

Essential Question

How can you compare two rates graphically?

1 ACTIVITY: Comparing Unit Rates

Work with a partner. The table shows the maximum speeds of several animals.

- Find the missing speeds. Round your answers to the nearest tenth.
- Which animal is fastest? Which animal is slowest?
- Explain how you convert between the two units of speed.

Animal	Speed (miles per hour)	Speed (feet per second)
Antelope	61.0	
Black mamba snake		29.3
Cheetah		102.6
Chicken		13.2
Coyote	43.0	
Domestic pig		16.0
Elephant		36.6
Elk		66.0
Giant tortoise	0.2	
Giraffe	32.0	
Gray fox		61.6
Greyhound	39.4	
Grizzly bear		44.0
Human		41.0
Hyena	40.0	
Jackal	35.0	
Lion		73.3
Peregrine falcon	200.0	
Quarter horse	47.5	
Spider		1.76
Squirrel	12.0	
Thomson's gazelle	50.0	
Three-toed sloth		0.2
Tuna	47.0	

Slope

In this lesson, you will

- find the slopes of lines.
- interpret the slopes of lines as rates.

2

ACTIVITY: Comparing Two Rates Graphically**Math Practice****Apply Mathematics**

How can you use the graph to determine which animal has the greater speed?

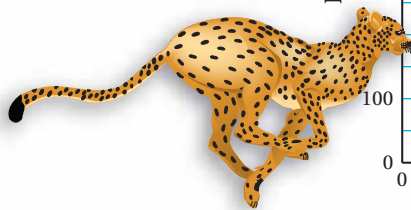
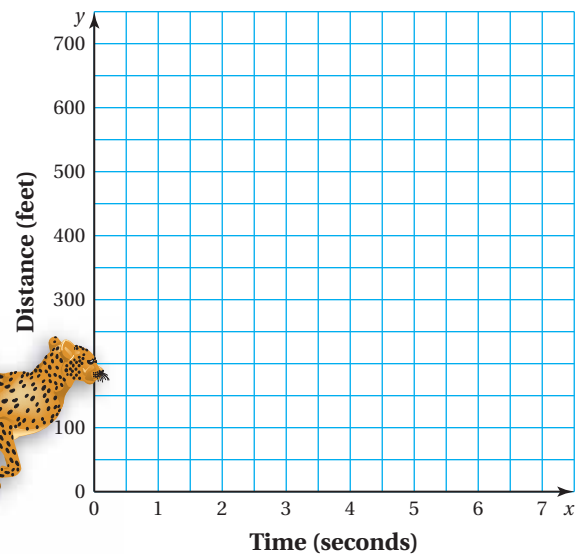
Work with a partner. A cheetah and a Thomson's gazelle run at maximum speed.

- a. Use the table in Activity 1 to calculate the missing distances.

	Cheetah	Gazelle
Time (seconds)	Distance (feet)	Distance (feet)
0		
1		
2		
3		
4		
5		
6		
7		



- b. Use the table to write ordered pairs. Then plot the ordered pairs and connect the points for each animal. What do you notice about the graphs?
- c. Which graph is steeper? The speed of which animal is greater?

**What Is Your Answer?**

3. **IN YOUR OWN WORDS** How can you compare two rates graphically? Explain your reasoning. Give some examples with your answer.
4. **REPEATED REASONING** Choose 10 animals from Activity 1.
 - a. Make a table for each animal similar to the table in Activity 2.
 - b. Sketch a graph of the distances for each animal.
 - c. Compare the steepness of the 10 graphs. What can you conclude?

Key Vocabulary

slope, p. 194

Study Tip

The slope of a line is the same between any two points on the line because lines have a *constant* rate of change.

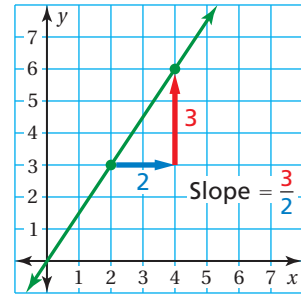
Key Idea

Slope

Slope is the rate of change between any two points on a line. It is a measure of the *steepness* of a line.

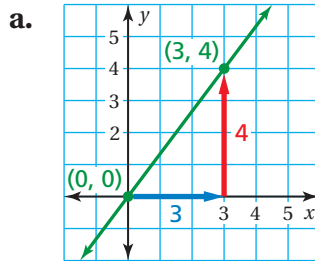
To find the slope of a line, find the ratio of the **change in y** (vertical change) to the **change in x** (horizontal change).

