Slope Intercept Form
The Leaky Bottle

ACTIVITY 3.4

SUGGESTED LEARNING STRATEGIES: Use Manipulatives, Create Representations, Discussion Group, Think/Pair/Share, Activating Prior Knowledge

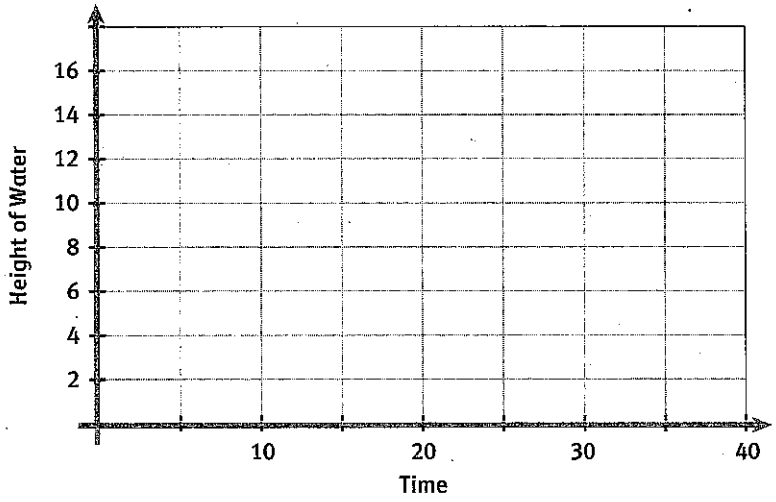
Owen's water bottle leaked in his bookbag. He did the following experiment to find how quickly water drains from a small hole placed in a water bottle.

1. Follow the steps below and fill in the table.

- Get a water bottle and a container to catch the water.
- Poke a small hole in the bottom of the water bottle
- Ensure the hole is facing down, and open the bottle cap.
- Draw a line on the bottle every 5 seconds to mark the water level.
- After the water is drained from the bottle, measure the heights at each of the times that you marked.

Time in Seconds	0	5	10	15	20	25	30	35	40
Height of Water (cm)									

2. Make a scatter plot of the data on the grid below.



3. Does the relationship between time and the height of the water appear to be linear? Explain your reasoning.

4. Is the data you collected continuous or discrete? Explain your reasoning.

5. Draw a line through the points on the scatterplot you created.

a. Find the slope of the line you drew.

b. Find the *y*-**intercept** of the line you drew.

MATH TERMS

The ***y*-intercept** of a line is the *y*-value when $x = 0$. It is the place where the line crosses the *y*-axis.

My Notes

SUGGESTED LEARNING STRATEGIES: Group Presentation, Think/Pair/Share, Create Representations

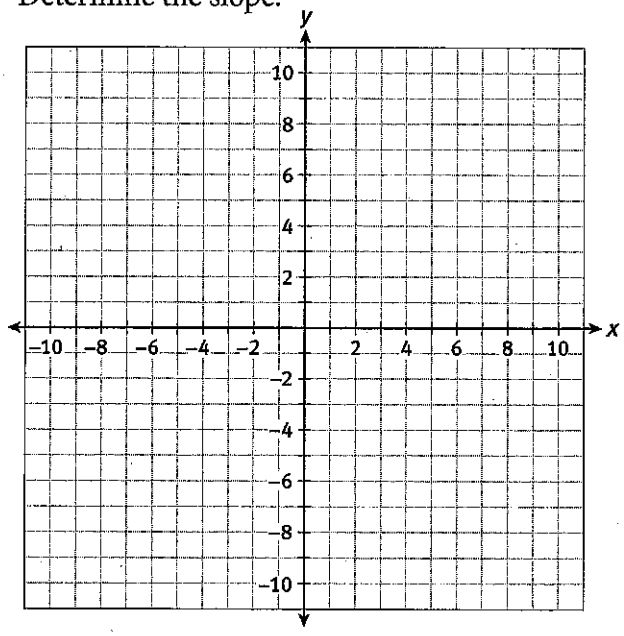
6. Write an equation that gives the height of the water H given the time t.

7. How does the coefficient of t in your equation relate to the experiment? Be certain to include appropriate units in your answer.

8. How does the constant term in the equation relate to the experiment? Be certain to include appropriate units in your answer.

