnings
Construction manager	$656, 570	$1,313,140	$1,969,710
Civil engineer	$870,600	$1,741,200	$2,611,800

The civil engineer earns $642,090 more than the construction manager over 30 years.

While working with your student at home, you may find the following vocabulary terms helpful in your communication about future planning. These are terms your student will be encouraged to use throughout our explorations and during our math chats, which are short, whole-group discussions at the conclusion of each activity.

- **Terms to Know**
    - **grant:** an amount of money given, usually by a government or nonprofit organization, to fund certain projects
    - **income:** money received or earned on a regular basis
    - **occupation:** a job or profession
    - **salary:** a fixed compensation periodically paid for regular work or services
    - **savings:** income not spent, or deferred consumption
    - **scholarship**: an award of financial aid for a student to further their education
    - **student loan:** money borrowed from the federal government or a private lender to help pay for college costs, like tuition, supplies, books, and living expenses
    - **work-study:** a program that offers students part-time employment in exchange for financial aid

We will do many explorations in class to help your student learn these concepts from firsthand experiences. Encourage your student to share these experiences with you and to teach you what he or she has learned. Ask your student to identify examples of what he or she is learning in everyday life, or use the examples on the attached page as a starting point.

Thank you for your support as your student begins this new learning adventure.

Math outside the Classroom!

Future planning is used all around our everyday lives. Chat about where you use future planning in your everyday life. Below are a few examples:

- ★ Use the internet to locate tuition costs for higher education at an institution that your student has shown an interest in. Start a conversation about options for paying for higher education. Take this time to also discuss the admissions requirements and motivate your student to be a dedicated student.

- ★ Do an internet search for current average salaries of some careers that interest your student. Compare the salaries, and talk about why some salaries are higher than others. Don’t limit your research to salaries. Find out about other job perks like job security, time off, or retirement benefits.