

## 3.2 Slope

### 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<br>(miles per hour) | Speed<br>(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                      |                            |

2

**ACTIVITY: Comparing Two Rates Graphically**

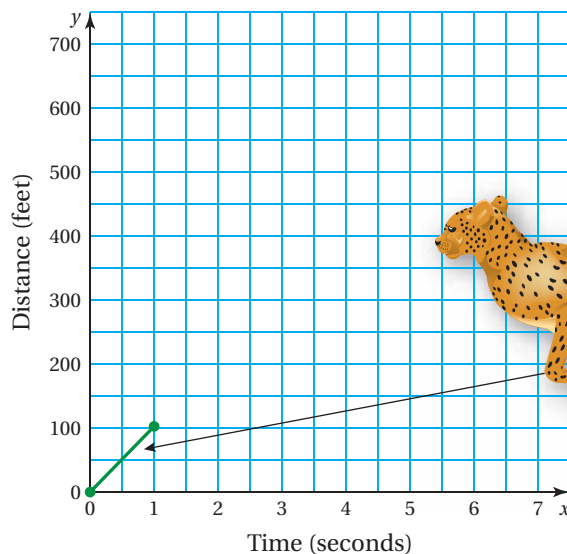
Work with a partner. A cheetah and a Thomson's gazelle are running at constant speeds.

- a. Find the missing distances.

|                | Cheetah         | Gazelle         |
|----------------|-----------------|-----------------|
| Time (seconds) | Distance (feet) | Distance (feet) |
| 0              | 0               | 0               |
| 1              | 102.6           |                 |
| 2              |                 |                 |
| 3              |                 |                 |
| 4              |                 |                 |
| 5              |                 |                 |
| 6              |                 |                 |
| 7              |                 |                 |



- b. Use the table to complete the line graph for each animal.



- c. Which graph is steeper? The speed of which animal is greater?

## What Is Your Answer?

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

## Key Vocabulary

slope, p. 106

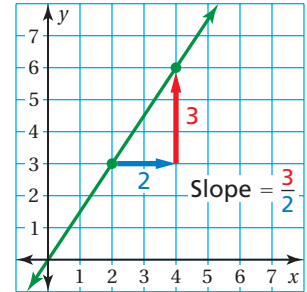
## Key Idea

### Slope

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

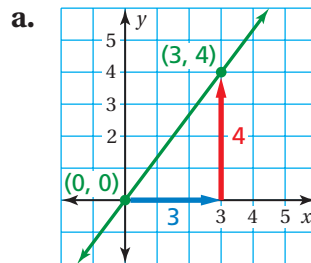
To find the slope of a line, find the ratio of the **change in y** (vertical change) to the **change in x** (horizontal change).

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



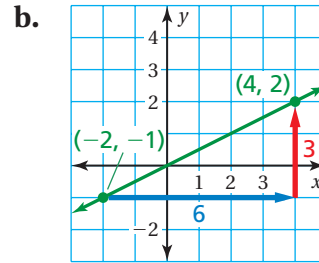
## EXAMPLE 1 Finding Slopes

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  $\frac{4}{3}$ .



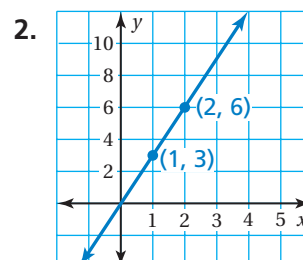
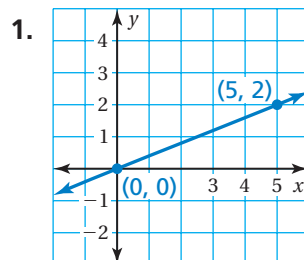
$$\begin{aligned} \text{slope} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{3}{6} = \frac{1}{2} \end{aligned}$$

∴ 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

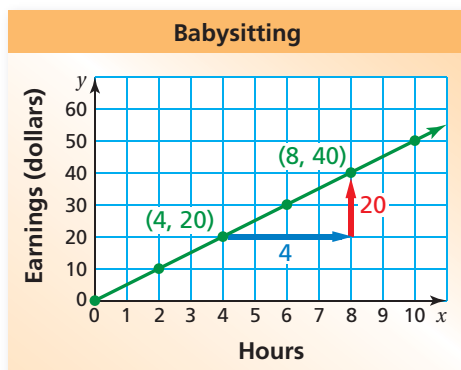


## EXAMPLE 2 Finding a Slope

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, $y$<br>(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.