9. For each linear equation below:

- Make a table of values.
- Graph using a different color for each line.
- Determine the slope.



a. $y = x$

x	$y = x$
−3	
−2	
−1	
0	
1	
2	
3	

b. $y = 2x$

x	$y = 2x$
−3	
−2	
−1	
0	
1	
2	
3	

c. $y = 4x$

x	$y = 4x$
−2	
−1.5	
−1	
0	
1	
2	
2.5	

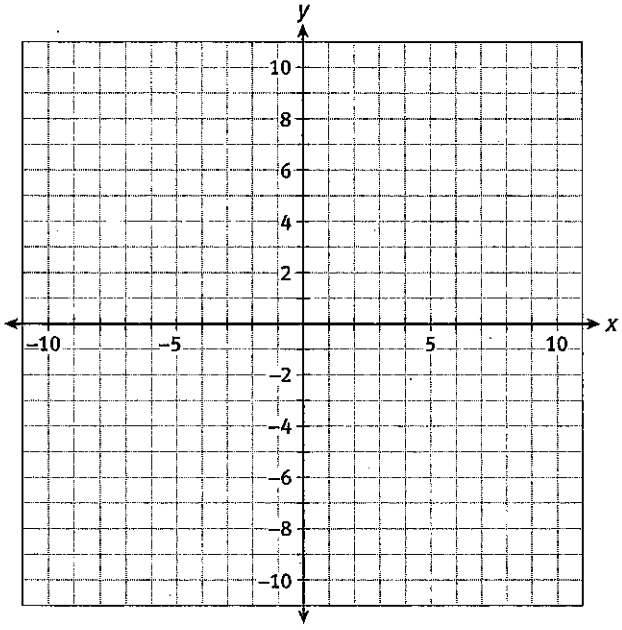
SUGGESTED LEARNING STRATEGIES: Think/Pair/Share, Create Representations, Look for a Pattern

My Notes

10. How does the slope you found for each linear equation relate to the coefficients of x in the equations for Question 9?

11. For each linear equation below:

- Make a table of values.
- Graph using a different color for each line.
- Determine the slope.



a. $y = -x$

x	$y = -x$
−3	
−2	
−1	
0	
1	
2	
3	

b. $y = -2x$

x	$y = -2x$
−3	
−2	
−1	
0	
1	
2	
3	

c. $y = -4x$

x	$y = -4x$
−2	
−1.5	
−1	
0	
1	
2	

12. How does the slope you found relate to the coefficients of x in the equations for Question 11?

13. Write an equation of a line that is:

a. Steeper (increasing) than the ones you graphed in Question 9.

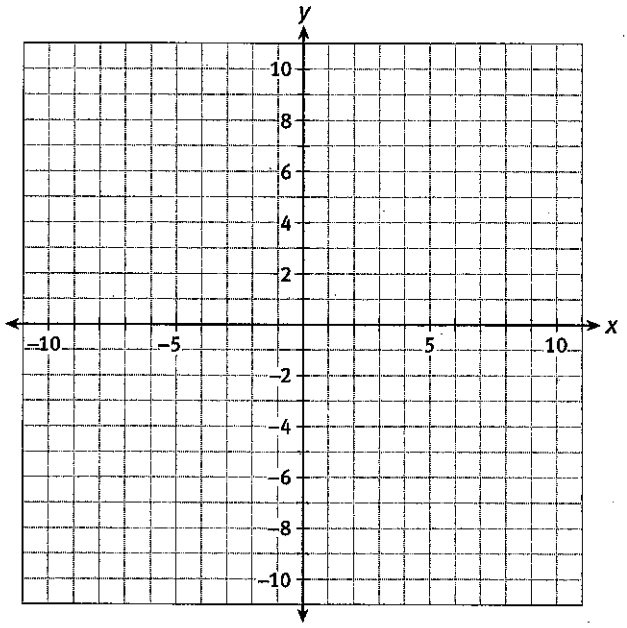
b. Steeper (decreasing) than the ones you graphed in Question 11.

My Notes

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Group Presentation, Think/Pair/Share, Guess and Check

14. For each linear equation below:

- Make a table of values.
- Graph using a different color for each line.
- Determine the slope.



a. $y = \frac{1}{2}x$ **b.** $y = \frac{1}{4}x$ **c.** $y = \frac{1}{5}x$

15. Compare and contrast the slopes you found in Questions 9, 11, and 14. Refer to the representations you've created in your comparisons. What conclusions can you draw about the slope of lines?

