



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

Date: \_\_\_\_\_

## Student Exploration: Slope-Intercept Form of a Line

**Vocabulary:** slope, slope-intercept form, y-intercept

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. Your friend offers to pay you \$10 plus \$2 per day if you will watch his dog while he's on vacation. Another friend offers you \$15 plus \$1 per day to watch her dog during the same time. You cannot do both jobs. Tell which job you would choose and explain why.

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2. A third friend offers you a flat \$20 to watch his dog during the same time. Tell whether you would choose this job over either of the other two and explain why.

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### Gizmo Warm-up

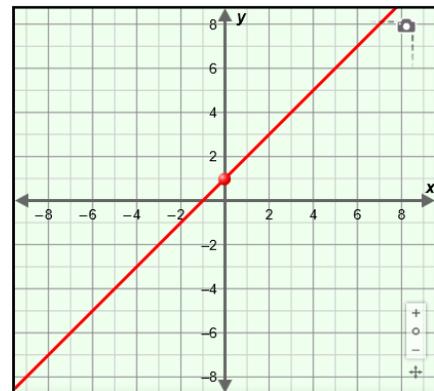
In the *Slope-Intercept Form of a Line* Gizmo, you can graph a line and manipulate its equation in **slope-intercept form** ( $y = mx + b$ ).

1. In the Gizmo, drag the point on the  $y$ -axis of the graph. Then, on the **CONTROLS** tab, drag the  $b$  slider. (You can also change  $b$  by clicking in the text field, typing a new value, and hitting **Enter**.) What changes about the line?

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2. In the Gizmo, drag the line on the graph (not by the point). Then use the slider or the text field to change the value of  $m$ .

A. What changes about the line? \_\_\_\_\_

B. What stays the same about the line? \_\_\_\_\_

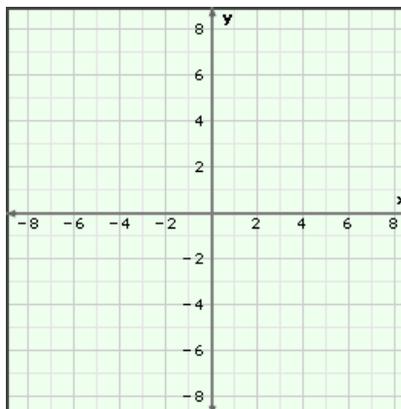


<b>Activity A:</b> <b>The equation</b> $y = mx + b$	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>Be sure <b>Show triangle</b> is turned off.</li> </ul>	$y = mx + b$
		$y = x + 1$

1. Consider the line with the equation  $y = 2x + 1$ .

- A. Substitute the  $x$ -values shown in the table below into the equation to find several points on the line  $y = 2x + 1$ . Plot the points on the grid and draw the line. Then check your work by graphing the line in the Gizmo and clicking on the **TABLE** tab.

$x$	$y$
-3	
-2	
-1	
0	
1	
2	
3	



- B. Where does your line cross the  $y$ -axis? \_\_\_\_\_ This is the graph's **y-intercept**.
- C. In general, the  $y$ -intercept of the line  $y = mx + b$  is  $b$ . Explain why that makes sense.

\_\_\_\_\_

- D. Study the table. By how much does  $y$  change as  $x$  increases by 1? \_\_\_\_\_

Where is this value in the equation  $y = 2x + 1$ ? \_\_\_\_\_

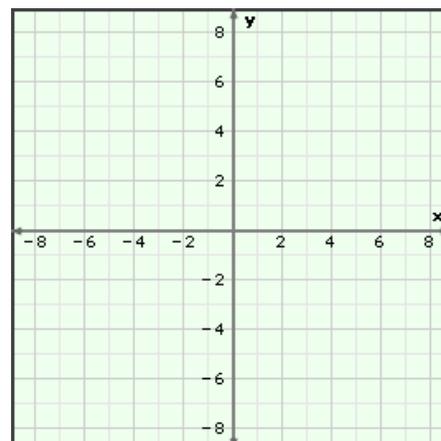
- E. On the **CONTROLS** tab, select **Show triangle** to see how the **slope** relates to the line. How can you graph the equation using just the slope and the  $y$ -intercept?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- F. Use the method you described above to graph  $y = \frac{2}{5}x - 4$  to the right. Check in the Gizmo.



**(Activity A continued on next page)**

### Activity A (continued from previous page)

2. Turn off **Show triangle**. In the Gizmo, set  $b$  to  $-5$ .

A. Vary the slope of the line in the Gizmo. Write the equations, in slope-intercept form, of three different lines with a  $y$ -intercept of  $-5$ .

