

What We Are Learning

Functions

Vocabulary

These are the math words we are learning:

coordinate plane plane formed by horizontal and vertical number lines intersecting at zero on each

function input-output relationship that has exactly one output for each input

linear function function whose graph is a straight line

ordered pair a pair of numbers that names a location on the coordinate plane

origin the point where the axes intersect on a coordinate plane, has the coordinates (0, 0)

parabola graph of a quadratic function

quadrant one-quarter of the coordinate plane, bounded on two sides by the axes

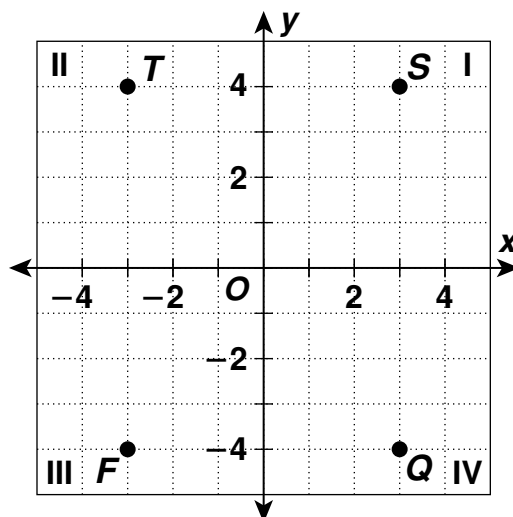
quadratic function function of the form $y = ax^2 + bx + c$, where $a \neq 0$

x-axis horizontal number line in the coordinate plane

y-axis vertical number line in the coordinate plane

Dear Family,

The student will be introduced to the **coordinate plane**, which is an extension of the number line. The coordinate plane is labeled below.



The coordinate plane is divided into four **quadrants** by the **x-** and **y-axes**. The **origin** is the point where the axes intersect, identified by the **ordered pair** (0, 0). An ordered pair (x, y) tells you the x - and y -coordinates of a point.

The x -coordinate tells you how far to move left or right from the origin. The y -coordinate tells you how far to move up or down. The student will use these coordinates to plot points in all four quadrants.

Draw a few points on the coordinate grid above and quiz the student to see if he or she can tell you the ordered pairs that identify the points.

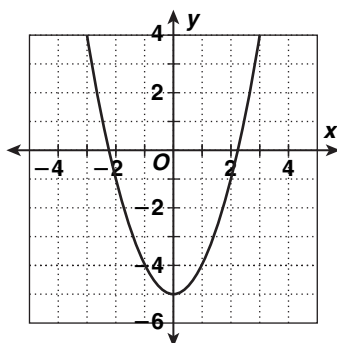
The student will also learn about **functions**. A function can be thought of as a machine that produces exactly one output for each input it receives. Functions are often written as equations with two variables, such as $y = 2x + 3$. In this case, the values of x are the inputs, and the resulting values of y are the outputs.

Find the output for each of the following input values for the function $y = 2x + 3$; 1, 2, 3, 4.

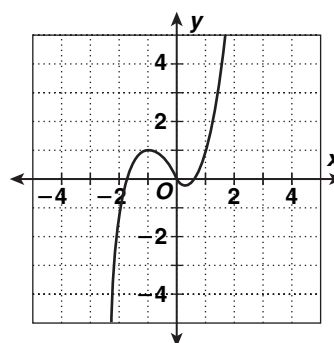
Input	Rule	Output
x	$2x + 3$	y
1	$2(1) + 3$	5
2	$2(2) + 3$	7
3	$2(3) + 3$	9
4	$2(4) + 3$	11

The student will learn about three types of functions. The function in the example above is a **linear function**. The graph of a linear function is a straight line. A **quadratic function** takes the form $y = ax^2 + bx + c$, and a cannot equal 0. The graph of a quadratic function is a **parabola**. A cubic function takes the form $y = ax^3 + bx^2 + cx + d$, and again, a cannot equal 0.

Quadratic Function
 $y = x^2 - 5$



Cubic Function
 $y = x^3 + x^2 - x$



As the student works through this section, help him or her find instances of functions in the real world. One example might be the total cost of renting different numbers of movies or video games, if each movie or video game costs amount the same to rent.

Sincerely,

What We Are Learning

Graphs

Vocabulary

These are the math words we are learning:

constant of variation the ratio by which two variable quantities are related

direct variation

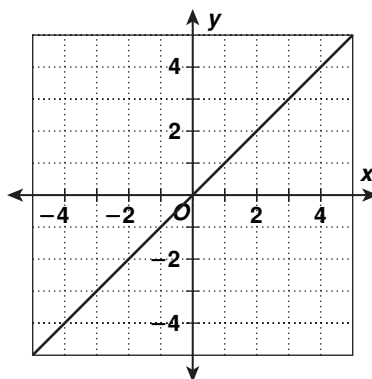
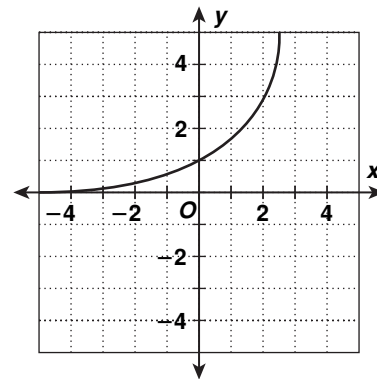
A relationship between two variables such that the data increase or decrease together at a constant rate

rate of change ratio comparing the amount of change in the independent variable in a function to the change in the dependent variable

slope the constant rate of change in a straight line

Dear Family,

In this section, the student will learn more about interpreting graphs on a coordinate plane. **Rate of change** compares the change in the independent variable, or input value, to the change in the dependent variable, or output value. Rates of change can be constant, meaning the graph is a straight line, or variable, meaning the graph is not a straight line.

Constant Rate of Change**Variable Rate of Change**

A constant rate of change is also called the **slope** of a line. Slope is the ratio of the vertical change in a line to the

horizontal change in the line, and is written as $\frac{\text{rise}}{\text{run}}$. The concept of slope will be extremely useful to future math topics.

The student will be learning how to use **direct variation** to relate two variable quantities, graph inequalities in two variables, and reference lines of best fit.

You can determine if two variable quantities have a direct relationship if the increase (or decrease) in one variable increases (or decreases) the other variable.

Determine whether the data set shows direct variation.

Lincoln High School Baseball and Softball Games

Softball Hits Per Game	8	12	11	15	9
Baseball Hits Per Game	5	7	8	13	12

Compare the ratios to see if a direct variation occurs.

$$\frac{8}{5} \neq \frac{9}{12} \quad \begin{array}{l} 45 \\ 96 \end{array}$$

This ratio is not constant because $45 \neq 96$. The relationship of the data is not a direct variation.

The student will also be learning how to find the constant of variation in a direct variation relationship and how to write an equation of direct variation.

Find the equation of direct variation, given that y varies directly with x .

x is -4 when y is 14

$$y = kx \quad y \text{ varies directly with } x.$$

$$14 = k \cdot -4 \quad \text{Substitute for } x \text{ and } y.$$

$$-\frac{14}{4} = k \quad \text{Solve for } k.$$

$$-\frac{7}{2} = k \quad \text{Simplify.}$$

$$y = -\frac{7}{2}x \quad \text{Substitute } -\frac{7}{2} \text{ for } k \text{ in the original equation.}$$

Concepts covered in this chapter are very important for subsequent mathematics courses your child will be taking. Review these processes daily with your child.

Sincerely,