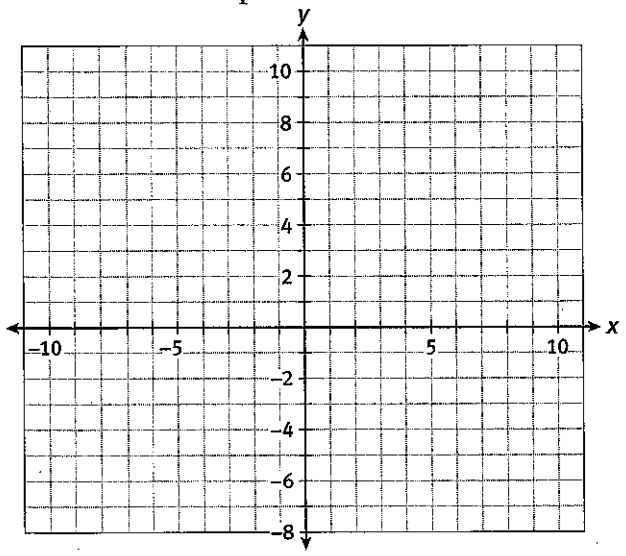
16. Write the equation of a line that is steeper than $\frac{1}{2}$ but less than one.

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Think/Pair/Share

My Notes

17. For each linear equation below:

- Make a table of values.
- Graph using a different color for each line.
- Determine the y-intercept.
- Determine the slope.



a. $y = \frac{2}{3}x + 3$ **b.** $y = \frac{2}{3}x + 6$ **c.** $y = \frac{2}{3}x - 3$

18. How is the y-intercept related to the constant term in the equations?

19. Look at the lines you graphed in item 17.

a. How do the three lines appear to be related?

b. Look at the three equations and make a conjecture based on your answer to part a.

c. What would happen to the graph of $y = \frac{2}{3}x - 3$ if it were shifted 6 units up?

d. What would happen to the graph of $y = \frac{2}{3}x + 6$ if it were shifted 9 units down?

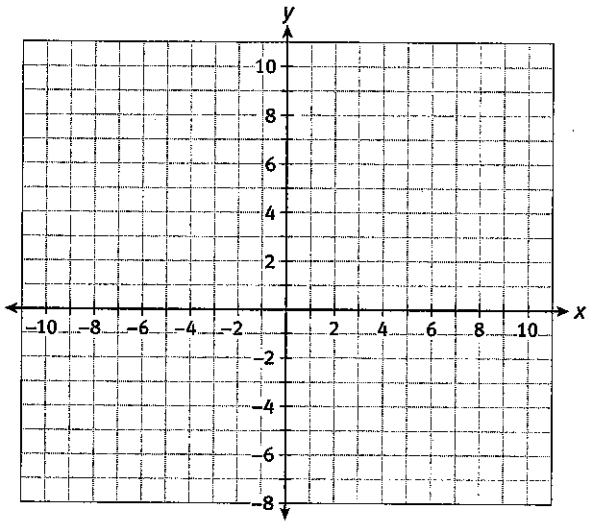
20. Identify the slope and y-intercept in each of the following equations.

a. $y = \frac{3}{2}x + 5$ **b.** $y = -x + 1$ **c.** $y = 4x - 3$

SUGGESTED LEARNING STRATEGIES: Shared Reading, Interactive Word Wall, Discussion Group, Create Representations

My Notes

21. Identify and plot the y-intercept of the equation $y = \frac{1}{2}x + 3$ on the coordinate grid and use the slope to find two more points on the line.



