## 5.5 Saving Money

### Writing Equations of Lines

## Objectives

In this lesson, you will:

- Use a point and a slope to write an equation of a line in point-slope form.
- Use a point and a slope to write an equation of a line in slope-intercept form.
- Use two points to write an equation of a line in point-slope form and in slope-intercept form.

## Key Terms

- slope-intercept form
- point-slope form

**SCENARIO** Your local community center recently offered a class to young adults about saving money. You took the class and applied what you learned in the class by saving money regularly.

### Problem 1    Saving for the Future

You started saving money regularly 6 months ago, and you have $410 in the account today. You have been meeting your goal of saving an additional $15 each week.

**A.** How much money had you saved one week ago? Show your work and use a complete sentence in your answer.

**B.** How much money had you saved one month ago? (Assume 4 weeks in a month.) Show your work and use a complete sentence in your answer.

**C.** How much money had you saved two months ago? Show your work and use a complete sentence in your answer.

**D.** Complete the table below that shows the amount of money that you have saved for different numbers of weeks.

| Time since money started to be saved regularly | Amount saved |
|:---:|:---:|
| weeks | dollars |
| 0 | |
| 4 | |
| 8 | |
| 12 | |
| 16 | |
| 20 | |
| 22 | |
| 23 | |
| 24 | |

## Investigate Problem 1

1. Use the grid below to create a graph of the table in part (D).
   First, choose your bounds and intervals. Be sure to label your
   graph clearly.

| Variable quantity | Lower bound | Upper bound | Interval |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |

(units)

(label)

(label)          (units)
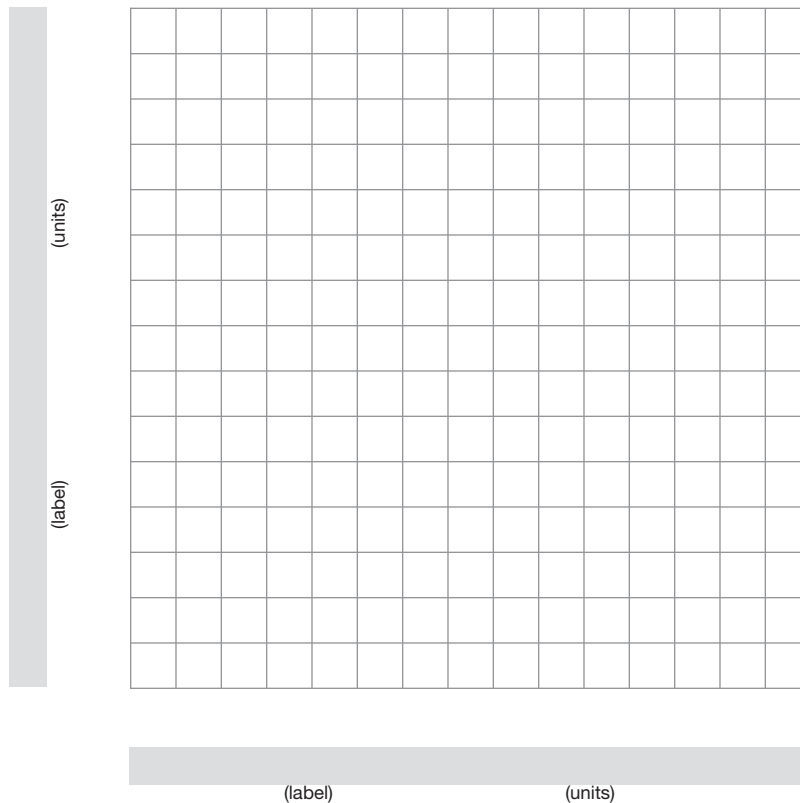
2. What is the slope of the line in your graph? Did you have to use
   the graph to determine the slope? Use complete sentences to
   explain your reasoning.

3. What is the *y*-intercept of your graph? Did you have to use the
   graph to determine the *y*-intercept? Use complete sentences to
   explain your reasoning.

4. Write an equation that gives the savings in terms of time. Use *x*
   to represent the time in weeks since you started saving money
   regularly and use *y* to represent your savings in dollars.

**5.** If you look at the original problem again, what information about the graph were you given? Use a complete sentence in your answer.

**6. Just the Math: Point-Slope Form** Instead of creating a table and a graph of the situation to use to write the equation, you can write the equation directly by using the **point-slope form** of a linear equation. The point-slope form of an equation of the line that passes through the point $(x_1, y_1)$ and has slope $m$ is

$y - y_1 = m(x - x_1)$.

