MATHEMATICS

In grade 8, your child will focus on three critical areas. The first is formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations. Your child will also focus on grasping the concept of a function and using functions to describe quantitative relationships. The third focus area is analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

Activities in these areas include:

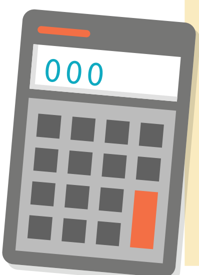
- Writing and evaluating expressions containing exponents.
- Finding the square roots and cube roots of numbers.
- Finding the distance between two points using the distance formula.
- Finding parts of a right triangle using the Pythagorean Theorem.
- Evaluating expressions involving addition, subtraction, multiplication, or division and expressing the answer in scientific notation.
- Determining whether the relationship between two quantities is linear.
- Finding the slope of a line using a table, graph, equation, diagram, and verbal description.
- Classifying equations by number of solutions.
- Determining functions from nonnumerical data.
- Graphing functions in the coordinate plane.
- Using the Pythagorean Theorem to find an unknown side length of a right triangle and to calculate various dimensions of right triangles found in a three-dimensional figure.
- Perform a series of transformations and/or dilations to a figure.

Your child can understand that numbers that are not rational are called irrational.

- Write a fraction or mixed number as a repeating decimal by showing, filling in, or otherwise producing the steps of long division.
- Write a repeating decimal as a fraction or mixed number in simplest form.
- Name all sets of numbers to which a given real number belongs.
- Convert a repeating decimal into a rational number.

HELP AT HOME

- Have your child enter different fractions into a calculator and determine if they are rational or irrational numbers.
- Have your child solve this problem: 1÷ 3. Your child will find that when he solves this problem, the remainder as a fraction will be 1/3. However, if he writes the remainder as a decimal he will discover the decimal, 0.3, repeats. This is a rational number.
- Have your child solve 2 ÷ 7. Your child will find the remainder can be written as a fraction, but not a terminating decimal because 2/7 is an irrational number.



VOCABULARY

RATIONAL NUMBERS are numbers that can be written as a fraction. They are terminating or repeating decimals.

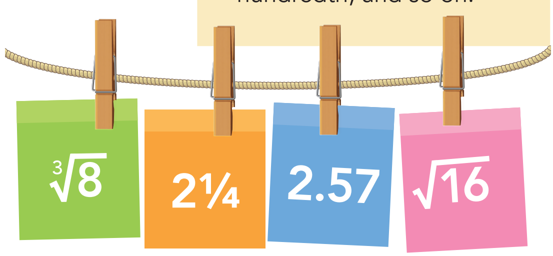
IRRATIONAL NUMBERS are numbers that cannot be written as a fraction. They are decimals that go on and on with no repeating pattern.

Your child can use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

- Find the square and cube roots of numbers.
- Estimate square roots and cube roots to the nearest integer using perfect squares and perfect cubes.
- Estimate square roots and cube roots to an appropriate approximation by truncating, or dropping, the digits after the first decimal place, then after the second decimal place, and so on.
- Compare and order rational and irrational numbers using a number line.
- Use the estimated value of an irrational number to evaluate an expression.

HELP AT HOME

- Make a clothesline out of string. Write various numbers (e.g., whole, fractions, decimals, square roots, cubed roots) on cards. Let your child put the cards on the clothesline in the correct order from least to greatest.
- Ask your child which whole number each is closest to on the clothesline.
- Using a calculator, have your child determine the square root and cube root of numbers. Have him first round the answer to the nearest tenth, then nearest hundredth, and so on.



Your child can understand and apply the properties of integer exponents to generate equivalent numerical expressions.

- Write an expression using exponents.
- Evaluate an expression containing exponents.
- Simplify expressions involving one, two, or three properties using the Laws of Exponents.
- Write an expression using a positive exponent.
- Write a fraction as an expression using a negative exponent other than -1.
- Multiply and divide with negative exponents.
- Classify expressions by their equivalence to a given expression.

HELP AT HOME

- Review the Laws of Exponents with your child. When multiplying the same base with exponents, add the exponents. When dividing the same base with exponents, subtract the exponents.
- Make a matching game with problems on one set of cards and answers on the other set. Have your child match them up.