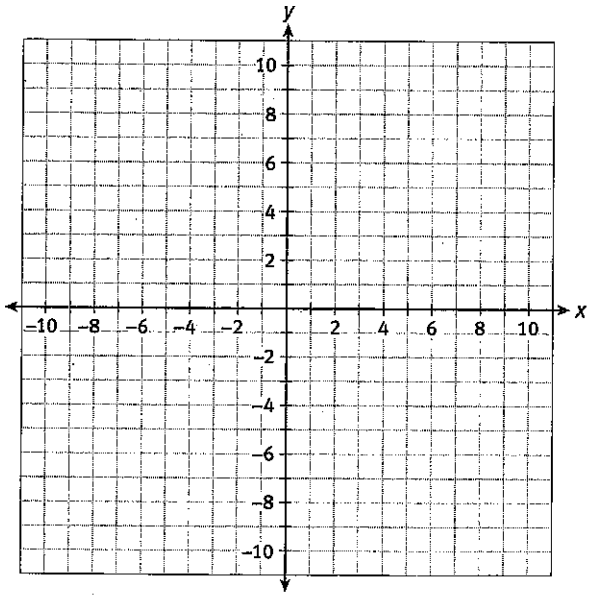
22. Sketch a line through the three points.

MATH TERMS
The **slope-intercept form** of a linear equation is $y = mx + b$, where m is the slope and b is the y-intercept.

Equations of the form $y = mx + b$ are written in **slope-intercept form**, where m is the slope of the line, and b is the y-intercept of the line.

23. Use the y-intercept and the slope to graph the following equations of lines.

a. $y = \frac{1}{3}x - 2$ **b.** $y = -2x + 1$ **c.** $y = -3x + 4$



SUGGESTED LEARNING STRATEGIES: Work Backwards, Quickwrite, Group Presentation

My Notes

24. Owen found that the equation $y = -3x + 24$ represented the water leaking from his bottle.

a. What is the y-intercept, and what would it represent in this context?

b. What is the slope, and what would it represent in this context?

c. Explain to Owen what would have to happen to the bottle for the slope to change to -4.

25. Explain how to graph the equation $y = 2x - 3$ without using a table of values.

26. The table and the equation below represent different functions.

x	-2	-1	0	1	2
y	1	5	9	13	17

$y = 3x - 4$

Which function has the greater rate of change? How do you know?

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

1. Find the slope.

x	y
0	10
3	8.5
6	7

Graph the linear equations.

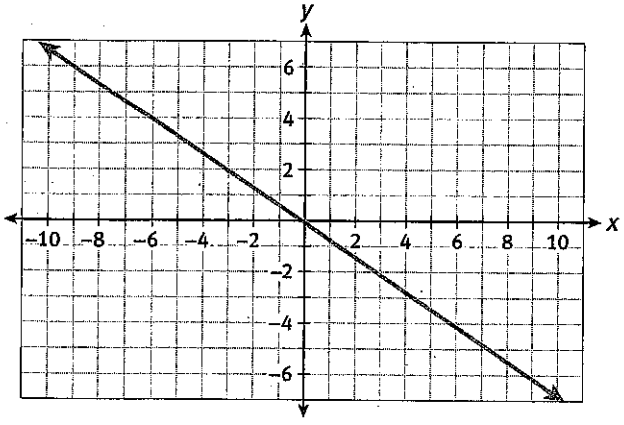
2. $y = 3x$

3. $y = -5x$

4. $y = -\frac{1}{2}x$

5. Write an equation of a line that has a slope that is greater than 1 but less than 2.

6. Write the equation of the line graphed below.



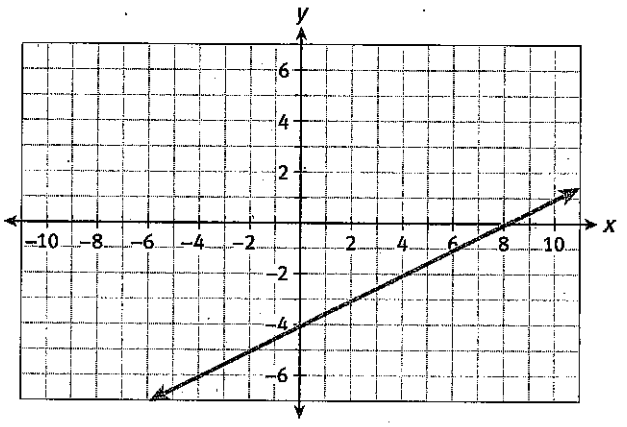
Graph the linear equations.

7. $y = 2x + 4$

8. $y = -3x + 2$

9. $y = \frac{2}{3}x - 5$

10. Write an equation for the line graphed below.



11. Write the equation of a function with a greater rate of change than the function graphed in item 10.

12. MATHEMATICAL REFLECTION Explain two ways to graph a linear equation of the form $y = mx + b$, where m and b represent any real number.