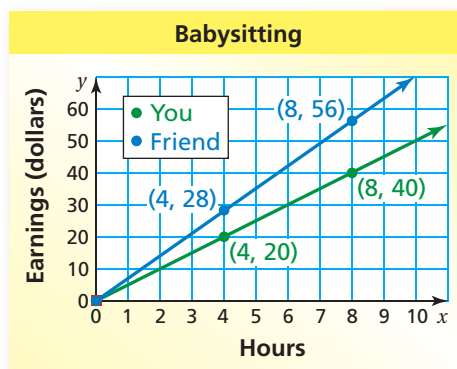
$$\begin{aligned} \text{slope} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{20}{4} \quad \leftarrow \text{dollars} \\ &= 5 \quad \leftarrow \text{hours} \end{aligned}$$

∴ The slope of the line 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 earnings of you and your friend for babysitting.

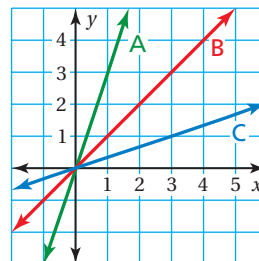


- Compare the steepness of the lines. What does this mean in the context of the problem?
- Find and interpret the slope of the blue line.

# 3.2 Exercises

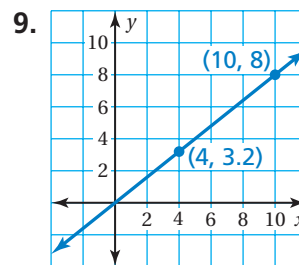
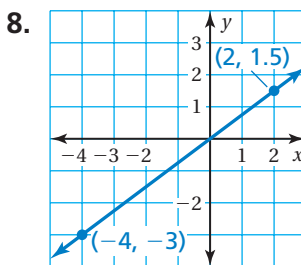
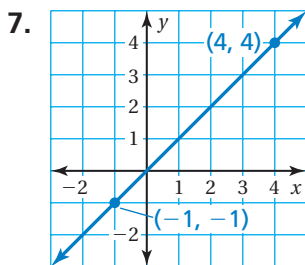
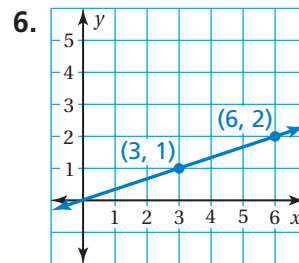
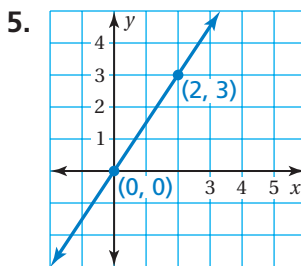
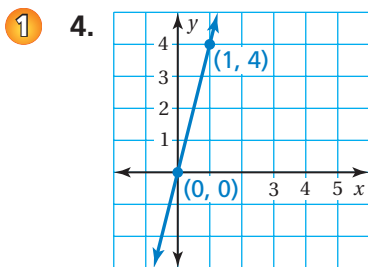
## Vocabulary and Concept Check

- 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 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 |

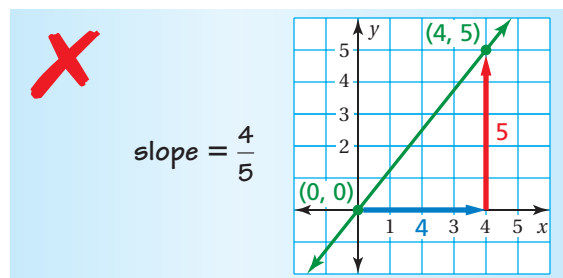
Graph the line that passes through the two points. Then find the slope of the line.

12.  $(0, 0), (5, 8)$

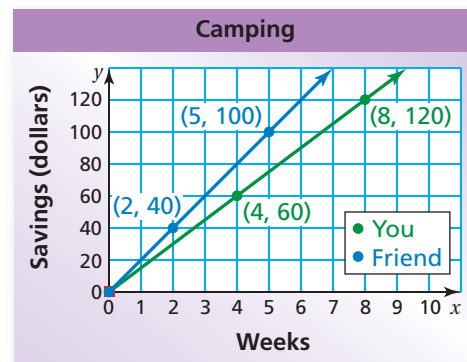
13.  $(-2, -2), (2, 2)$

14.  $(10, 4), (-5, -2)$

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



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** The table shows data from a key to a map of Ohio.



| 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

Copy and complete the statement using  $<$ ,  $>$ , or  $=$ . (Section 2.1)

20.  $\frac{9}{2}$    $\frac{8}{3}$

21.  $-\frac{8}{15}$    $\frac{10}{18}$

22.  $\frac{-6}{24}$    $\frac{-2}{8}$

Multiply. (Section 2.3)

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

24.  $1\frac{1}{2} \times \left(-\frac{6}{15}\right)$

25.  $-2\frac{1}{4} \times -1\frac{1}{3}$

26. **MULTIPLE CHOICE** You have 18 stamps from Mexico in your stamp collection. These stamps are  $\frac{3}{8}$  of your collection. The rest of the stamps are from the United States. How many stamps are from the United States? (Section 2.5)

(A) 12

(B) 24

(C) 30

(D) 48