

Name: \_\_\_\_\_

## Skill Builder

## Calculating Slope

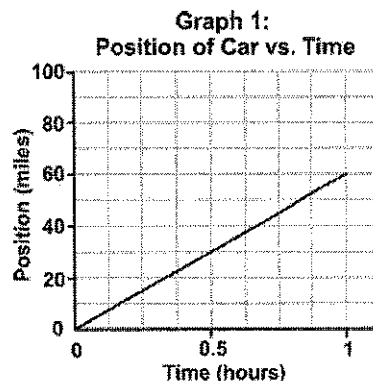
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How do you use a graph to make predictions? One way is to find a mathematical relationship between the variables by finding the slope of the line. This skill sheet will help you master calculating slope and making predictions from graphs.

### 1. What is slope?

You are going on a road trip. Graph 1 shows how the position of your car changes with time. On this graph, the starting point of the trip is represented by the point (0,0).

1. What information is represented on the y (vertical) axis of the graph?  
\_\_\_\_\_
2. What information is represented on the x (horizontal) axis of the graph?  
\_\_\_\_\_
3. What does the line in the graph tell you about your road trip?  
For example, is your speed changing or staying the same?  
\_\_\_\_\_



Since the line in the graph is straight with no curves, it is *linear*. We can also describe what this line looks like by its *slope*. Slope tells how steep a line is. Slope is calculated by finding the ratio of the “rise” of the line (its vertical change) to the “run” of the line (its horizontal change).

### 2. Slope equals rise over run

The slope of the graph to the right can be determined by first choosing two points along the line. The two points chosen for this graph are (0,0) and (5,10). The format for writing pairs of point is: (x, y).

The next step is to make a right triangle. The line segment between the two chosen points is the hypotenuse of the triangle. The sides of the triangle are formed as shown on the graph.

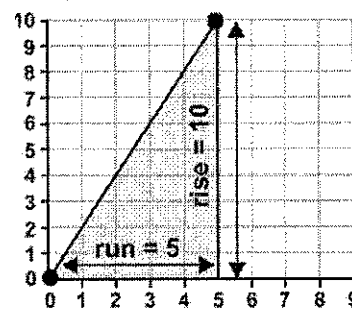
The height or “rise” of the triangle is 10. The length of the base or “run” of the triangle is 5.

Calculate the slope of the line using the equation:

$$\text{slope of a line} = \frac{\text{rise}}{\text{run}}$$

1. What is the slope of the line in Graph 2?  
\_\_\_\_\_
2. Is the point (2.5, 5) on the line in Graph 2? How do you know?  
\_\_\_\_\_

Graph 2: The Slope of a Graph



### 3. Calculating slope using an equation for a line

Two points on a line can be represented as:  $(x_1, y_1)$  and  $(x_2, y_2)$ . The equation for calculating the slope using these two points is:

$$\text{slope of line} = \frac{y_2 - y_1}{x_2 - x_1}$$

The slope of a line is the rate of change. By knowing the rate of change of a line (the slope), you can write an equation for a line that will help you make predictions if you are given a value for either  $x$  or  $y$ .

The equation for a line is:

$$y = m(x) + b$$

where:

$m$  = slope of the line

$b$  = y-intercept (the  $y$  value when  $x$  is equal to zero)

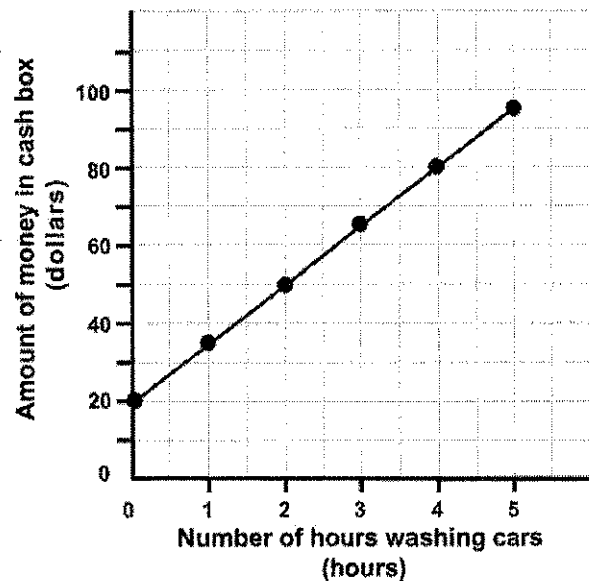
1. Chose two points on the line in Graph 3. Calculate the slope of the line.