RESOURCES

Laws of Exponents		
product	$a^m \cdot a^n = a^{m+n}$	$2^2 \cdot 2^3 = (2\cdot2)(2\cdot2\cdot2) = 2^5$
quotient	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{2^3}{2^2} = \frac{2\cdot\cancel{2}\cdot\cancel{2}}{\cancel{2}\cdot\cancel{2}} = 2^{3-1} = 2$
power	$(a^m)^n = a^{m\cdot n}$	$(2^2)^3 = (2\cdot2\cdot2)(2\cdot2\cdot2)(2\cdot2\cdot2) = 2^6$
inverse	$a^{-1} = \frac{1}{a}$	$2^{-1} = \frac{1}{2}$ (this is a definition)

Error		Correct
$x^2 \cdot y^3 \neq (xy)^5$	the two numbers multiplied do not have the same base.	no way to simplify
$2x^{-1} \neq \frac{1}{2x}$	Unless there are ( ), around 2x, the exponent applies only to the x	$2x^{-1} = \frac{2}{x}$
$x^3 \cdot x^5 \neq x^{15}$	See the product law above. Multiplication → add exponents	$x^3 \cdot x^5 = x^8$
$(x^3)^5 \neq x^8$	See the power law above. When raising a power to a power, multiply exponents.	$(x^3)^5 = x^{15}$

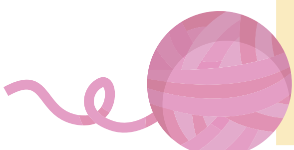
Image by Vivian Irvine
https://www.tes.com/lessons/fr3wAQNAXyyT1w/rules-of-the-laws-of-exponents

Your child can use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. He can evaluate square roots of small perfect squares and cube roots of small perfect cubes and know that the square root of 2 is irrational.

- Find square roots of numbers.
- Find cube roots of numbers.
- Estimate square roots and cube roots to the nearest integer.
- Order and compare real numbers.
- Find the distance between two points using the distance formula.
- Find parts of a right triangle using the Pythagorean Theorem.
- Find the edge length of a cubical object with a given volume.

HELP AT HOME

- Have your child apply square root by finding the distance between two coordinates on centimeter (cm) graph paper. Have him use the distance formula to determine the distance between the coordinates. Then lay a piece of yarn on a graph containing both coordinates. He can measure the distance with the yarn, then measure the yarn with a centimeter ruler to see how close the written answer to distance is compared to the estimated yarn distance.
- Repeat this activity with your child using the Pythagorean Theorem and a right triangle.



RESOURCES

PYTHAGOREAN THEOREM

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

DISTANCE FORMULA

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Your child can use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one integer is than the other.

- Compare and interpret scientific notation quantities in the context of the situation.
- Evaluate expressions involving addition, subtraction, multiplication, or division and express the answer in scientific notation.

VOCABULARY

SCIENTIFIC NOTATION = one non-zero digit to the left of zero. Has "x10" with an exponent that represents the number of times to move the decimal to make it standard form (e.g., 5,000 = 5 x 10^3).

HELP AT HOME

- Using a science book, have your child find actual numbers that are written in scientific notation. The number may be really small or really large. Begin with smaller exponents of 10 to help your child understand the concept and move to larger exponents. For example: 3 x 10^2 = 300, 3 x 10^3 = 3000. Therefore each time an exponent changes, it multiplies (or divides) the number by a power of 10.
- Have your child add, subtract, multiply, and divide large numbers and write the answers in scientific notation.

HELPFUL HINT

When you move the decimal to the left the exponent increases, when you move the decimal to the right the exponent decreases.

LEFT

2,000,000,000

9 8 7 6 5 4 3 2 1

2 x 10^9

RIGHT

0.0000732

1 2 3 4 5

7.32 x 10^{-5}

Your child can perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. He is able to use scientific notation and choose units of appropriate size for measurements of very large and very small quantities, as well as interpret scientific notation that has been generated by technology.

- Perform operations with numbers expressed in both decimal and scientific notation and express the answer in scientific notation without a scientific calculator.
- Compare and order numbers expressed as decimals and scientific notation without a calculator.
- Choose a meaningful unit of measure in the context of the situation with, and without, a scientific calculator.
- Interpret scientific notation that has been generated by a scientific calculator.

HELP AT HOME

- Have your child type a large number problem in the calculator (e.g., 90,000 x 28,000,000) and determine the answer in scientific notation (e.g., 2.52×10^{12}).