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$



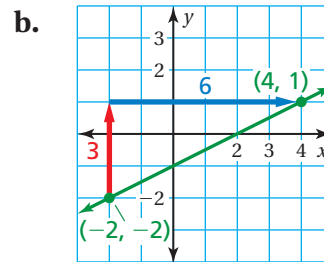
EXAMPLE 1 Finding Slopes

Find the slope of each line.



$$\begin{aligned} \text{slope} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{4}{3} \end{aligned}$$

∴ The slope of the line is $\frac{4}{3}$.



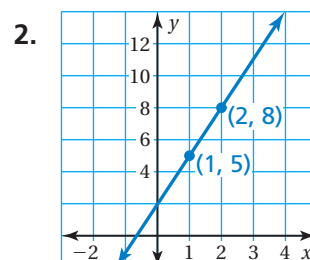
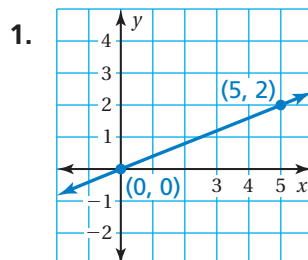
$$\begin{aligned} \text{slope} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{3}{6} = \frac{1}{2} \end{aligned}$$

∴ The slope of the line is $\frac{1}{2}$.

On Your Own

Find the slope of the line.

Now You're Ready
Exercises 4–9

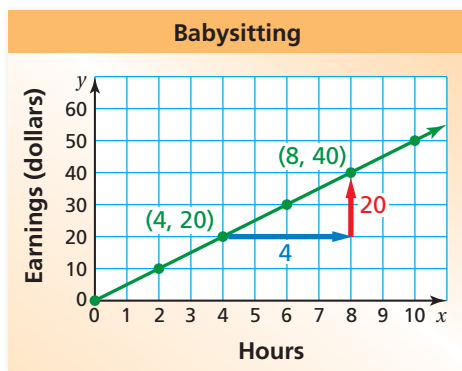


EXAMPLE 2 Interpreting a Slope

The table shows your earnings for babysitting.

- Graph the data.
- Find and interpret the slope of the line through the points.

Hours, x	0	2	4	6	8	10
Earnings, y (dollars)	0	10	20	30	40	50



- Graph the data. Draw a line through the points.
- Choose any two points to find the slope of the line.

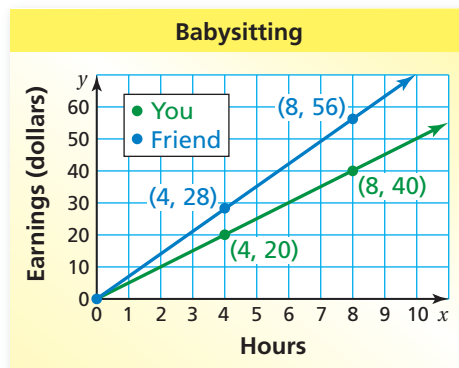
$$\begin{aligned}
 \text{slope} &= \frac{\text{change in } y}{\text{change in } x} \\
 &= \frac{20}{4} \quad \leftarrow \text{dollars} \\
 &= 5 \quad \leftarrow \text{hours}
 \end{aligned}$$

- The slope of the line represents the unit rate. The slope is 5. So, you earn \$5 per hour babysitting.

On Your Own

Now You're Ready
Exercises 10 and 11

- In Example 2, use two other points to find the slope. Does the slope change?
- The graph shows the amounts you and your friend earn babysitting.

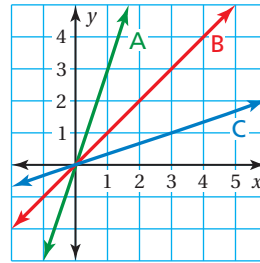


- Compare the steepness of the lines. What does this mean in the context of the problem?
- Find and interpret the slope of the blue line.

5.5 Exercises

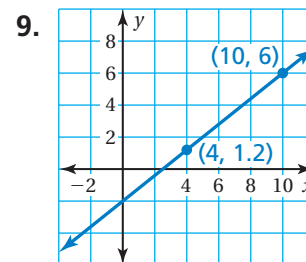
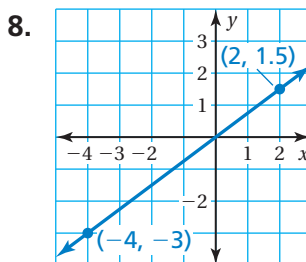
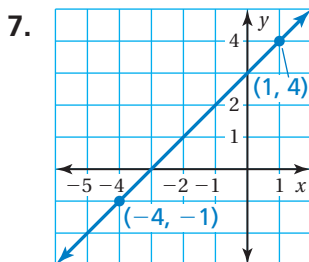
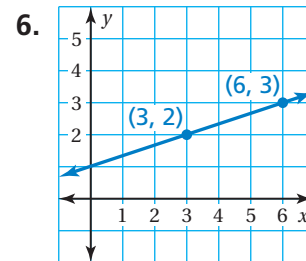
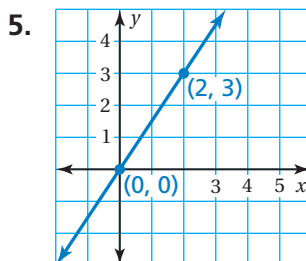
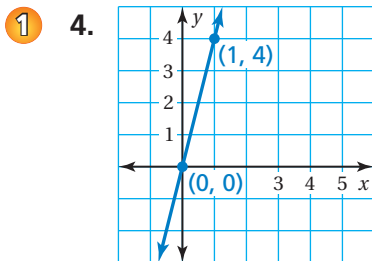
Vocabulary and Concept Check

