Explore Functions

UNDERSTAND: How can you recognize a function?

Model It

➤ **Complete the problems about functions.**

1 A rule may tell you what to do to a starting value, or **input**, to get a final value, or **output**. Use the rules to complete the tables.

a. Input: number of mangos that cost $2 each
Output: total cost

Mangos	1	2	3	4
Cost	$2	$4		

b. Input: x, number of students
Output: y, least number of two-student desks needed

Students (x)	1	2	3	4	5	6
Desks (y)	1	1				

c. A **function** is a type of rule in which each input results in exactly one output. Explain why both rules above are functions.

d. In problem 1a, you can say that the total cost is *a function of* the number of mangos. Write a similar statement about the numbers of students and desks.

2 Use the rule to complete the table. Explain why y is not a function of x.

Input: x, a number; Output: y, all numbers x units from 0 on a number line

Input (x)	1	2	3	4	5
Output (y)	−1, 1				

DISCUSS IT

Ask: In problem 1b, why do some inputs have the same output?

Share: To find the number of desks needed . . .

Learning Targets SMP 1, SMP 2, SMP 3, SMP 7, SMP 8

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

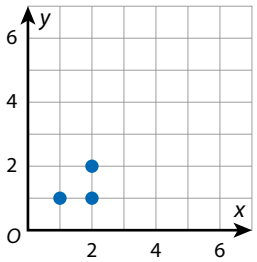
Model It

➤ **Complete the problems about showing a rule with a graph.**

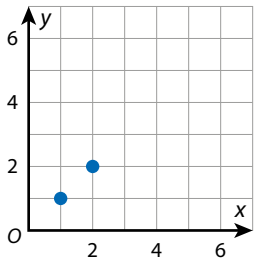
3 You can make a graph of the (input, output) pairs for a rule.

a. Complete both graphs by plotting (input, output) pairs for input values of 3, 4, and 5.

Input: *x*, a whole number
Output: *y*, all factors of *x*



Input: *x*, a whole number
Output: *y*, the number of factors of *x*



b. Look at the graph on the left. Is *y* a function of *x*? Explain how you know.

c. Look at the graph on the right. Is *y* a function of *x*? Explain how you know.

4 **Reflect** How can making a table or graph help you decide whether a rule is a function?

DISCUSS IT

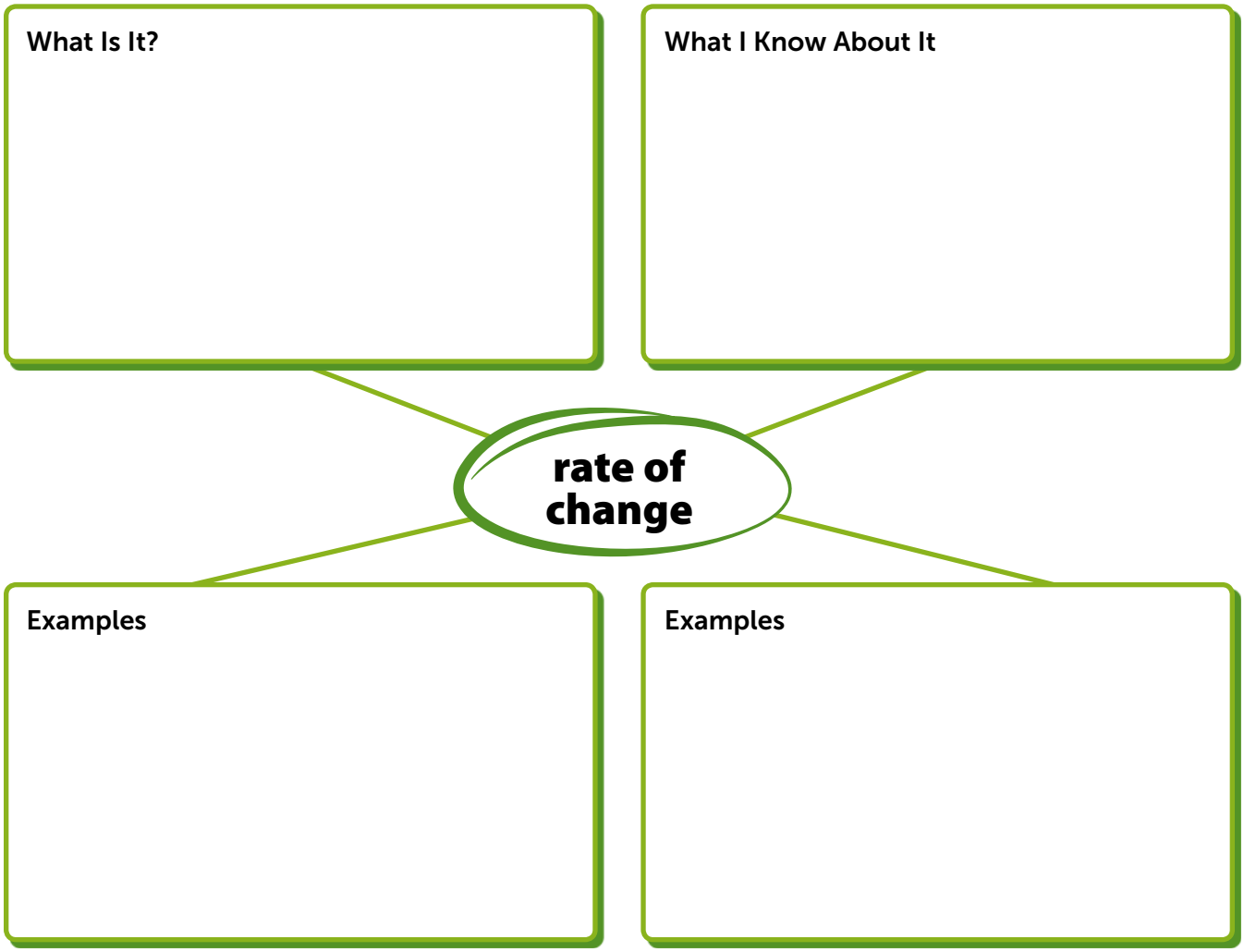
Ask: If you extend the graph on the right to include more inputs, will you ever find an input with more than one point above it? Why?

