

Slope-intercept form is useful for modeling real-life situations where you are given a starting value (the y -intercept) and a rate of change (the slope).

At 0 meters, the pressure is 1 atm.

Problem 6 Modeling a Function STEM

Physics Water pressure can be measured in atmospheres (atm). Use the information in the diagram to write an equation that models the pressure y at a depth of x meters. What graph models the pressure?

Step 1 Identify the slope and the y -intercept.

The slope is the rate of change, 0.1 atm/m.

The y -intercept is the starting value, 1 atm.

Step 2 Substitute the slope and y -intercept into the slope-intercept form.

$$y = mx + b \quad \text{Use slope-intercept form.}$$

$$y = 0.1x + 1 \quad \text{Substitute 0.1 for } m \text{ and 1 for } b.$$

Step 3 Graph the equation.

The y -intercept is 1. Plot the point $(0, 1)$.

The slope is 0.1, which equals $\frac{1}{10}$. Plot a second point 1 unit above and 10 units to the right of the y -intercept. Then draw a line through the two points.

Got It? 6. A plumber charges a \$65 fee for a repair plus \$35 per hour. Write an equation to model the total cost y of a repair that takes x hours. What graph models the total cost?

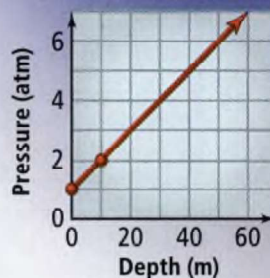
Think

How do you identify the y -intercept?

The y -intercept is the y -value when $x = 0$. So the y -intercept is the pressure at a depth of 0 m. This is the starting value, 1 atm.



Pressure Underwater



Lesson Check

Do you know HOW?

1. What is an equation of the line with slope 6 and y -intercept -4 ?
2. What equation in slope-intercept form represents the line that passes through the points $(-3, 4)$ and $(2, -1)$?
3. What is the graph of $y = 5x + 2$?

Do you UNDERSTAND? **MATHEMATICAL PRACTICES**

4. **Vocabulary** Is $y = 5$ a linear equation? Explain.
5. **Reasoning** Is it *always*, *sometimes*, or *never* true that an equation in slope-intercept form represents a direct variation? Support your answer with examples.
6. **Writing** Describe two different methods you can use to graph the equation $y = 2x + 4$. Which method do you prefer? Explain.



Practice and Problem-Solving Exercises

A Practice

Find the slope and y-intercept of the graph of each equation.

- | | | |
|-------------------|---------------------|--------------------------------------|
| 7. $y = 3x + 1$ | 8. $y = -x + 4$ | 9. $y = 2x - 5$ |
| 10. $y = -3x + 2$ | 11. $y = 5x - 3$ | 12. $y = -6x$ |
| 13. $y = 4$ | 14. $y = -0.2x + 3$ | 15. $y = \frac{1}{4}x - \frac{1}{3}$ |

See Problem 1.

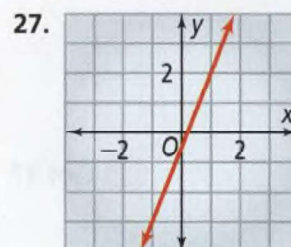
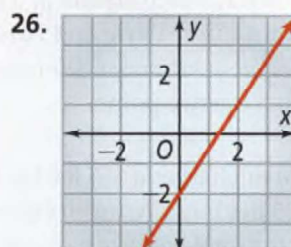
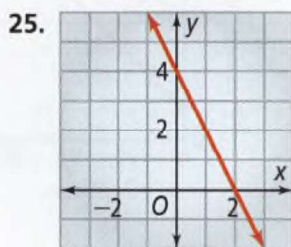
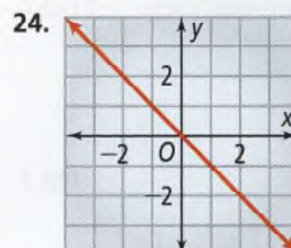
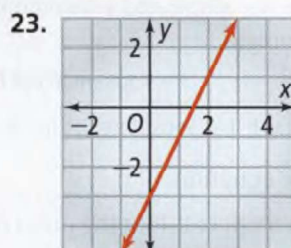
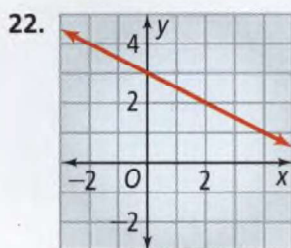
Write an equation in slope-intercept form of the line with the given slope m and y-intercept b .