Your child can graph proportional relationships, interpreting the unit rate as the slope of the graph. He is able to compare two different proportional relationships represented in different ways.

- Graph real-world proportional relationships.
- Determine whether the relationship between two quantities is linear.
- Find the constant rate of change in a linear relationship.
- Compare proportional relationship between two different quantities represented in different forms.
- Find the slope of a line using a table, a graph, equations, a diagram, and a verbal description.
- Find the slope of a line that passes through two given points.
- Given an equation of a proportional relationship, your child can graph the relationship and recognize that the unit rate is the coefficient of x.

HELP AT HOME

- Have your child make a table with (x, y) coordinate points. Let the x represent the hours, and y represent the distance. For example, have your child use the formula $y = 60x$ to complete the table. Next he can make a graph with points that satisfy $y = 50x$. Then he can compare the table and the graph. Are they both proportional? What is the constant rate of each? Which set has the greatest slope?

RESOURCES

SAMPLE FUNCTION TABLE

This function table has the rule, "Add 6 to a number."

$x + 6 = y$

x	y
0	6
1	7
2	8
3	9
4	10

Each row has an "x" number and a "y" number that go together.

The "x" number is the input. Add 6 to this number.

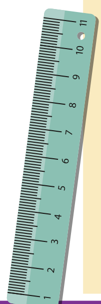
The "y" number is the output. This is the answer to the "x" number plus 6.

Your child can use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. He can also derive the equation y=mx for a line through the origin and the equation y=mx+b for a line intercepting the vertical axis at b.

- Graph two triangles given the vertices of both and determine if they are similar.
- Graph a pair of similar triangles, write a proportion comparing the rise to the run for each of the similar slope triangles, and find the numeric value.
- Choose two pairs of points when given the hypotenuse of a right triangle in a coordinate plane. Record the rise, run, and slope relative to each pair and verify that they are the same.

HELP AT HOME

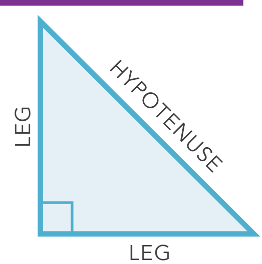
- Using square tiles on your floor or paper, have your child draw a right triangle. Then draw a second triangle by extending the sides to the first triangle, so that the triangles are similar. Have him determine the hypotenuse of the first by using a ruler to measure the two legs and solve by the Pythagorean Theorem. Repeat for the larger triangle. Ask, "What did you find about the lengths of the hypotenuse on the two triangles?" Have your child write a proportion comparing the slopes (rise/run) of the two triangles.



VOCABULARY

LEGS
Make up a right angle.

HYPOTENUSE
The side opposite the right angle.



Your child can solve linear equations in one variable. He can give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. He is able to show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, a = b results (where a and b are different numbers).

- Solve an equation using the multiplicative inverse.
- Solve an equation using the addition, subtraction, multiplication or division properties of equality to justify the steps to the solution.
- Solve multi-step equations in which coefficients and constants may be any rational number.
- Create equivalent expressions by combining like terms and using the Distributive Property.
- Translate a word phrase or real-world problem into an equation.
- Solve equations with variables on both sides of the equals sign.
- Solve equations containing grouping symbols.
- Determine if an equation has no solution.
- Determine if an equation is an identity with infinitely many solutions.
- Create equations that have one solution, infinitely many solutions, or no solutions.
- Classify equations by number of solutions.

HELP AT HOME

- Give your child equations to solve equations such as: 3x = 9, 2x+4 = 10, 5x + 3 = 5x + 7 - 4, 3x – 1 = 3x + 5, 1/3x + 7 = 10, 5(x + 3) = 2(x + 7). Determine how many solutions each equation has (one, infinite or none).

$$3x = 9$$

$$\frac{\cancel{3}x}{\cancel{3}} = \frac{9}{3}$$

$$x = 3$$

number of solutions = ONE

NUMBER OF SOLUTIONS

ONE:	variable = number
INFINITE:	0 = 0
NONE:	0 = any number other than 0

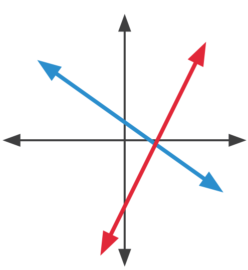
Your child can analyze and solve pairs of simultaneous linear equations. He is able to understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously.