Share: I know that a rule is not a function if its graph . . .

 Name:

Prepare for Functions

1 Think about what you know about rates of change. Fill in each box.
Use words, numbers, and pictures. Show as many ideas as you can.



2 Circle the equation with a rate of change of 3.

$3y = 2x + 5$ $y = 6x - 3$ $y = 3x + 12$

➤ **Complete problems 3–5.**

3 **a.** Use the rule to complete the table.

Input: x, number of tickets that cost \$9 each
Output: y, total cost

Tickets (x)	1	2	3	10
Cost (y)	\$9			

b. Explain why the rule is a function.

4 **a.** Use the rule to complete the table.

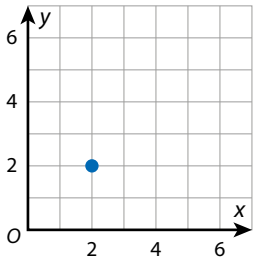
Input: x, an angle
Output: y, the angle supplementary to x

Input (x)	10°	26°	45°	90°	112°	175°
Output (y)	170°	154°				

b. Is the rule a function? Explain.

5 **a.** Complete the graph by plotting (input, output) pairs for input values of 3, 4, and 5.

Input: x, a whole number
Output: y, all prime numbers less than or equal to x



b. Is y a function of x? How can you tell by looking at the graph?

UNDERSTAND: How can you recognize a function?

Develop Understanding of Linear and Nonlinear Functions

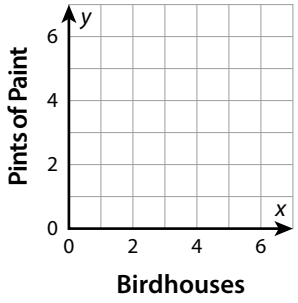
Model It: Graphs

➤ **Try these two problems involving linear and nonlinear functions.**

1 **a.** Functions can be classified as linear or nonlinear. Look at this **linear function**. Then complete the table and graph.

Input: x, number of birdhouses Aimee paints with 0.5 pint of paint each; Output: y, total pints of paint she needs

Birdhouses (x)	Pints of Paint (y)
1	
2	
3	
4	
5	



b. Look at the shape of the graph. Why do you think this function is classified as a linear function?

DISCUSS IT

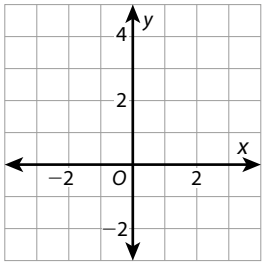
Ask: How can you tell the shape of the graph from the table?

Share: The rate of change shown in the table . . .

2 **a.** Complete the table and graph for this **nonlinear function**.

Input: x, an integer; Output: y, the square of x

Input (x)	−2	−1	0	1	2
Output (y)					



b. How is the graph different from the graph of the linear function in problem 1?

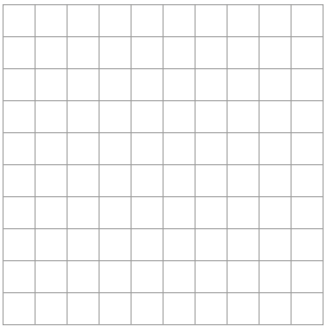
Model It: Equations

➤ **Try this problem about functions.**

3 Many functions can be represented by equations that show how to calculate the output y for the input x.

a. Determine whether each equation represents a linear function. Show your work.

$y = 2x - 1$ $y = -x^2$ $y = -x$



SOLUTION

b. Explain how you know that equations of the form $y = mx + b$ always represent linear functions.

DISCUSS IT

Ask: How do you know that equations of the form $y = x^2$ do not represent linear functions?

Share: Not all functions are linear because . . .

CONNECT IT

➤ **Complete the problems below.**

4 You want to determine whether a function is linear. How can making a graph or writing an equation help?

5 Does the rule describe a linear function? Use a model to explain.

Input: x, a number; Output: y, 6 more than 5 times x

Practice Linear and Nonlinear Functions

➤ **Study how the Example shows how to determine whether a function is linear or nonlinear. Then solve problems 1–4.**

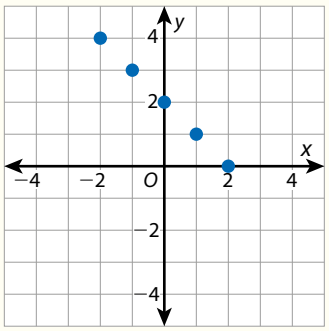
Example

Use a graph to determine whether the function is a linear function.

Input: *x*, a number; Output: *y*, 2 more than −1 times *x*

Make a table of input and output values.

Input (*x*)	−2	−1	0	1	2
Output (*y*)	4	3	2	1	0



Graph the (input, output) pairs. The points lie on a straight line. Plotting more points will continue to follow the same straight line. The function is linear.

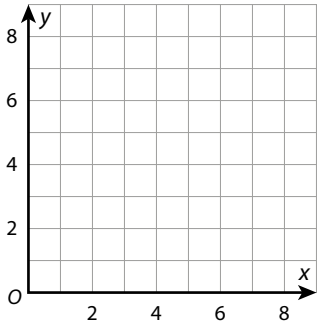
1 **a.** What is an equation that represents the rule in the Example?

b. Use the equation to explain why the rule is a linear function.

