EUREKA MATH™ TIPS FOR PARENTS

KEY CONCEPT OVERVIEW

In this topic, students learn the concept of a **function**, its formal definition, and how it works as an input–output machine. For example, if the function is *multiply by 5*, the output will always equal the input times 5. Students learn that the equation $y = mx + b$ defines a **linear function** whose graph is a straight line, and that a **nonlinear function** is a set of ordered pairs that graph as something other than a straight line. Students begin comparing two functions represented in different ways. For example, students are presented with an equation, a word problem, the **graph of a function**, and the **table of values** that represent a function and are asked to determine which function has the greatest **rate of change**.

You can expect to see homework that asks your child to do the following:

- Interpret the graph of a function to identify key features, including whether the function is linear or nonlinear.
- Find the **average rate of change**.
- Determine whether a given representation represents a function, and create representations of real-world functions. For example, the water flowing from a faucet into a bathtub is a linear function with relation to time if the flow of water is constant.
- Create a rule (an equation) that represents a function.
- Identify whether a function is **discrete** or **not discrete**.
- Determine **restrictions on the variables**.
- Compare functions and determine which has the greater rate of change.

SAMPLE PROBLEMS *(From Lesson 5)*

The distance that Giselle runs is a function of the amount of time she spends running. Giselle runs 3 miles in 21 minutes. Assume she runs at a constant rate.

a. Write an equation in two variables that represents the distance she ran, y, as a function of the time she spent running, x.

$$\frac{3}{21} = \frac{y}{x}$$

$$y = \frac{1}{7}x$$

b. Use the equation you wrote in part (a) to determine how many miles Giselle can run in 28 minutes.

$$y = \frac{1}{7}(28)$$

$$y = 4$$

Giselle can run 4 miles in 28 minutes.

c. Is the function discrete?

The function is not discrete because we can find the distance Giselle runs for any given amount of time she spends running (e.g., 10.2 minutes).

Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at GreatMinds.org.

HOW YOU CAN HELP AT HOME

You can help at home in many ways. Here are some tips to help you get started.

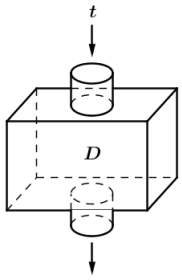
- Help your child understand the restrictions on a variable by discussing real-world situations around you. For example, determine whether the value of a variable can be a fraction or a negative number if it represents a number of people (whole numbers only), a number of ounces (zero or positive numbers only), or a temperature (zero or positive or negative numbers—including fractions—are acceptable).
- Identify the average rate of change in a real-world situation. For example, if you walked 2 miles to the store in 20 minutes, you can determine the average rate by dividing the distance you traveled by the time it took to get there ($\frac{2}{20}$, or 0.1, miles per minute). Take this a step further by asking your child to create a function rule, or equation, that represents the situation. He might say, "For our walk, let m represent the miles walked and t represent the minutes it took to walk that distance; the function rule is $m = 0.1t$."

TERMS

Average rate of change: The average change of one quantity in relation to a second quantity. For example, we rarely walk at a constant rate—we stop at crosswalks, speed up to cross the street, etc.—but we can calculate the average rate of change for a trip by dividing the total distance walked by the time it took to complete the trip.

Discrete: The input (usually the x-value) is restricted to certain values such as integers or whole numbers. For example, if the input is *number of people,* the function is discrete because people can only be represented by whole numbers.

Function: An assignment of exactly one output for each and every input. In the image, the input is t seconds, and the function, D, manipulates t in some way (often according to an equation) and outputs a distance traveled after t seconds.



Distance traveled in t seconds

Graph of a function: The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. The set represents the solution set of the function. For example, in the simple function *multiply by 5*, the set of ordered pairs to graph would include (–2, –10), (–1, –5), (0, 0), (1, 5), (2, 10), (3, 15), and so on.

Linear function: A set of ordered pairs that can be represented by the equation $y = mx + b$ and graphs as a straight line.

Nonlinear function: A set of ordered pairs that graphs as something other than a straight line.

Not discrete: A function in which the input (usually the x-value) can be any value, including fractions, decimals, and negative numbers. For example, a function with temperature as its input is not discrete because temperatures can have positive, negative, and decimal values (e.g., $42.5°$ or $-6°$).

Rate of change: The rate at which one quantity (e.g., distance traveled) changes in relation to another quantity (e.g., time spent traveling). The rate of change of a linear function is the slope of the graph of a line. In most real-world situations, we identify the average rate of change.

Restrictions on a variable: Some functions represent real-world situations and have restrictions on which numbers or types of numbers they can represent. For example, a variable that represents a number of people cannot be a fraction or a negative number.

MODELS

Table of Values

Bags of Candy (x)	1	2	3	4	5	6	7	8
Cost in Dollars (y)	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00