- Graph lines in a plane.
- Use graphs and tables to relate them to equations.
- Interpret a point as an ordered pair (x,y).
- Identify the point of intersection of two lines as the solution to the system.
- Verify by computation that a point of intersection is a solution to each equation in the system.
- Determine the number of solutions using the slope and y-intercepts.
- Write a second equation to create a specific solution.
- Work without use of a scientific calculator.

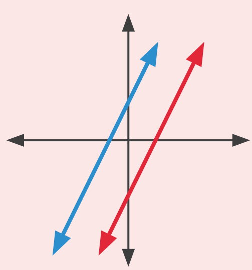
HELP AT HOME

- Make the following cards: "7x = 14", "3y = 6x - 12", "Mandy paid $4 for each book. She spent $8. How many books did she buy?", and "y = -2x + 5". Have your child pull two cards. Graph the equations. Determine if there is one, none or infinite solutions. Repeat by replacing the cards and pulling two more cards. Remind your child that the point of intersection (if any) is the solution to the system of equations.
- Have your child check the solution by using a calculator to graph the solutions.

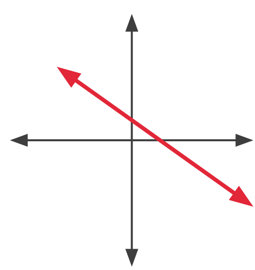
RESOURCES



The graphs intersect at a single point.
There is ONE solution.



The equations have the same slope. The graphs are parallel.
There is NO solution.



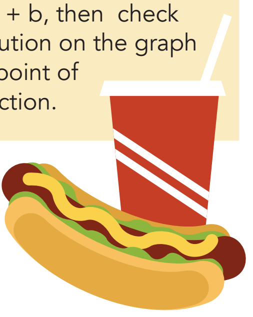
The graphs are identical.
There are an INFINITE number of solutions.

Your child can analyze and solve pairs of simultaneous linear equations. He is able to solve real-world and mathematical problems leading to two linear equations in two variables.

- Analyze the relationship between the dependent and independent variables.
- Use variables to represent two quantities in a real-world problem.
- Write an equation to express one quantity in terms of the other quantity.
- Represent proportional relationships by equations.
- Explain what a point on the graph of a proportional relationship means in terms of the situation.
- Interpret solutions in the context of the problem.
- Graph two linear equations on the coordinate grid and find their intersection point.

HELP AT HOME

- Have your child solve situations that have two variables. For example: Keith had 3 hot dogs and 2 drinks. He spent $12. Mary had 2 hot dogs and 4 drinks. She spent $16. How much was each item? Explain what the x and y values mean in this problem. Have your child graph the two systems in terms of y = mx + b, then check the solution on the graph at the point of intersection.



Your child can understand that a function is a rule that assigns to each input exactly one output. He knows the graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

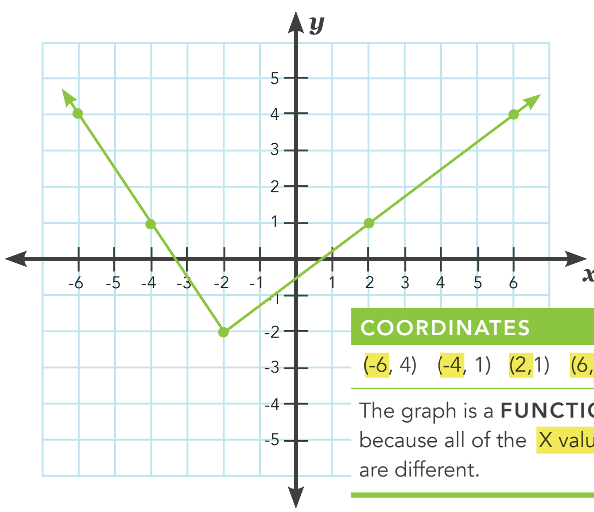
- Determine functions from non-numerical data.
- Graph inputs and outputs as ordered pairs in the coordinate plane.
- Graph functions in the coordinate plane.
- Read inputs and outputs from the graph of a function in the coordinate plane.
- Tell whether a set of points in the plane represents a function.
- Work without the use of a scientific calculator.

