

## Objective

Determine the link between an algebraic equation, a corresponding table of values, and the resulting graph.

## 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

# Symbolic Algebra

The National Council of Teachers of Mathematics states “It is essential that they [students] become comfortable in relating symbolic expressions containing variables to verbal, tabular, and graphical representation of numerical and quantitative relationships.” (*Principles and Standards for School Mathematics*, page 223) To this end, this activity focuses on an introductory story and the link between its representational algebraic expression, its values in tabular form, and its graph.

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

## Talk About It

Discuss the Try It! activity.

- **Ask:** According to the story problem, what should be the value of  $y$ ?
- **Ask:** What is a good rule of thumb for determining what each peg value should be based on a given table of values?
- **Ask:** Look at the pegboard. What is the  $y$ -intercept for your equation? Why isn't it 2? Elicit from students that each hole on the  $y$ -axis represents \$15 in order to fit the graph on the pegboard.

## Solve It

Reread the problem with the students. Have them write the algebraic equation in the form of  $y = mx + b$ . Then have students create a table of values based on the equation. After the table is complete, have students graph the coordinates. Finally, have students read the results and indicate when (at the end of what week) Joshua will have enough money to buy the guitar.

## More Ideas

For another way to teach about writing algebraic equations—

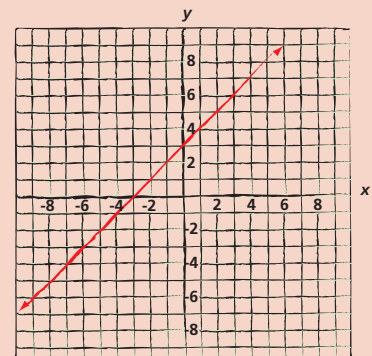
- Have students budget for something they would like to buy. **Ask:** How much money can you put toward your purchase right now? How much can you afford to put aside each week? **Say:** Write an equation for your savings plan in slope-intercept format. Create a table and graph the coordinates. **Ask:** How long will it take you to save enough to buy what you want?

## Formative Assessment

Have students try the following problem.

Which equation matches the graph?

- A.  $y = x + 3$
- B.  $y = 3x$
- C.  $y = \frac{9}{5}x + 32$
- D.  $y = 5$



# Try It!

30 minutes | Pairs

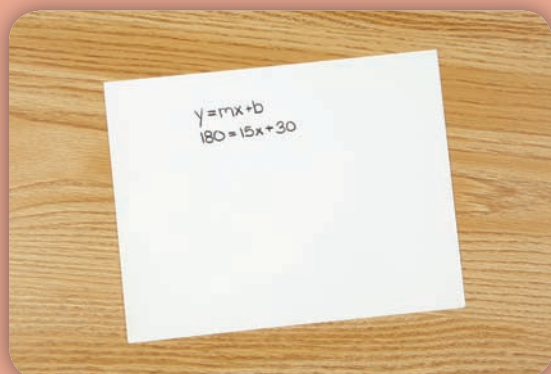
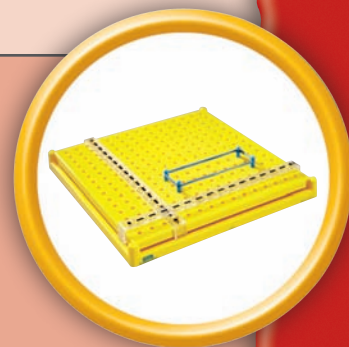
Here is a problem about solving a word problem using algebraic symbols, a table, and a graph.

