LESSON 3

Objective

Given a set of ordered pairs, graph the line and write an equation for it in $y = mx + b$ form.

Common Core State Standards

- **8.F.4** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Functions

Lines in Slope-Intercept Form

By now students are familiar with equations in the form of $y = mx + b$. They've learned that the slope (m) means "the rise over the run" and that the y-intercept (b) is the point at which the line intersects the y-axis. This activity will help students determine a line, in slope-intercept form, from a table of values.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Ask:** *Why is the x-value of the y-intercept always zero?*
- **Ask:** *What are the other points on this line? How can we use the equation to check?*
- **Ask:** *How can you use the equation to show that (6, 3) is not on the line?*

Solve It

Reread the problem with students. Ask students to explain in writing how knowing the y-intercept and the slope of a line helps them graph the line.

More Ideas

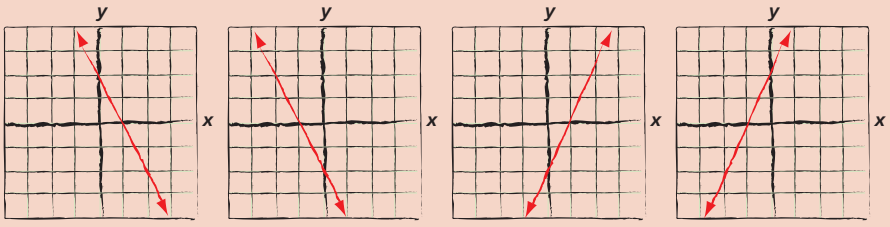
For another way to teach about slope and intercept—

- Have students work in pairs. Have them set up their pegboards for Quadrant I graphing. One student places a peg anywhere on the y-axis and another peg anywhere in the quadrant. The other student stretches a rubber band between the two pegs and then writes the equation for the line using the $y = mx + b$ format. Have students alternate roles and repeat several times.

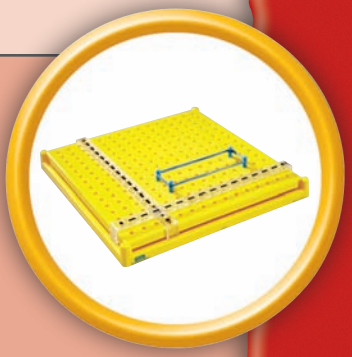
Formative Assessment

Have students try the following problem.

Which graph below is the graph of the equation $y = 2x + 2$*?*



A. B. C. D.



Try It! 20 minutes | Pairs

Here is a problem about graphing a line in slope-intercept form.

Peter would like to visit his grandmother, but he must take a taxicab to her house. (She will give him a ride home.) The table below shows the rates the cab company charges.

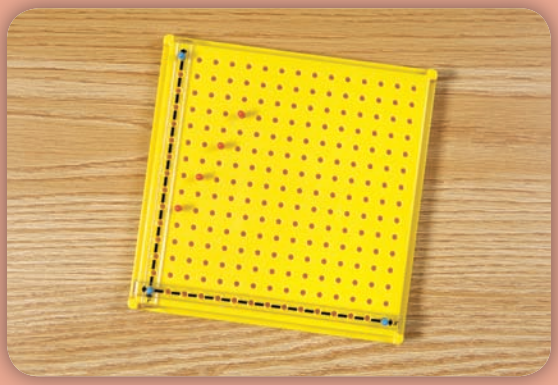
Miles	1	2	3	4
Total	$5	$7	$9	$11

How much will it cost Peter for cab fare if his grandmother lives 7 miles away?

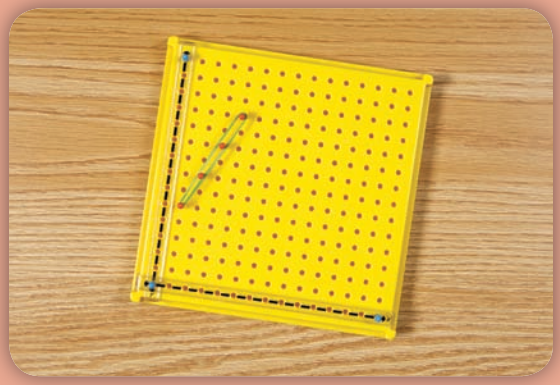
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials

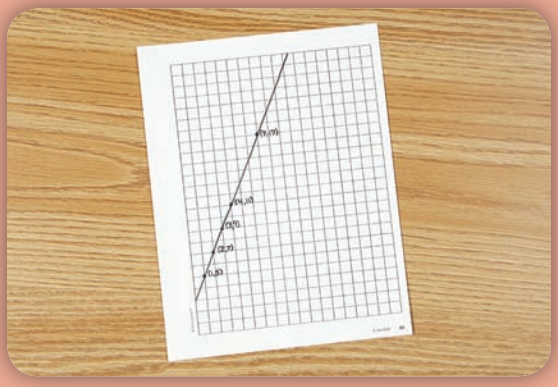
- XY Coordinate Pegboard
- $\frac{1}{4}$-Inch Grid Paper (BLM 6; 1 per student)



1. Have students set up their pegboards for Quadrant I graphing. Then have them plot the values from the table.



2. Have students stretch a rubber band from (1, 5) to (4, 11). **Ask:** *How do you determine the slope of the line?* Elicit from students that you go "up 2 and over 1." **Say:** *This means that the ratio of rise over run is 2:1.*



⚠ Look Out!

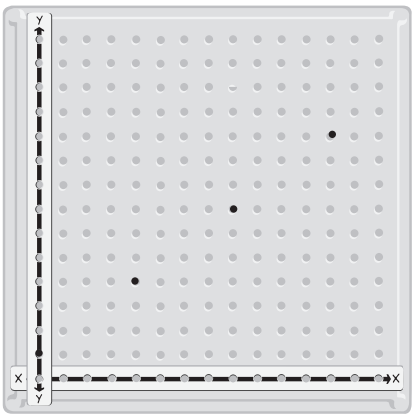
Some students may confuse the *y*-intercept with the *x*-intercept. Explain that when *x* is 0, the point is on the *y*-axis. That is why that point is called the *y*-intercept.

3. Have students transfer their graphs to the grid paper. **Ask:** *How do you determine the y-intercept of the line?* Make sure students understand that in order to find the *y*-intercept they must determine the value of *y* when $x = 0$. They can do this by extending the line through the *y*-axis. Have students write the equation of the line in the form of $y = mx + b$. **Ask:** *How much will it cost Peter for cab fare if his grandmother lives 7 miles away?* Have students locate the correct value on their graph.

Answer Key

Use an XY Coordinate Pegboard to plot the ordered pairs. Make a table. Write the equation of the line in the form $y = mx + b$. (Check students' work.)

1.



x	y
0	1
4	4
8	7
12	10

$m = \frac{3}{4}$

$b = 1$

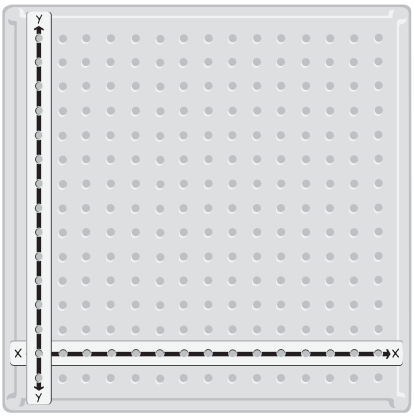
$y = \frac{3}{4}x + 1$

Using an XY Coordinate Pegboard, model the line that contains the ordered pairs in the table. Sketch the model. Write the equation of the line in the form $y = mx + b$.

(Check students' models.)

2.

x	y
0	1
1	4
2	7
3	10
4	13



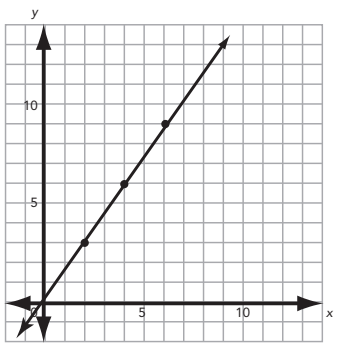
$m = 3$

$b = 1$

$y = 3x + 1$

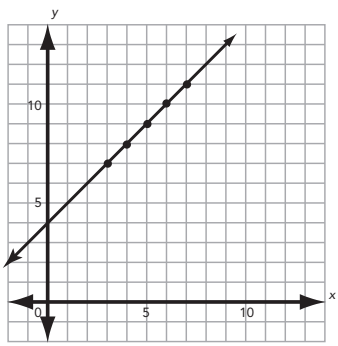
Write the equation of each line in the form $y = mx + b$.