HELP AT HOME

- Give your child a set of coordinates to graph. Have him determine if the coordinates create a function. Let him highlight the coordinates if they make a function. Repeat this activity several times with new coordinates.
- Your child can create a function table using the rule "y = 2x + 5," then decide if it is a function and explain his answer.

HELPFUL HINT

It is a function if all of the x values are different.



COORDINATES

(-6, 4) (-4, 1) (2, 1) (6, 4)

The graph is a **FUNCTION** because all of the X values are different.

Your child can compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal description).

- Translate among the representations and partial representations of functions.
- Determine the properties of a function from a verbal description, table, graph, or algebraic form.
- Make comparisons between the properties of two functions represented differently.
- Work with a scientific calculator.

HELP AT HOME

- Encourage your child to write down two different linear functions, one in a table and the other in a graph. Instruct him to compare the rate of change in both, and the y-intercept of both, and determine if they are proportional, etc.

HELPFUL HINT

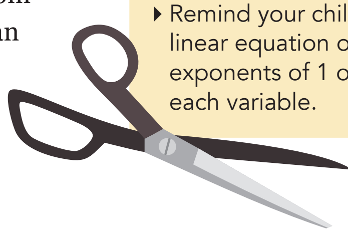
A linear function makes a line when graphed.

Your child can interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line, and give examples of functions that are not linear.

- Identify the rate of change between input and output values.
- Provide examples of relationships that are nonlinear functions.
- Create a table of values that can be defined as a nonlinear function.
- Analyze rates of change to determine linear and nonlinear functions.
- Determine rate of change from equations in forms other than the slope-intercept form.

HELP AT HOME

- Have your child cut pictures out of a magazine that represent linear and nonlinear. Put the solutions in two separate piles.
- Write equations on sticky notes. Encourage your child to separate the equations into linear and nonlinear.
- Remind your child that a linear equation only has exponents of 1 or 0 on each variable.

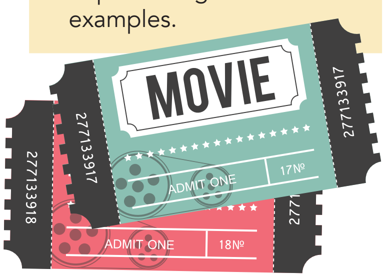


Your child can construct a function to model a linear relationship between two quantities. He can also determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. He is able to interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

- Use variables to represent quantities in a real-world or mathematical problem.
- Analyze a variety of function representations such as verbal description, table, two (x,y) values, graph, and equations.
- Write a linear function modeling a situation.
- Find the initial value of the function in relation to the situation.
- Find the rate of change in relation to the situation.
- Find the y-intercept in relation to the situation.
- Explain constraints on the domain in relation to the situation.

HELP AT HOME

- Write real-world situations that involve functions. For example: Angie bought 6 adult tickets to the movie and 2 children's tickets. She spent $58. The solution would be 6x + 2y = 58. Have your child find the rate of change when transformed into y = mx + b form ((-1)/3). Determine the y intercept (29). Then have him determine various costs for movie tickets (adult $5, children $14; adult $7, children $8). Last, have him determine if the equation is a function (yes). Repeat using similar examples.

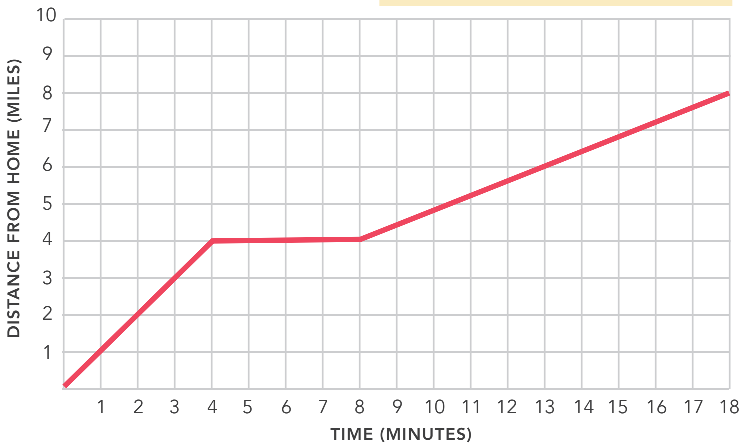


Your child can describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). He can sketch a graph that exhibits the qualitative features of a function that has been described verbally.