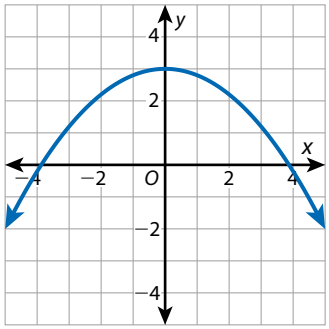
2 Complete the table and graph for the function. Tell whether the function is linear or nonlinear. Explain your reasoning.

Input: *x*, a number; Output: *y*, 6 divided by *x*

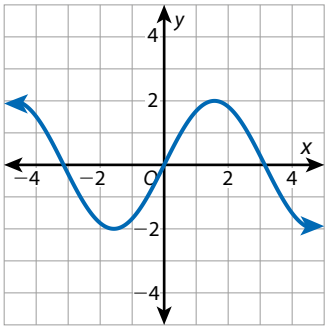
Input (*x*)	**Output (*y*)**
1	
2	
3	
4	



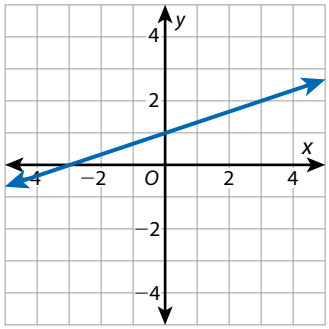
3 Each graph represents a function. Tell whether the function is *linear* or *nonlinear*.



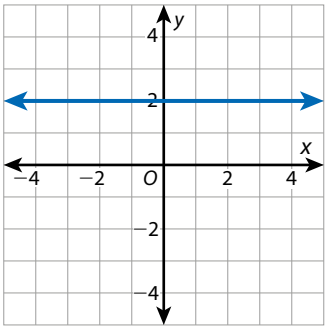
a. _____



b. _____



c. _____

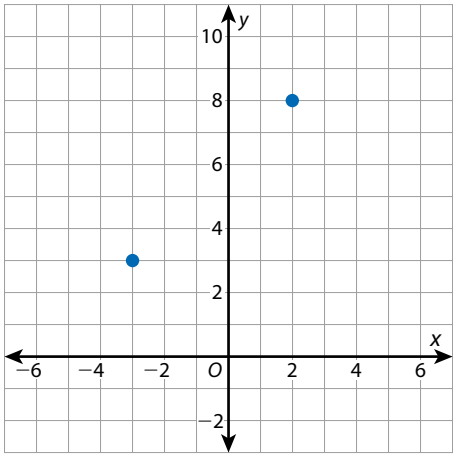


d. _____

4 Felipe wants to figure out if the equation $y = x(x + 2)$ represents a linear function.

He finds two (x, y) pairs and plots them.

x	−3	2
y	3	8



Felipe says he can draw a line through these two points, so the equation represents a linear function.

a. Explain why Felipe's reasoning is incorrect.

b. Does the equation represent a linear function? Explain your reasoning.

UNDERSTAND: How can you recognize a function?

Refine Ideas About Functions

Apply It

Math Toolkit graph paper, straightedges

➤ **Complete problems 1–5.**

1 Apply Ana is bowling. She pays $4 per game and $7 to rent shoes. After three games, each additional game is free. Is the total cost to bowl a function of the number of games played? Use a table or graph to help explain your answer.

2 Identify The tables show inputs and outputs for two functions. One of the functions is linear. Explain how you can tell without a graph which represents a linear function.

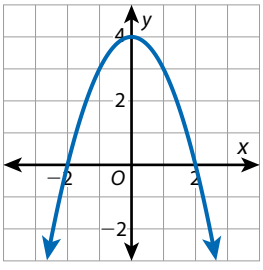
Table 1

Input	1	2	3	4	5
Output	6	7	9	12	16

Table 2

Input	2	4	6	8	10
Output	5	9	13	17	21

3 Analyze Fiona says the graph does not represent a function because inputs −1 and 1 have the same output, 3. Is Fiona correct? Explain.



4 **PART A** Give an example of a nonlinear function. You may represent the function by giving the rule in words or by writing an equation.

PART B Make a graph or table to represent your function.

PART C Use your graph or table to help you explain why your function is nonlinear.

5 **Math Journal** How can you tell if a rule represents a function? Explain how a graph, table, or equation for a rule can help you determine whether the rule is a function.

End of Lesson Checklist

☐ **INTERACTIVE GLOSSARY** Find the entry for *function*. Show an example of a linear function, a nonlinear function, and a relationship that is not a function.

Explore Using Functions to Model Linear Relationships

Previously, you learned about functions. In this lesson, you will learn about writing equations to model linear functions.

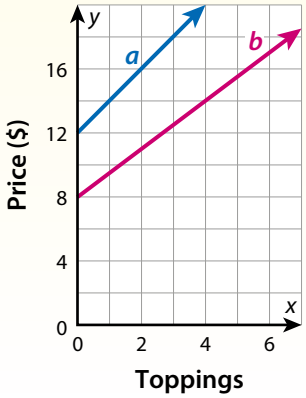
➤ **Use what you know to try to solve the problem below.**

A customer can use the menu above to call in a pizza order. He or she chooses a size and then adds toppings. The graphs and equations model the prices of the two sizes of pizza.

$y = 1.5x + 8$

$y = 2x + 12$

Which equation and which line model the price of a small pizza? Which equation and which line model the price of a large pizza?



TRY IT

DISCUSS IT

Ask: Which numbers in the problem helped you answer the questions?

Share: The numbers I used were . . .