3.



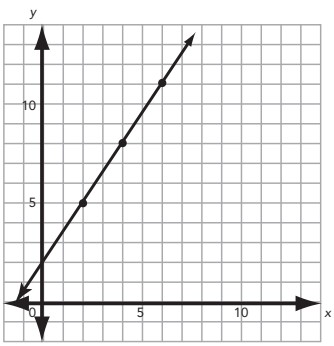
$y = \frac{3}{2}x$

4.



$y = x + 4$

5.



$y = \frac{3}{2}x + 2$

Answer Key

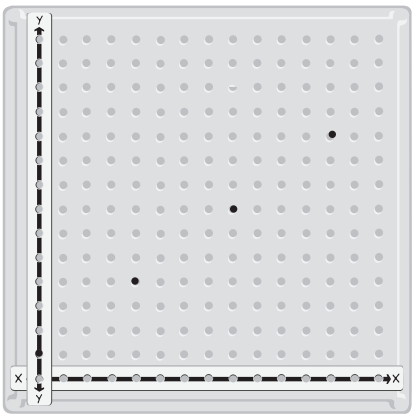
Challenge! Describe how to graph a line if all you know are the slope and *y*-intercept of the line. Draw a picture to help.

Challenge: (Sample) The slope and the *y*-intercept can be substituted into $y = mx + b$. Then from the *y*-intercept, use the slope to find another point on the graph and connect the points to graph the line.

Name _____

Use an XY Coordinate Pegboard to plot the ordered pairs. Make a table. Write the equation of the line in the form $y = mx + b$.

1.



x	*y*

m = _____

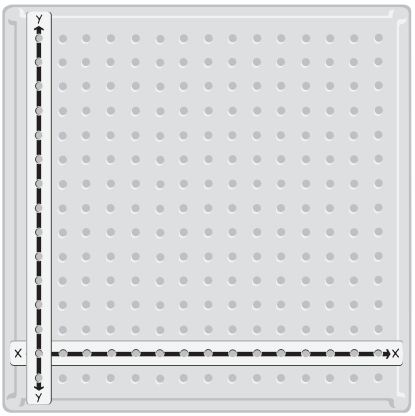
b = _____

_____

Using an XY Coordinate Pegboard, model the line that contains the ordered pairs in the table. Sketch the model. Write the equation of the line in the form $y = mx + b$.

2.

x	*y*
0	1
1	4
2	7
3	10
4	13



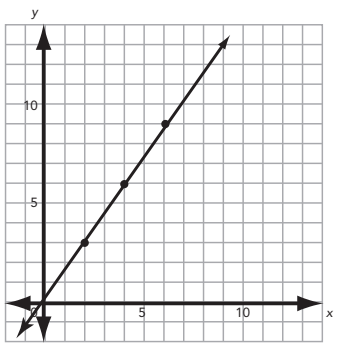
m = _____

b = _____

_____

Write the equation of each line in the form $y = mx + b$.

3.



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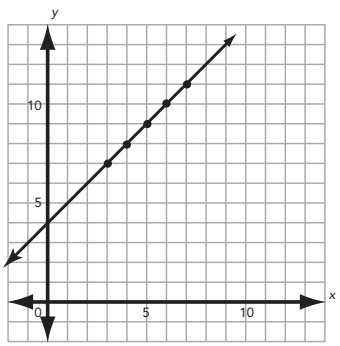
4.



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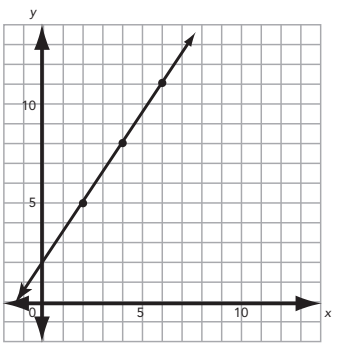
5.



_____

Name _____

Challenge! Describe how to graph a line if all you know are the slope and *y*-intercept of the line. Draw a picture to help.

$\frac{1}{4}$-Inch Grid Paper

Name _____