- | | | |
|-----------------------|-------------------------|---|
| 16. $m = 1, b = -1$ | 17. $m = 3, b = 2$ | 18. $m = \frac{1}{2}, b = -\frac{1}{2}$ |
| 19. $m = 0.7, b = -2$ | 20. $m = -0.5, b = 1.5$ | 21. $m = -2, b = \frac{8}{5}$ |

See Problem 2.

Write an equation in slope-intercept form of each line.

See Problem 3.



Write an equation in slope-intercept form of the line that passes through the given points.

See Problem 4.

- | | | |
|---------------------------|-----------------------------|----------------------------|
| 28. $(0, 3)$ and $(2, 5)$ | 29. $(-2, 4)$ and $(3, -1)$ | 30. $(-3, 3)$ and $(1, 2)$ |
|---------------------------|-----------------------------|----------------------------|

Graph each equation.

See Problem 5.

- | | | |
|-----------------|------------------|-------------------|
| 31. $y = x + 5$ | 32. $y = 3x + 4$ | 33. $y = -2x + 1$ |
|-----------------|------------------|-------------------|

34. **Retail Sales** Suppose you have a \$5-off coupon at a fabric store. You buy fabric that costs \$7.50 per yard. Write an equation that models the total amount of money y you pay if you buy x yards of fabric. What is the graph of the equation?

See Problem 6.

35. **Temperature** The temperature at sunrise is 65°F . Each hour during the day, the temperature rises 5°F . Write an equation that models the temperature y , in degrees Fahrenheit, after x hours during the day. What is the graph of the equation?

B Apply

36. Using the tables below, predict whether the two graphs will intersect. Plot the points and sketch the lines. Do the two lines appear to intersect? Explain.

x	y
-2	9
-1	7
0	5
1	3
2	1

x	y
-2	-18
-1	-14
0	-10
1	-6
2	-2

Find the slope and y-intercept of the graph of each equation.

37. $y - 2 = -3x$ 38. $y + \frac{1}{2}x = 0$ 39. $y - 9x = \frac{1}{2}$ 40. $2y - 6 = 3x$
 41. $-2y = 6(5 - 3x)$ 42. $y - d = cx$ 43. $y = (2 - a)x + a$ 44. $2y + 4n = -6x$

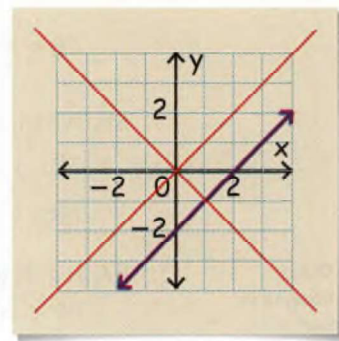
45. **Think About a Plan** Polar bears are listed as a threatened species. In 2005, there were about 25,000 polar bears in the world. If the number of polar bears declines by 1000 each year, in what year will polar bears become extinct?

- What equation models the number of polar bears?
- How can graphing the equation help you solve the problem?

46. **Error Analysis** A student drew the graph at the right for the equation $y = -2x + 1$. What error did the student make? Draw the correct graph.

47. **Computers** A computer repair service charges \$50 for diagnosis and \$35 per hour for repairs. Let x be the number of hours it takes to repair a computer. Let y be the total cost of the repair.

- Write an equation in slope-intercept form that relates x and y .
- Graph the equation.
- Reasoning** Explain why you should draw the line only in Quadrant I.



Use the slope and y-intercept to graph each equation.

48. $y = 7 - 3x$ 49. $2y + 4x = 0$ 50. $3y + 6 = -2x$
 51. $y + 2 = 5x - 4$ 52. $4x + 3y = 2x - 1$ 53. $-2(3x + 4) + y = 0$

Write a recursive formula and an explicit formula in slope-intercept form that model each arithmetic sequence. How does the recursive formula relate to the slope-intercept form?

54. 3, 5, 7, 9, ... 55. -1, 3, 7, 11, ... 56. 0.7, 0.3, -0.1, -0.5, ...

57. **Writing** Describe two ways you can determine whether an equation is linear.

58. **Hobbies** Suppose you are doing a 5000-piece puzzle. You have already placed 175 pieces. Every minute you place 10 more pieces.

- Write an equation in slope-intercept form to model the number of pieces placed. Graph the equation.
- After 50 more minutes, how many pieces will you have placed?

C Challenge

Find the value of a such that the graph of the equation has the given slope m .

59. $y = 2ax + 4$, $m = -1$ 60. $y = -\frac{1}{2}ax - 5$, $m = \frac{5}{2}$ 61. $y = \frac{3}{4}ax + 3$, $m = \frac{9}{16}$