\_\_\_\_\_

B. If you know the  $y$ -intercept of a line, what else do you need to write its equation?

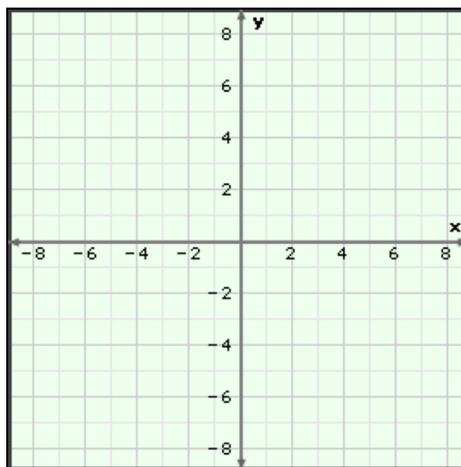
\_\_\_\_\_

C. In the blanks below, write the equations, in slope-intercept form, of three different lines with a  $y$ -intercept of  $1.5$ . Sketch the graphs of the lines on the grid to the right. Label each with its equation. Check your work in the Gizmo.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



3. A line contains the points  $(-5, 0)$  and  $(0, -3)$ .

A. What is the equation, in slope-intercept form, of the line that contains both of these points? \_\_\_\_\_

B. Explain how you found the equation above. \_\_\_\_\_

\_\_\_\_\_

C. Graph this equation in the Gizmo. Explain how you can check if both  $(-5, 0)$  and  $(0, -3)$  lie on this line. \_\_\_\_\_

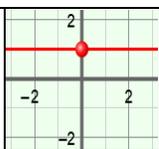
\_\_\_\_\_

4. Write the equation, in slope-intercept form, of each line described below. Then check your answers in the Gizmo.

A.  $y$ -intercept =  $0$ , slope =  $-6$  \_\_\_\_\_

B.  $y$ -intercept =  $-1$ , slope =  $\frac{4}{5}$  \_\_\_\_\_



<b>Activity B:</b> <b>Horizontal and vertical lines</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click on the <b>CONTROLS</b> tab.</li> <li>• Turn on <b>Show triangle</b>.</li> </ul>	
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1. Drag the line in the Gizmo until it is horizontal.

A. Write the slope, y-intercept, and equation of your line below.

slope = \_\_\_\_\_ y-intercept = \_\_\_\_\_ equation: \_\_\_\_\_

B. Click on the **TABLE** tab. What do you notice about the coordinates of the points?

\_\_\_\_\_

C. Click on the **CONTROLS** tab. In the Gizmo, graph several other horizontal lines. Write the equations of three of your lines below.

\_\_\_\_\_

D. What is the general equation of a horizontal line? \_\_\_\_\_

E. Why does it make sense that the graph of an equation like that is a horizontal line?

\_\_\_\_\_

2. Drag the line in the Gizmo until it is vertical.

A. Write the slope and equation of your line. slope = \_\_\_\_\_ equation: \_\_\_\_\_

B. Click on the **TABLE** tab. When  $x = 0$ , what is  $y$ ? \_\_\_\_\_ Why do you think this is true? \_\_\_\_\_

C. Sketch several vertical lines on the grid to the right. Label each line with its equation. (Note: This Gizmo does not allow most vertical lines.)

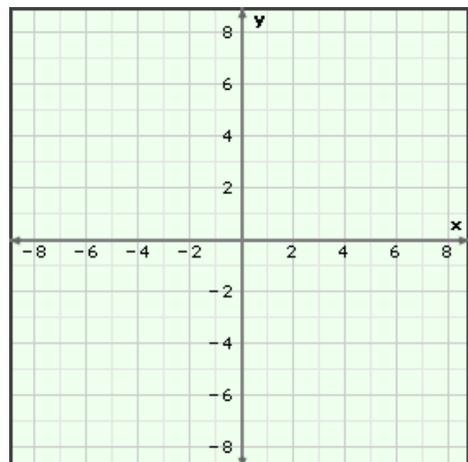
D. What is the general equation of a vertical line?

\_\_\_\_\_

E. Why does it make sense that the graph of an equation like that is a vertical line?

\_\_\_\_\_

\_\_\_\_\_



<b>Activity C:</b> <b>Using <math>y = mx + b</math></b>	<u>Get the Gizmo ready:</u>	<b>x</b>	<b>y</b>
	<ul style="list-style-type: none"> <li>Click on the <b>CONTROLS</b> tab.</li> <li>Turn off <b>Show triangle</b>.</li> </ul>	0	25.00
		1	33.00
		2	41.00
		3	49.00
		4	57.00

Maggie is in charge of finding a company to print t-shirts for her softball team. She's decided to go with T-Shirts & More. They charge a \$25 set-up fee plus \$8 per shirt.

1. You can write an equation in slope-intercept form ( $y = mx + b$ ) to describe this situation.

A. What is the value of  $b$ ? \_\_\_\_\_ Why? \_\_\_\_\_

\_\_\_\_\_

B. What is the value of  $m$ ? \_\_\_\_\_ Why? \_\_\_\_\_

\_\_\_\_\_

C. What is the equation in slope-intercept form for this situation? \_\_\_\_\_

D. What do  $x$  and  $y$  represent?  $x =$  \_\_\_\_\_  $y =$  \_\_\_\_\_

E. Graph your equation in the Gizmo. Click the zoom out button (←) until the  $y$ -intercept appears. Explain why part of this graph doesn't apply to this situation. \_\_\_\_\_

\_\_\_\_\_

F. Click on the **TABLE** tab. Change the **MIN** and **MAX** values to show the cost for up to 25 shirts. What is the cost of 10 shirts? \_\_\_\_\_

2. Maggie decides to add the team logo to every shirt. This increases the cost by \$2 per shirt.

A. What is the new equation in slope-intercept form? \_\_\_\_\_

Explain: \_\_\_\_\_

B. Sketch this new line on the grid to the right.

C. What is the cost of 10 shirts? \_\_\_\_\_

D. Given your answer to the previous question, what point must be on the graph of this line? \_\_\_\_\_

Use the **TABLE** in the Gizmo to check your answer.