- Match the graph of a function to a given situation.
- Create a graph of a function that describes the relationship between two variables.
- Write a verbal description of the functional relationship between two variables depicted on a graph.

HELP AT HOME

- Create a story problem in which your child will graph the situation. For example: Sam was driving to school. He stopped for a few minutes to get breakfast. He then continued at a slower rate than before until he got to school. Graph Sam's trip.

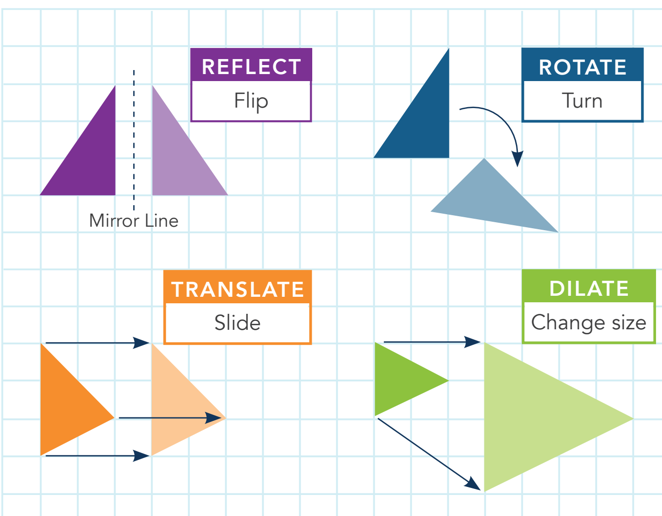


Your child can verify experimentally the properties of rotations, reflections, and translations. He knows lines are taken to lines, and line segments to line segments of the same length. He also knows angles are taken to angles of the same measure.

- Identify lines and line segments in two-dimensional figures.
- Measure and compare lengths of a figure and its image.
- Verify that after a figure has been translated, reflected, or rotated, corresponding lines and line segments remain the same length.
- Determine the change in orientation to isolate the transformations used.

HELP AT HOME

- Have your child draw a figure on graph paper. Then have him trace with wax paper or tracing paper. Have him do a series of rotations, reflections, translations, or a mixture of several. Instruct him to determine what happened to the length of each side and angle.
- Draw a figure and its transformation on graph paper. Have your child determine what transformation took place.



Your child can verify experimentally the properties of rotations, reflections, and translations. He knows parallel lines are taken to parallel lines.

- Identify parallel lines in two-dimensional figures.
- Measure and compare parallelism of a figure and its image.
- Verify that after a figure has been translated, reflected, or rotated, corresponding parallel lines remain parallel.

HELP AT HOME

- Using the same figures from the previous activity, have your child determine what happens to the parallel lines in the original figure compared to the transformed figure.

Your child can understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Given two congruent figures, he can describe a sequence that exhibits the congruence between them.

- Perform a series of transformations to prove or disprove that two given figures are congruent.
- Describe a sequence of transformations that exhibit congruence of two figures.

HELP AT HOME

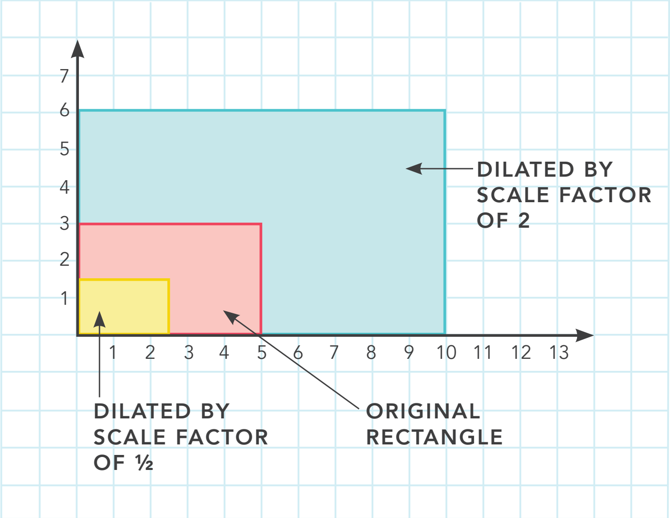
- Insert clip art from your computer onto a blank document. Copy and paste the picture. Use the cursor on the computer to flip, rotate, or translate the piece of clip art. Let your child determine which transformation you performed. Now, allow him to complete the process and you decide what transformation took place.