*Joshua wants to buy an electric guitar that costs \$180. He already has saved \$30. He also plans to save \$15 a week toward his purchase. How many weeks must Joshua save his money before he can buy the guitar?*

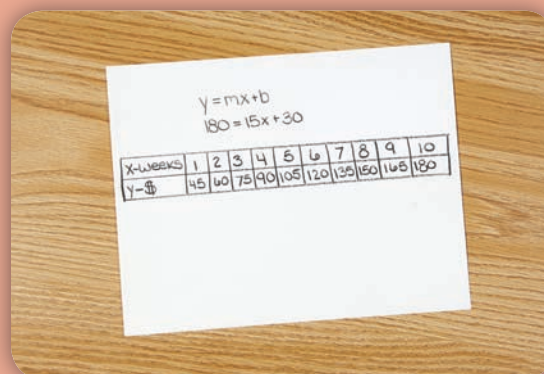
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

## Materials

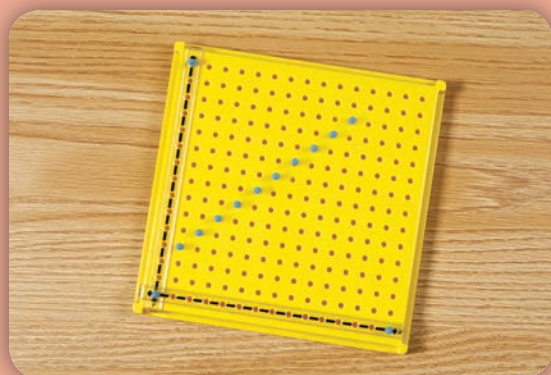
- XY Coordinate Pegboard
- paper (1 sheet per pair)
- pencils (1 per pair)



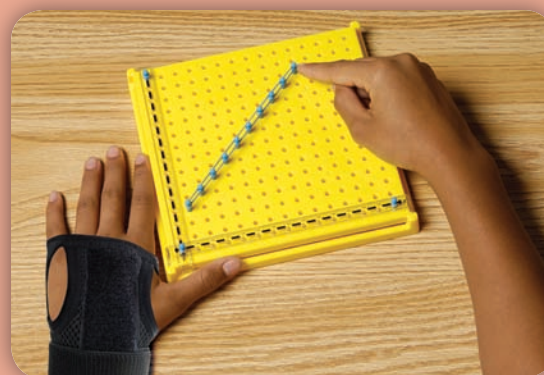
1. Help students set up an algebraic equation to represent the word problem. Have them determine what the unknown variable ( $x$ ) will represent. Have students write the algebraic equation in slope-intercept form ( $y = mx + b$ ).



2. Have students create a table of values for the equation, beginning with  $x = 1$  and ending with  $x = 10$ .



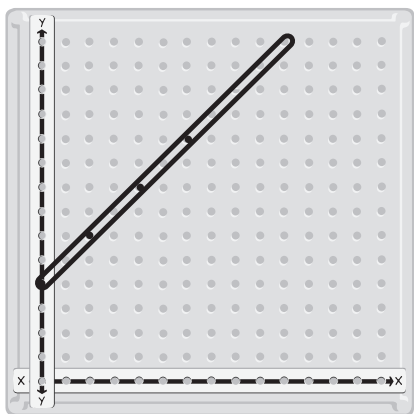
3. Have students set up their pegboards for Quadrant I graphing. **Say:** Look over the values on your table. **Ask:** What should each peg on the y-axis represent? What should each peg on the x-axis represent? Elicit from the students that each x-value should represent one week and that each y-value should represent \$15.



4. Ask students to connect the points with a rubber band to show the linear function. Have students point to the solution on their graphs.

Use an XY Coordinate Pegboard to graph the line shown on the grid. Make a table of ordered pairs for six points on the line. Write an equation for the line in the form  $y = mx + b$ . (Check students' work.)

1.

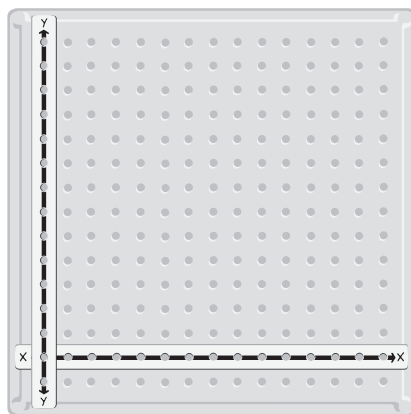


$x$	$y$
0	4
2	6
4	8
6	10
8	12
10	14

$$y = x + 4$$

Using an XY Coordinate Pegboard, graph the line for the equation given. Sketch the model. Make a table of ordered pairs for the line. (Check students' models.)