Learning Target SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6, SMP 7

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

CONNECT IT

1 Look Back Which equation and graph represent the price of each size pizza? How do you know?

2 Look Ahead The graphs and equations in the **Try It** problem are linear models because they model, or represent, linear functions.

a. A linear function has a constant rate of change. What do the rates of change represent in this situation?

b. The **initial value** of each function in the **Try It** is the value of y when $x = 0$. What do the initial values represent in this situation?

c. What quantities do the variables x and y represent in this situation? Use the phrase *is a function of* to describe the relationship between these quantities.

3 Reflect Look back at the equations and graphs in the **Try It** problem. Which type of model would you rather use to find the price of a pizza? Explain.

 Name:

Prepare for Using Functions to Model Linear Relationships

1 Think about what you know about linear equations. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

What Is It?

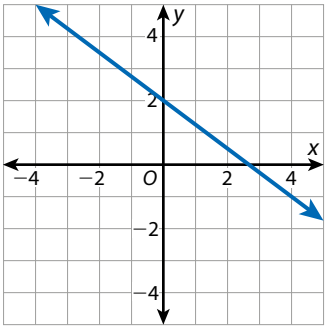
What I Know About It

slope-intercept form

Examples

Non-Examples

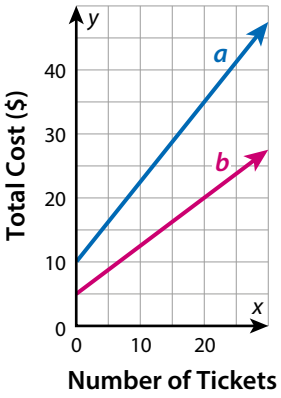
2 Write an equation for the graph in slope-intercept form.



3 A poster announces a carnival is coming to town. People pay an admission fee to enter the carnival. Then they buy tickets to go on rides. The total cost of attending the carnival is a function of the number of tickets bought. The graphs and equations model the total costs for children and for adults.

$y = 1.25x + 10$

$y = 0.75x + 5$



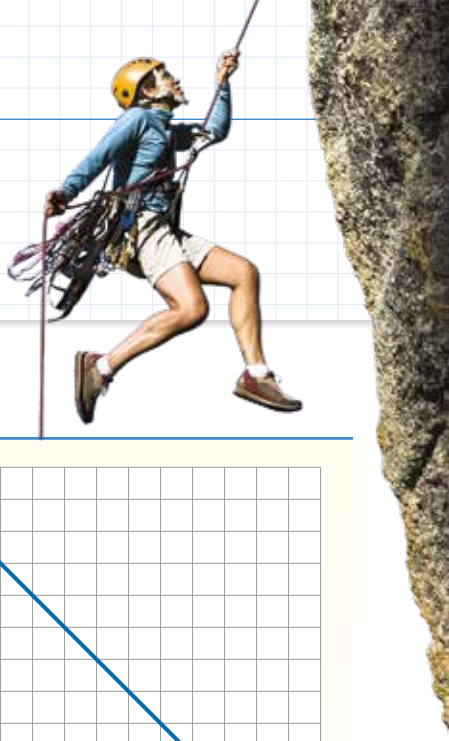
a. Which equation and which line model the total cost for a child? Which equation and line model the total cost for an adult? Show your work.

SOLUTION _____

_____

b. Check your answer to problem 3a. Show your work.

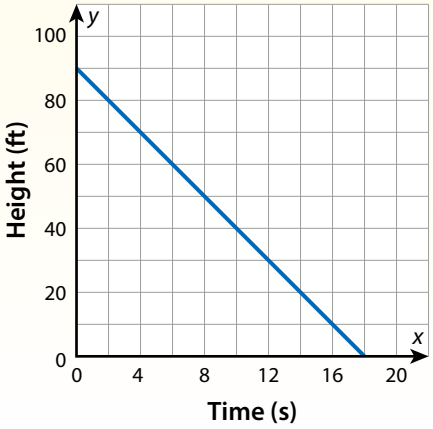
Develop Interpreting a Linear Function



Read and try to solve the problem below.

Aretha is rappelling down the side of a cliff. The graph shows her height above the ground in feet as a function of time in seconds as she descends.

What is Aretha's height above ground when she begins rappelling down? At what rate does she descend?



TRY IT

DISCUSS IT

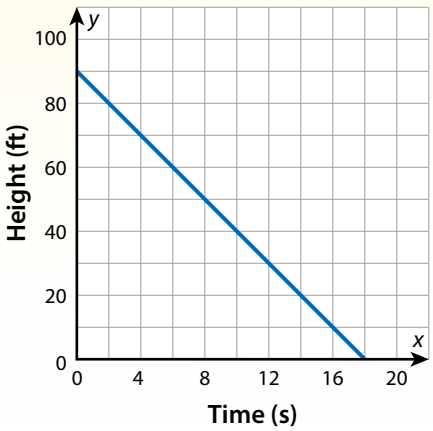
Ask: How did you use the information from the graph to solve the problem?

Share: I used the graph by . . .

➤ **Explore different ways to interpret a linear function.**

Aretha is rappelling down the side of a cliff. The graph shows her height above the ground in feet as a function of time in seconds as she descends.

What is Aretha's height above ground when she begins rappelling down? At what rate does she descend?



Model It

You can model the function with a linear equation.

Find the slope and *y*-intercept.

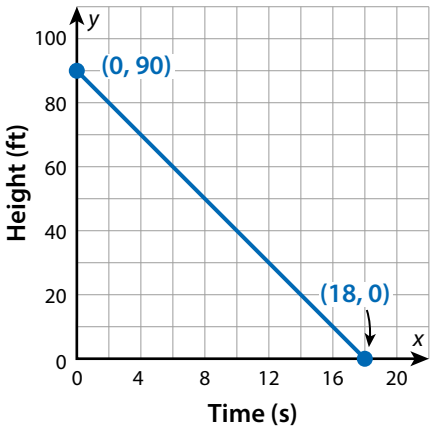
$$\text{slope} = \frac{90 - 0}{0 - 18}$$

$$= \frac{90}{-18}$$

$$= -5$$

The graph shows that the *y*-intercept is 90.