- VOCABULARY** Is there a connection between rate and slope? Explain.
- REASONING** Which line has the greatest slope?
- REASONING** Is it more difficult to run up a ramp with a slope of $\frac{1}{5}$ or a ramp with a slope of 5? Explain.



Practice and Problem Solving

Find the slope of the line.



Graph the data. Then find and interpret the slope of the line through the points.

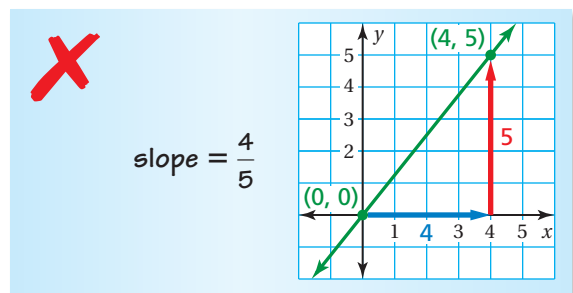
2 10.

Minutes, x	3	5	7	9
Words, y	135	225	315	405

11.

Gallons, x	5	10	15	20
Miles, y	162.5	325	487.5	650

12. **ERROR ANALYSIS** Describe and correct the error in finding the slope of the line passing through $(0, 0)$ and $(4, 5)$.



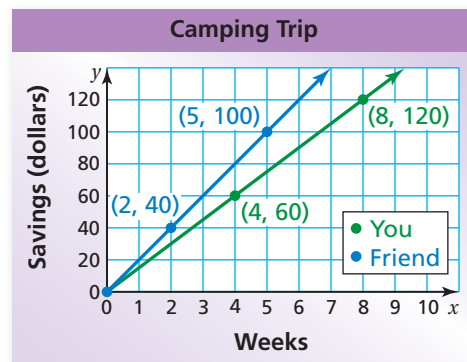
Graph the line that passes through the two points. Then find the slope of the line.

13. $(0, 0), \left(\frac{1}{3}, \frac{7}{3}\right)$

14. $\left(-\frac{3}{2}, -\frac{3}{2}\right), \left(\frac{3}{2}, \frac{3}{2}\right)$

15. $\left(1, \frac{5}{2}\right), \left(-\frac{1}{2}, -\frac{1}{4}\right)$

16. **CAMPING** The graph shows the amount of money you and a friend are saving for a camping trip.



- Compare the steepness of the lines. What does this mean in the context of the problem?
- Find the slope of each line.
- How much more money does your friend save each week than you?
- The camping trip costs \$165. How long will it take you to save enough money?

17. **MAPS** An atlas contains a map of Ohio. The table shows data from the key on the map.



Distance on Map (mm), x	10	20	30	40
Actual Distance (mi), y	25	50	75	100

- Graph the data.
- Find the slope of the line. What does this mean in the context of the problem?
- The map distance between Toledo and Columbus is 48 millimeters. What is the actual distance?
- Cincinnati is about 225 miles from Cleveland. What is the distance between these cities on the map?

18. **CRITICAL THINKING** What is the slope of a line that passes through the points $(2, 0)$ and $(5, 0)$? Explain.

19. **Number Sense** A line has a slope of 2. It passes through the points $(1, 2)$ and $(3, y)$. What is the value of y ?



Fair Game Review what you learned in previous grades & lessons

Multiply. (Section 2.4)

20. $-\frac{3}{5} \times \frac{8}{6}$

21. $1\frac{1}{2} \times \left(-\frac{6}{15}\right)$

22. $-2\frac{1}{4} \times \left(-1\frac{1}{3}\right)$

23. **MULTIPLE CHOICE** You have 18 stamps from Mexico in your stamp collection. These stamps represent $\frac{3}{8}$ of your collection. The rest of the stamps are from the United States. How many stamps are from the United States? (Section 3.4)

(A) 12

(B) 24

(C) 30

(D) 48