Your child can describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

- Name an ordered pair as the coordinates of pairs in a coordinate plane.
- Graph coordinates in a coordinate plane.
- Describe the changes occurring to coordinates of a figure after transformations and dilations.
- Determine the new coordinates of an image given the original coordinates and a series of transformations and/or dilations to be applied.

HELP AT HOME

- Continue with the activity on page 34 (clip art manipulation). Now, include changing the size of the clip art.
- Using graph paper, have your child draw a rectangle. Then have him dilate it by a scale factor of 2 (multiply by 2), and draw the new rectangle. Instruct him to write the original coordinates and compare to the new coordinates. Repeat, but this time have him dilate a figure by ½ and compare the results to the first dilation.
- Pay attention to what changes take place in the coordinates when a figure is dilated.



Your child can understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. Given two similar two-dimensional figures, he can describe a sequence that exhibits the similarity between them.

- Perform a series of transformations and dilations to prove or disprove that two given figures are similar.
- Describe a sequence of transformations and dilations that exhibit similarity of two figures.

HELP AT HOME

- Use photos that are exactly the same, except for the size, to show your child similarity. Have him determine the rate of change.

Your child can use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

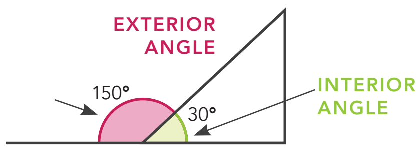
- Construct triangles from three measures of angles.
- Construct viable arguments.
- Make conjectures regarding relationships and measurements of the angles created when two parallel lines are cut by a transversal.
- Apply proven relationships to establish properties to justify similarity.

HELP AT HOME

- Cut two congruent triangles. Cut one into three parts. Have your child arrange the cut angles to form a straight line. Notice the measure of the exterior angles is the same as the sum of the two interior angles.

VOCABULARY

CONGRUENT TRIANGLES
Triangles that have the same size and shape.



Your child can explain a proof of the Pythagorean Theorem and its converse.

- Use algebraic reasoning to relate a visual model to the Pythagorean Theorem.
- Explain why the Pythagorean Theorem holds.

HELP AT HOME

- Review how to solve an equation with your child.
- Review how to square a number and how to find a square root of a number.
- Have your child draw a right triangle with side lengths measuring 3 cm, 4 cm, and 5 cm. Now have him use the ruler to draw squares of each side attached to it. This will show that $3^2 + 4^2 = 5^2$.

Your child can apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions.

- Apply the Pythagorean Theorem to find an unknown side length of a right triangle.
- Use the Pythagorean Theorem in a diagram to solve real-world problems involving right triangles.
- Find right triangles in a three-dimensional figure.
- Use the Pythagorean Theorem to calculate various dimensions of right triangles found in a three-dimensional figure.
- Provide answers as whole numbers and irrational numbers approximated to three decimal places with the use of a calculator.

HELP AT HOME

- Lean a ladder against the house. Have your child determine how high the ladder is on the wall by measuring the ladder and the length the ladder is from the base of the house. Have him us the converse of the Pythagorean Theorem to determine how high the ladder is on the wall. Repeat doing similar activities.

RESOURCES

CONVERSE OF PYTHAGOREAN THEOREM

$c^2 - b^2 = a^2$ or $c^2 - a^2 = b^2$

Your child can apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

- Connect any two points on a coordinate grid to a third point so that the three points form a right triangle.
- Use a right triangle built from two original points connecting a third point in a coordinate grid and the Pythagorean Theorem to find the distance between the two original points.

HELP AT HOME

- Tell your child two coordinates. Have him determine a third coordinate to make a right triangle. Then have him use the Pythagorean Theorem to find the measure of the hypotenuse.

Your child can identify and recite the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

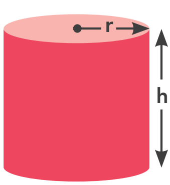
- Use the formula to find the volume of cylinders, cones, and spheres.
- Solve real-world problems involving the volume of cylinders, cones, and spheres.

HELP AT HOME

- Cut open an orange. Have your child measure the radius and determine the volume of the orange by using the volume of a sphere formula.
- Have him determine how many chips would fit into a cylinder container by estimating the volume of a cylinder.
- Have your child determine how much ice cream would fit into a sugar cone.