An equation of the function is $y = -5x + 90$.



Analyze It

You can answer the questions by analyzing each part of the equation.

$$y = -5x + 90$$

rate of change | initial value

The **rate of change** shows how Aretha's height, *y*, changes over time, *x*.

The **initial value** of the function is Aretha's height at time 0.

CONNECT IT

➤ **Use the problem from the previous page to help you understand how to interpret a linear function.**

1 How can you determine what *x* and *y* represent in the equation of the function?

2 Look at **Model It** and **Analyze It**. What is Aretha's height above the ground when she starts rappelling? At what rate does she descend? How do you know?

3 **a.** Explain how to write an equation of a linear function when you know the rate of change and initial value of the function.

b. Describe how the rate of change and initial value of the linear function are represented in the graph of the function.

4 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

Use what you learned to solve these problems.

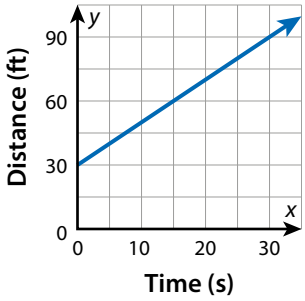
Classes Attended	Monthly Cost Gym A	Monthly Cost Gym B
5	$75	$110
10	$150	$160
15	$225	$210
20	$300	$260

5 The total monthly cost of exercise classes is a linear function of the number of classes attended. The table shows costs for two different gyms.

a. What is the cost per class at each gym?

b. Which gym charges a monthly fee? How do you know?

6 The graph shows distance in feet as a function of time in seconds. Write an equation for the function and describe a situation that it could represent. Include the initial value and rate of change for the function and what each quantity represents in this situation.



7 Mr. Seda plans a field trip for one of his classes. He rents one bus for the whole class and purchases a museum ticket for each student. The equation $y = 11x + 400$ gives the cost of the field trip as a function of the number of students who attend.

What is the initial value of the function? What is the rate of change? What do these values tell you about the field trip?

Practice Interpreting a Linear Function

➤ **Study the Example showing how to interpret a linear function. Then solve problems 1–4.**

Example

Snow falls early in the morning and stops. Then at noon snow begins to fall again and accumulate at a constant rate. The table shows the number of inches of snow on the ground as a function of time after noon. What is the initial value of the function? What does this value represent?

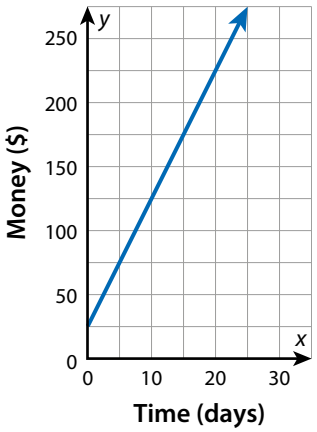
Hours After Noon	Inches of Snow
0	6
1	8.5
2	11

The initial value is 6, the number of inches of snow at noon, when the time value is 0. It represents the amount of snow that was already on the ground before it began snowing again.

1 **a.** What is the rate of change of the function in the Example? What does this value represent?

b. Suppose there was no snow on the ground before it began snowing at noon. What is the equation of this function?

2 The graph shows money in dollars as a function of time in days. Write an equation for the function, and describe a situation that it could represent. Include the initial value, rate of change, and what each quantity represents in the situation.



3 Each day Kyle buys a cup of soup and a salad for lunch. The salad costs a certain amount per ounce. The equation below models the total cost of Kyle's lunch.

$y = 0.45x + 3.75$

a. What do the variables x and y represent? Use the phrase *is a function of* to describe how the equation relates these quantities to one another.

b. What does the value of the function for $x = 0$ represent?

c. What does the rate of change represent?

d. What is the cost of an 8-ounce salad without soup? How do you know?

4 Carmela is a member of a social club. She pays an annual membership fee and \$15 for each event she attends. The equation $y = 15x + 25$ represents her total cost each year. Which statement about the function is true? Select all that apply.

A The initial value is 15.

B x represents the cost of each event.

C The rate of change is 15.

D The initial value represents the annual membership fee.

E The number of events she attends is a function of the total cost.

F The total cost is a function of the number of events she attends.

Develop Writing an Equation for a Linear Function from Two Points

➤ **Read and try to solve the problem below.**

The Duda family owns 10 acres of land. They want to buy more land and start a ranch. The amount of land they need is a linear function of the number of grazing animals they plan to have. The family decides to raise alpaca. The table gives the number of acres they need for different numbers of alpaca.

Write an equation to model the data in the table.

TRY IT

Math Toolkit graph paper, straightedges

DISCUSS IT

Ask: How did you use the information given in the table?

Share: I used the numbers in the table to . . .

➤ **Explore different ways to write an equation for a linear function.**

The Duda family owns 10 acres of land. They want to buy more land and start a ranch. The amount of land they need is a linear function of the number of grazing animals they plan to have. The family decides to raise alpaca. The table gives the number of acres they need for different numbers of Alpaca.

Write an equation to model the data in the table.

Number of Alpaca	Land Needed (acres)
10	25
20	40
30	55

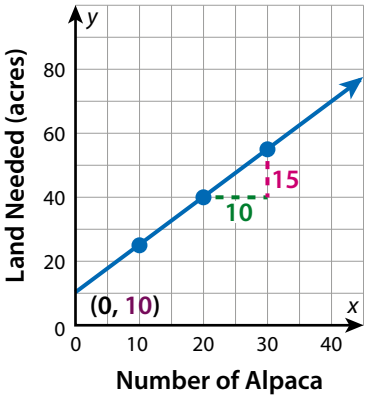
Picture It

You can use a graph to find the slope and *y*-intercept.

