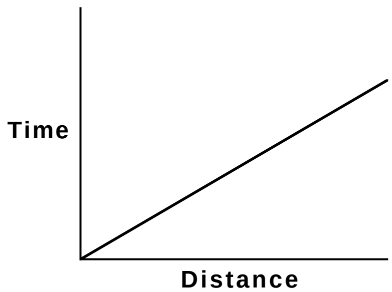
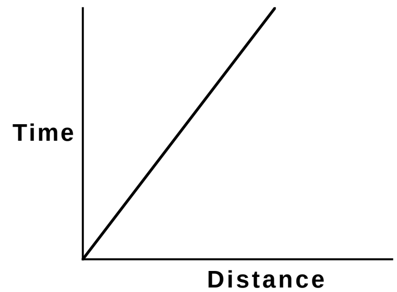
Name ______________________ Date ________ Class ______________

GRAPHING AND ORGANIZING DATA

Slope of a Line

A line graph is a useful way of examining the relationship between different variables. For example, suppose that you often ride your bicycle to your friend's house. On two of these rides you record how much distance you cover every 30 s. When you graph your data, you have the following:





Both graphs show the same two variables, but the line on the right is much steeper than the one on the left. This difference tells you something about the relationship between the *x* and *y* variables in the two graphs.

Steepness of a Line Shows the Rate of Change

The lines in each graph represent distances covered in certain time intervals. Distance is measured along the *y*-axis, and time is measured along the *x*-axis. If more distance (*y*) is covered in the same amount of time (*x*), then the line must rise higher on the *y*-axis in the same distance on the *x*-axis. In other words, the steepness of the line shows how quickly the variable on the *y*-axis changes relative to the variable on the *x*-axis. If the line is steep, the *y* variable changes quickly.

This Rate of Change Is Called Slope

A line's steepness is called its *slope*. The slope of a straight line can be found by dividing the change in the *y*-axis by the change in the *x*-axis.

Math Skills

What is the slope of a line that runs through the points (3,2) and (5,9)?

Solution

1. Write the equation. As indicated above, the slope is equal to the change in the *y* coordinates divided by the change in the *x* coordinates. The Greek letter Δ is often used for the words "change in," so Δy should be read as "change in *y*."

$$slope = \frac{\Delta y}{\Delta x}$$

2. Substitute known values in for the variables. To find the change in *y*, subtract the first *y* coordinate from the second one. Similarly, to find the change in *x*, subtract the first *x* coordinate from the second one.

$$slope = \frac{\Delta y}{\Delta x} = \frac{(9-2)}{(5-3)}$$

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GRAPHING AND ORGANIZING DATA

Slope of a Line *continued*

3. Simplify the equation.

$$slope = \frac{(9-2)}{(5-3)} = \frac{7}{2}$$

Math Skills

In any equation of the form $y = mx + b$, m is equal to the slope of the line. Find the slope of the line given by the equation $3y - 12x = 9$.

Solution

1. Rearrange and simplify the equation to the form $y = mx + b$.

$$3y - 12x = 9 \qquad 3y = 12x + 9$$

$$y = \frac{12x+9}{3} \qquad y = 4x + 3$$

2. Compare your equation to the equation $y = mx + b$. The number that corresponds to the m in $y = mx + b$ is the slope of the line. In the equation $y = mx + b$, m is the number by which x is multiplied. In the equation $y = 4x + 3$, 4 is the slope of the line.

Practice

1. Find the slope of a line that runs through the points (1,2) and (6,3).

2. Suppose you have a line graph with kilometers on the y-axis and minutes on the x-axis. If your line indicates that in 2.0 minutes you travel 0.4 km and in 5.0 minutes you travel 1.0 km, what is the slope of the line?

3. What common term can be used to describe the slope of the line you found in problem 2? (**Hint:** The slope of the line in problem 2 is an indication of how much distance is traveled in a certain amount of time.)

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