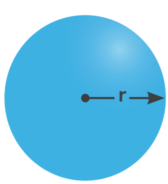
RESOURCES

VOLUME FORMULAS



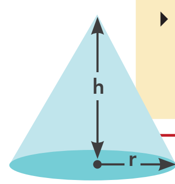
CYLINDER

$V = \pi r^2 h$



SPHERE

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



CONE

$V = \frac{1}{3}\pi r^2 h$

NOTE:

V = volume

r = radius

h = height

Your child can construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. He can describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

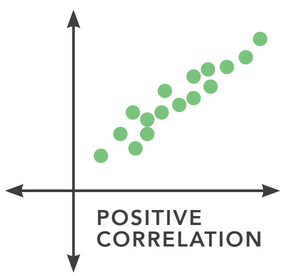
- Plot ordered pairs on a coordinate grid representing the relationship between two data sets.
- Describe patterns in the context of the measurement data.
- Interpret patterns of association in the context of the data sample.

HELP AT HOME

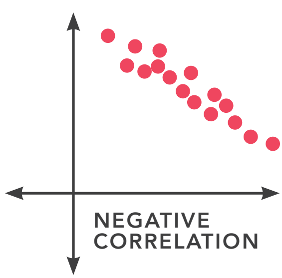
- Have your child make a scatter plot and compare the number of words on a page (y axis) to the page numbers (x axis). Determine what kind of correlation it is: positive, negative, or no correlation.
- Then have him make a scatter plot comparing a person's age (x axis) to their height (y axis) and describe the correlation.
- Finally, have him make a scatter plot comparing the amount of money you have when you begin shopping (y axis) to the time spent shopping (x axis). Then have him describe the correlation.

RESOURCES

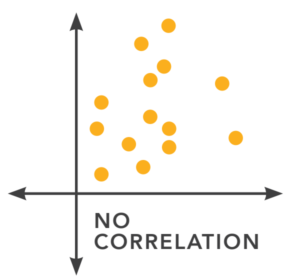
SAMPLE SCATTER PLOTS AND CORRELATIONS



POSITIVE CORRELATION



NEGATIVE CORRELATION



NO CORRELATION

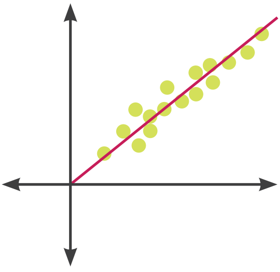
Your child can understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, he can informally assess the model fit by judging the closeness of the data points to the line.

- Draw a straight trend line to approximate the linear relationship between the plotted points of two data sets.
- Make inferences regarding the reliability of the trend line by noting the closeness of the data point to the line.

HELP AT HOME

- Using the graphs from the previous activity, have your child plot the trend line of each (if there is one).

RESOURCES



TREND LINE
Try to have the line as close as possible to all points, and as many points above the line as below.

Your child can use the equation of a linear model to solve problems in the context of bivariate measurement data interpreting the slope and intercept.

- Determine the equation of the trend line that approximates the linear relationship between the plotted points of two data sets.
- Use a linear equation to describe the association between two quantities in bivariate data.
- Interpret the slope of the equation in the context of the collected data.
- Interpret the y-intercept of the equation in the context of the collected data.

HELP AT HOME

- Using the trend lines from the previous activity, have your child determine the slope of each line using rise/run. Have him apply his answer to the data by describing what the slope represents.

Your child can understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. He is able to construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. He also can use relative frequencies calculated for rows or columns to describe possible association between the two variables.

- Create a two-way table to record the frequencies of bivariate categorical values.
- Compute marginal sums or marginal percentages.
- Determine the relative frequencies for rows and/or columns of a two-way table.
- Use the relative frequencies and context of the problem to describe possible associations between the two sets of data.

HELP AT HOME

- Have your child collect data that compares Coke and Pepsi as the favorite drink of adults vs. children. Have him organize the results in a two-way table. Next, he can determine the relative frequency of each by dividing the row amount by the total column amount. Ask, "Is there a connection between the age of a person and their favorite drink choice?"

	COKE	PEPSI	TOTAL
Adults	21	6	27
Children	47	28	75
Total	68	34	102