Plot the points given in the table and graph the line.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{15}{10} = 1.5$$

y-intercept = 10



Model It

You can calculate the rate of change and initial value.

Use the values from any two rows of the table to find the rate of change.

Use (10, 25) and (30, 55): rate of change $= \frac{55 - 25}{30 - 10} = \frac{30}{20} = 1.5$

To find the initial value, substitute the rate of change and one pair of values from the table into the equation for a linear function.

Use (10, 25): $y = mx + b$

$25 = 1.5(10) + b$

$10 = b$

CONNECT IT

Use the problem from the previous page to help you understand how to write an equation for a linear function.

1. Look at **Picture It** and **Model It**. What is the equation for the amount of land needed as a function of the number of alpaca on the ranch? What does the equation mean in this situation?

2. **a.** Look at **Model It**. What other pair of x- and y-values could you use to find the initial value? Use these values to show you get the same answer.

   b. Edward uses $x = 10$ and $y = 40$ to find the initial value. What is his mistake?

3. How do you know that there is only one possible value for the rate of change?

4. Explain how you can write the equation for a linear function when you know only two points on the line.

5. **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

Use what you learned to solve these problems.

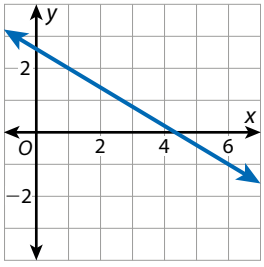
Skeins of Embroidery Floss	Cost of Project
5	$11.25
8	$13.50
12	$16.50

6 The cost of a cross-stitch project is a function of the number of skeins of embroidery floss it requires. The table shows the cost of projects that use different amounts of embroidery floss. What is the equation of the linear function that models this situation? Show your work.

SOLUTION

7 You are trying to find the equation of the line that passes through two points, P and Q. P is in Quadrant II and Q is in Quadrant IV. What do you know about the slope of the line? Explain.

8 What is the equation of the function shown by the graph? Show your work.



SOLUTION

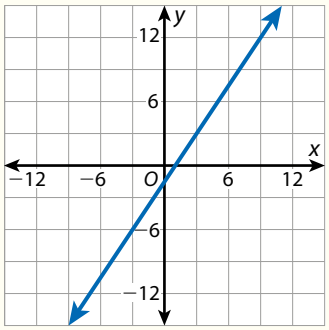
Practice Writing an Equation for a Linear Function from Two Points

➤ **Study the Example showing how to write an equation for a linear function from two points. Then solve problems 1–4.**

Example

What is the equation of the function shown by the graph? Show your work.

The lines passes through (9, 12) and (3, 3).



$$\text{slope} = \frac{12-3}{9-3} = \frac{9}{6} = \frac{3}{2}$$

$$y = mx + b$$

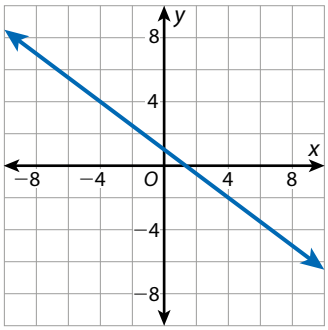
$$12 = \frac{3}{2}(9) + b$$

$$12 = \frac{27}{2} + b$$

$$-\frac{3}{2} = b$$

$$y = \frac{3}{2}x - \frac{3}{2}$$

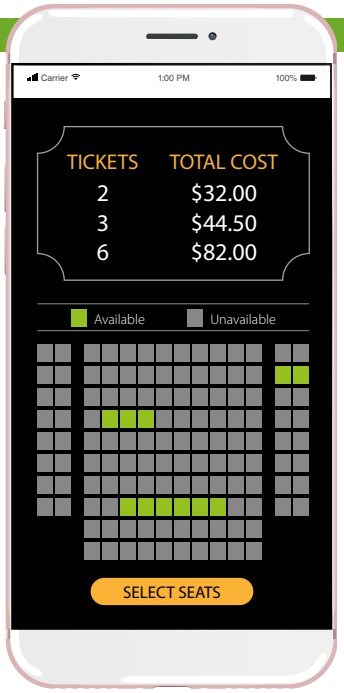
1 What is the equation of the function shown by the graph? Show your work.



SOLUTION _____

2 The graph of a linear function passes through the points (3, 19) and (5, 23). Write an equation for the function. Show your work.

SOLUTION _____



3 Vinh pays a convenience fee when he reserves movie tickets on his cell phone app. The app shows him the total cost of his purchase for different numbers of tickets.

a. What is the equation that models this linear function? Show your work.

SOLUTION

b. Use the phrase *is a function of* to describe the situation represented by the equation you wrote in problem 3a.

c. How much is each movie ticket?

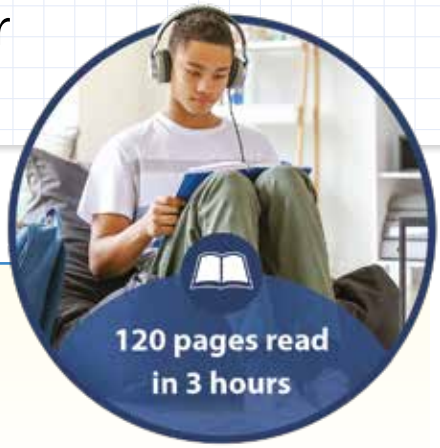
d. How much is the convenience fee?

4 **a.** The graph of a linear function passes through the points $(-6, 26)$ and $(9, -39)$. Write an equation for the function. Show your work.

SOLUTION

b. What is the *y*-intercept of the line?