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2. The y-intercept of a line is the  $y$  value when the  $x$  value is equal to zero. What is the y-intercept of the line in Graph 3?

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3. You now know the the value for slope ( $m$ ), and the  $y$  intercept ( $b$ ). Write the equation for the line in Graph 3.

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4. A friend wants to have a car wash next weekend, but she only wants to wash cars for 3 hours. Use the graph to predict how much money would be in the cash box (if they start with \$20 for making change) after three hours of washing cars. Hint: You know the  $x$  value, the slope, and the  $y$ -intercept. You need to calculate the  $y$  value.

Graph 3: Money in cash box at car wash vs. hours washing cars



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5. Use the equation for the line to predict how much the car wash will earn washing cars if you work for five hours per day for eight Saturdays. The class trip costs \$500.00. Will you earn enough money from washing cars to pay for the class trip?
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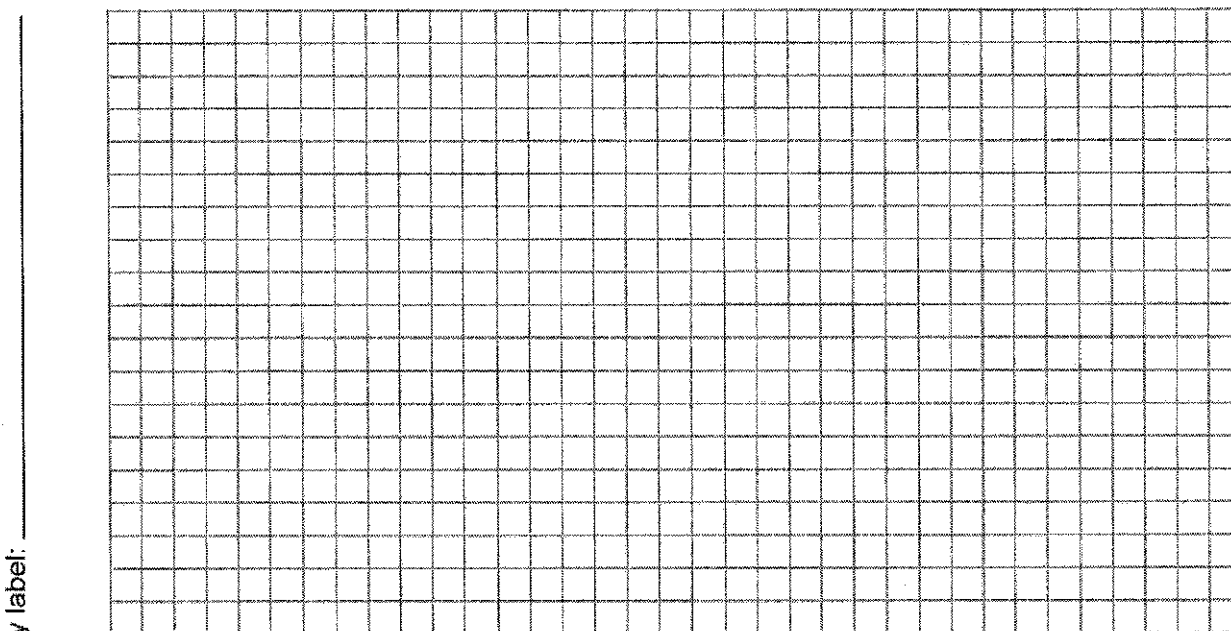
#### 4. Practice with calculating slope

Make a graph of the data below using the grid provided. Be sure to label the  $x$ -axis and the  $y$ -axis.

Road Trip Data

$x$ Time (hours)	$y$ Distance traveled (kilometers)
0	0
1	10
2	20
3	30
4	40
5	50
6	60

Title: \_\_\_\_\_



x label: \_\_\_\_\_

1. What is the slope of the line for the road trip data set?

2. What is the  $y$ -intercept of this data set?

3. Write the equation of the line for this data set.

## 5. Additional questions

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1. You know that the slope of a line is equal to 3 and the  $y$ -intercept is equal to 1.
- a. Write the equation for this line.

- b. Using this equation for the line, come up with five pairs of coordinates ( $x$  and  $y$  values) that work in this equation.
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2. Two points on a line are: (2, 8) and (6, 10). What is the slope of this line?
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3. You have been give two equations for calculating slope. How are these two equations similar?

$$\text{slope of a line} = \frac{\text{rise}}{\text{run}}$$

$$\text{slope of a line} = \frac{y_2 - y_1}{x_2 - x_1}$$

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