2.  $y = \frac{1}{2}x + 3$



$x$	$y$
0	3
2	4
4	5
6	6
8	7
10	8

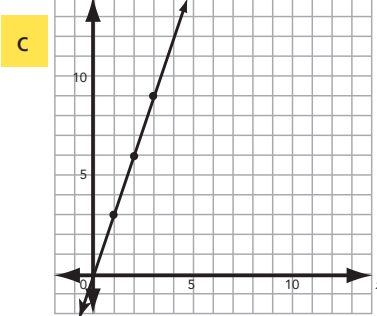
Match each representation in the top row with its equation.

3.

a

$x$	$y$
0	1
1	2
2	3
3	4
4	5

4.



5.

b

$x$	$y$
0	1
2	5
4	9
6	13
8	17

a.  $y = x + 1$

b.  $y = 2x + 1$

c.  $y = 3x$

## Answer Key

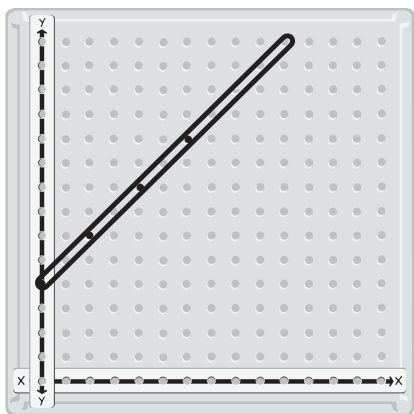
**Challenge!** For Questions 3 and 5, what information for the equation did you get directly from the table and what information did you have to make a calculation to find? Explain.

Challenge: (Sample) The  $y$ -intercept can come directly from the table, but the slope has to be calculated.

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Use an XY Coordinate Pegboard to graph the line shown on the grid. Make a table of ordered pairs for six points on the line. Write an equation for the line in the form  $y = mx + b$ .

1.

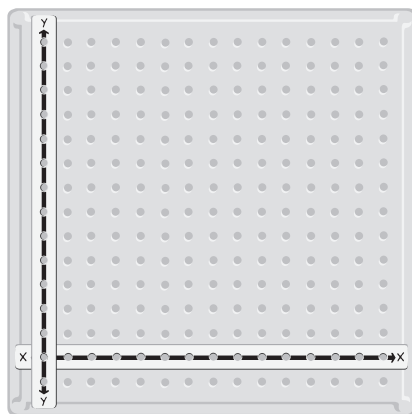


$x$	$y$

$y =$  \_\_\_\_\_

Using an XY Coordinate Pegboard, graph the line for the equation given. Sketch the model. Make a table of ordered pairs for the line.

2.  $y = \frac{1}{2}x + 3$



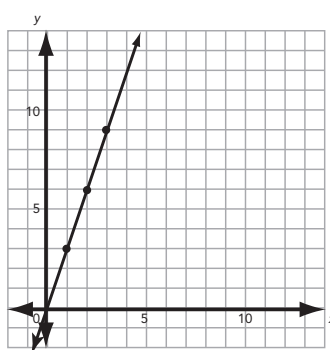
$x$	$y$

Match each representation in the top row with its equation.

3.

$x$	$y$
0	1
1	2
2	3
3	4
4	5

4.



5.

$x$	$y$
0	1
2	5
4	9
6	13
8	17

a.  $y = x + 1$

b.  $y = 2x + 1$

c.  $y = 3x$

**Challenge!** For Questions 3 and 5, what information for the equation did you get directly from the table and what information did you have to make a calculation to find? Explain.

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