Develop Writing an Equation for a Linear Function from a Verbal Description



➤ **Read and try to solve the problem below.**

Kadeem spends the afternoon reading a book he started yesterday. He reads 120 pages in 3 hours. One hour after Kadeem begins reading, he is on page 80. Write an equation for the page he is on, y, as a function of minutes spent reading, x. What page number was he on when he started reading today?

TRY IT

Math Toolkit graph paper, straightedges, tracing paper

DISCUSS IT

Ask: How did you begin to solve the problem?

Share: The first thing I did was . . .

➤ **Explore different ways to write an equation for a linear function from a verbal description.**

Kadeem spends the afternoon reading a book he started yesterday. He reads 120 pages in 3 hours. One hour after Kadeem begins reading, he is on page 80. Write an equation for the page he is on, *y*, as a function of minutes spent reading, *x*. What page number was he on when he started reading today?

Picture It

You can graph the function.

Plot the point **(60, 80)**.

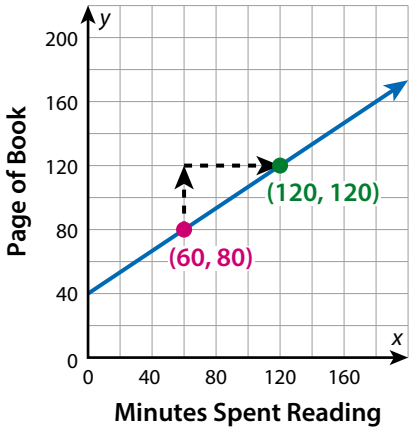
Find the rate of change, which is the slope of the line.

120 pages in 3 hours is 120 pages in 180 minutes.

$\text{slope} = \frac{120}{180} = \frac{40}{60} = \frac{2}{3}$

Use the slope to plot another point at **(120, 120)**.

Draw a line through the points and identify the *y*-intercept.



Model It

You can calculate the rate of change and initial value.

$\frac{120 \text{ pages}}{3 \text{ hours}}$ can be written as $\frac{120 \text{ pages}}{180 \text{ minutes}}$.

The rate of change is $\frac{2}{3}$ page per minute.

To find the initial value, use the equation for a linear function. Then substitute the **rate of change** and the point **(60, 80)**.

$y = mx + b$

$80 = \frac{2}{3}(60) + b$

CONNECT IT

Use the problem from the previous page to help you understand how to write an equation for a linear function from a verbal description.

1. What does the point (60, 80) represent?

2. Use the graph in **Picture It** to estimate the *y*-intercept. Check your estimate by solving the equation in **Model It** to find the value of *b*. What does this value represent in this situation?

3. Write the equation for the page Kadeem is on as a function of minutes he spends reading.

4. What is the rate of change in pages per hour? Write an equation for the page Kadeem is on as a function of hours spent reading.

5. Use the equations you wrote in problems 3 and 4 to find the page that Kadeem was on after 3 hours, or 180 minutes, of reading. Are your answers the same?

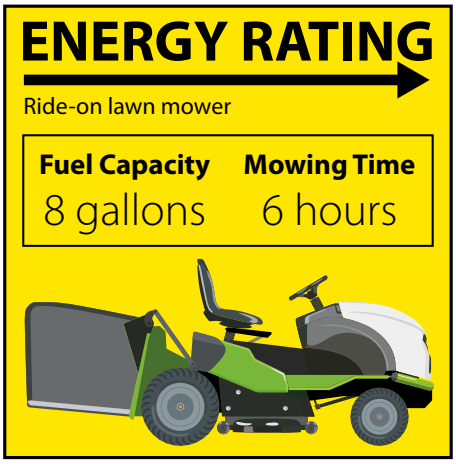
6. Do the different equations in problems 3 and 4 represent the same function? Explain.

7. **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

Use what you learned to solve these problems.

8 A lawn mower has the given energy rating. A full tank of gas can power the lawn mower for about 6 hours. What equation can be used to find the amount of gas left in the tank, *y*, as a function of the mowing time, *x*? Show your work.



SOLUTION _____

9 The graph of a linear function passes through the point (–2, –7). When the input increases by 3, the value of the function increases by 8. What is the equation that models the function?

10 Aniyah is driving home at a constant speed. After 20 minutes, she is 70 miles from home. After 1 hour, she is 40 miles from home. What equation models her distance from home, *y*, as a function of time, *x*? Show your work.

SOLUTION _____

Practice Writing an Equation for a Linear Function from a Verbal Description

➤ **Study the Example showing how to write an equation for a linear function from a verbal description. Then solve problems 1–4.**

Example

Dolores is making a music video using a drone. She sets the drone on a platform 1 meter above the ground. Then she uses the controls to make it rise at a constant rate. The drone reaches a height of 16 meters in 5 seconds. What is the equation for the drone's height, *y*, as a function of time, *x*?

At 0 seconds, the drone is 1 meter above the ground.

At 5 seconds, the drone is 16 meters above the ground.

rate of change: $\frac{16-1}{5-0} = \frac{15}{5} = 3$ initial value: 1

Use the equation for a linear function, $y = mx + b$.

$y = 3x + 1$

1 The drone in the Example hovers at 16 meters for a few minutes before being lowered at a constant rate. It reaches the ground after 6 seconds.

a. Why can the drone's descent be modeled by a linear function?

b. The linear model of the drone's descent gives its height as a function of time. Is the rate of change positive or negative? Explain.

c. What equation models the drone's descent as time increases? Show your work.

SOLUTION _____

Vocabulary

initial value
in a linear function, the value of the output when the input is 0.

linear function
a function that can be represented by a linear equation.

rate of change
in a linear relationship between *x* and *y*, it tells how much *y* changes when *x* changes by 1.