What point were you given in the problem statement?

What slope were you given in the problem statement?

Write the point-slope form of the equation.

Now write the equation in slope-intercept form. Show all your work.

What do you notice? Use a complete sentence in your answer.

**7.** What does the $y$-intercept mean in terms of the problem situation?

**8.** What are the advantages of each method of finding the equation? What are the disadvantages of each method? Use complete sentences in your answer.

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## Investigate Problem 1

**9.** Write the equation of a line that passes through the given point and has the given slope. Then write the equation in slope-intercept form. Show all your work.

Passes through (–5, 6) and has slope of 3

Passes through (4, 0) and has slope of $\frac{1}{2}$

Passes through (3, –2) and has slope of –4

## Problem 2    Everybody's Saving!

A friend of yours also took the class and also started saving money regularly. She excitedly tells you that, after only 6 weeks she had $132 saved, and after 12 weeks she had $240 saved. She told you that she has been saving the same amount each week.

**A.** Do you think that you can generalize this problem situation by using a linear equation? Use complete sentences to explain your reasoning.
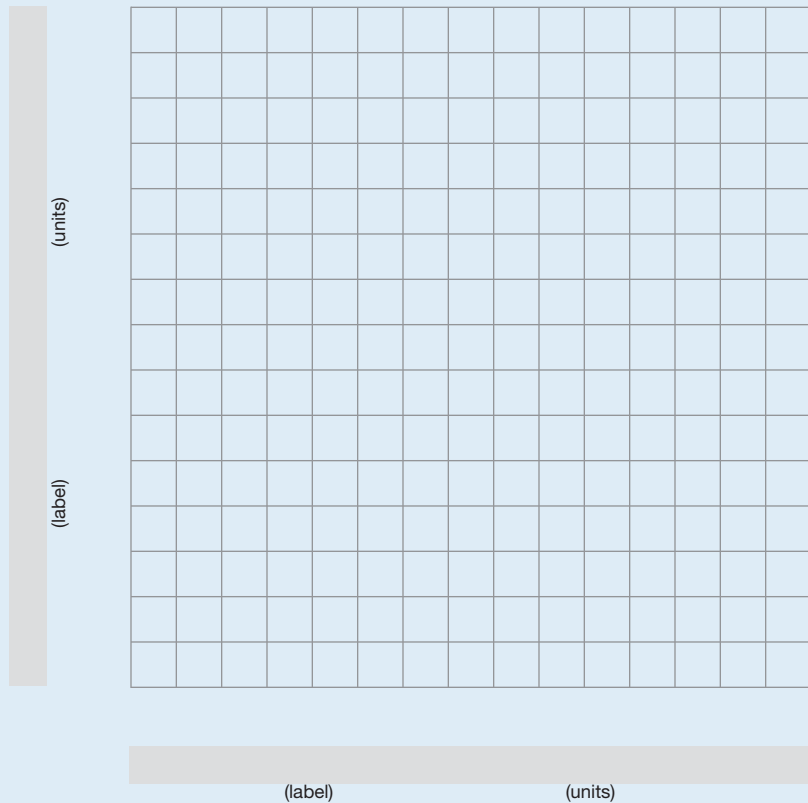
**B.** Use the grid on the next page to create a graph with the information you have so far. First, choose your bounds and intervals. Be sure to label your graph clearly.

| Variable quantity | Lower bound | Upper bound | Interval |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |

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## Problem 2  Everybody's Saving!

(units)

(label)

(label)          (units)

**C.** How does this problem differ from the previous problem? Use complete sentences to explain.

**D.** What information do you need in order to write an equation that generalizes the problem situation? Use a complete sentence in your answer.

## Investigate Problem 2

**1.** Find the slope of the line that you graphed in part (B). Show all your work.

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2. Find an equation of the line in slope-intercept form. Show all your work.

3. Could you have used either point to find the equation of the line? Use complete sentences to explain your reasoning.

4. Find an equation of the line in slope-intercept form that passes through each given set of points. Show all your work.

(–2, 2) and (1, 5)

(1, 7) and (3, 2)

(–3, 1) and (8, 1)

**Summary**    **Writing an Equation of a Line**

To write the equation of a line, you need to know at least two pieces of information:

- The slope and the $y$-intercept,
- The slope and another point on the line, or
- Two points on the line.

Then, use the slope-intercept form of the equation of a line, $y = mx + b$, to write the equation of the line.

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