2 The Drama Club is selling tie-dye T-shirts as a fundraiser. They buy the dyeing materials for $60 and white T-shirts for $2.50 each. They sell the finished shirts for $10 each.

a. Write an equation for the money they spend, y, as a function of the number of T-shirts they buy, x.

b. Write an equation for the money they collect, y, as a function of the number of T-shirts they sell, x.

c. Write an equation for their profit, y, as a function of the number of T-shirts they sell, x.

3 On his first birthday, Tomás was 30 inches tall. For the next year, he grew half an inch each month. What equation models his height during that year, y, as a function of the number of months, x?

4 Write an equation for each linear function described below.

a. The value of the function at $x = -2$ is 0. The value of the function at $x = 8$ is -25.

b. The graph of the function has a y-intercept of 13. When x increases by 1, y decreases by 4.

c. The graph of the function intersects the y-axis at $y = 18$ and intersects the x-axis at $x = -15$.

d. The function describes a proportional relationship. Its graph passes through the point (3, 7).

Refine Using Functions to Model Linear Relationships

➤ **Complete the Example below. Then solve problems 1–9.**

Example

A swimming pool is being filled at a constant rate of 6 gallons per minute. After 1 minute, there are 8 gallons of water in the pool. What equation represents this function?

Look at how you could use the rate of change and a point to write the equation.

The rate of change is 6.

The 8 gallons of water in the pool after 1 minute is represented by the point (1, 8) on the graph of the function.

$y = mx + b$

$8 = 6(1) + b$

$2 = b$

SOLUTION _____

CONSIDER THIS . . .
The information given represents the slope and a point on the line when the function is graphed.

PAIR/SHARE
What does 2 represent in this situation?

Apply It

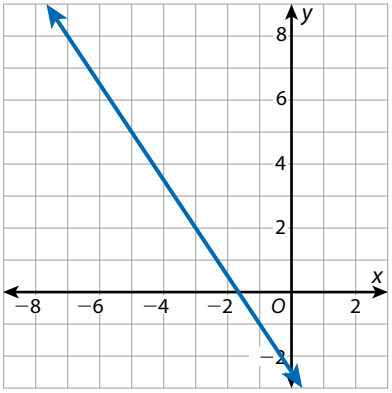
1 Celsius (C) and Fahrenheit (F) are two different scales for measuring temperature. The freezing point of water is 0°C, or 32°F. The boiling point of water is 100°C, or 212°F. Write an equation that shows the temperature in degrees Fahrenheit as a function of the temperature in degrees Celsius. Show your work.

CONSIDER THIS . . .
Are the Celsius temperatures the input values or output values?

PAIR/SHARE
How can you write an equation for temperature in degrees Celsius as a function of temperature in degrees Fahrenheit?

SOLUTION _____

2 What is the equation of the function shown by the graph? Show your work.



CONSIDER THIS . . .
How can you find the rate of change for the function?

PAIR/SHARE
Can you use the graph to check your answer? Explain.

SOLUTION

3 Lillie uses some birthday money to open a bank account. Then she deposits the same amount into the account each week. The equation $y = 35x + 100$ represents the total amount in the account after x weeks. What does the initial value of the function represent?

A The amount deposited each week

B The amount used to open the bank account

C The total amount in the account after the first week of saving

D The total amount in the account after x weeks

Chloe chose A as the correct answer. How might she have gotten that answer?

CONSIDER THIS . . .
What point on the graph of the function represents the initial value?

PAIR/SHARE
How much did Lillie use to open the bank account? How much does she deposit each week?

4 Javier and Ellema both get their cars washed and fill their gas tanks at the same gas station. Javier pays $26.96 for a car wash and 5.6 gallons of gas. Ellema pays $48.62 for a car wash and 13.2 gallons of gas.

a. What is an equation for the cost of gas and a car wash as a function of the amount of gas bought? Show your work.

SOLUTION

b. What does each variable represent?

c. What are the initial value and the rate of change of the function? What does each one represent?

5 Which savings plan can be modeled by $y = 50x + 25$?

A Start with $50. Save $25 each week.

B Save $250 in 5 weeks for a total of $300.

C Start with $25. The total saved after 5 weeks is $275.

D The total saved is $25 the first week and $50 the second week.

6 Does the table show a linear function? Explain.

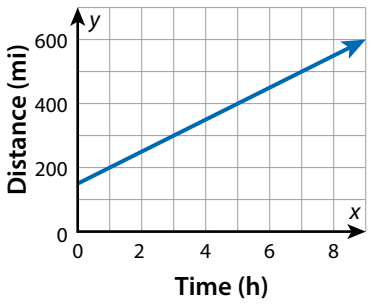
x	0	2	5	10
y	20	30	40	50

7 The equation $y = 0.15x + 0.40$ represents the cost of mailing a letter weighing 1 ounce or more. In the equation, x represents the weight of the letter in ounces and y represents the cost in dollars of mailing the letter. In this situation, the _____ is a function of the _____.

8 Tell whether the information given is enough to write an equation for the linear function.

	Yes	No
a. The initial value and the rate of change of the function	○	○
b. The slope of the line and the rate of change of the function	○	○
c. The slope of the line and one point on the line that is not the y-intercept	○	○
d. The y-intercept of the line and the value of the function at $x = 5$	○	○
e. The y-intercept of the line and the value of the function at $x = 0$	○	○

9 **Math Journal** The graph shows distance as a function of time. Write an equation for the line. Then describe a situation that could be represented by the graph. Include the initial value and rate of change for the function. Then tell what each quantity represents in this situation.



End of Lesson Checklist

- ☐ **INTERACTIVE GLOSSARY** Find the entry for *initial value*. Give an example of a situation that can be modeled by a linear function with an initial value of 30.
- ☐ **SELF CHECK** Go back to the Unit 4 Opener and see what you can check off.