

# Writing Linear Equations from Graphs and Tables

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 26

## Quick Review

To write a linear equation, you need two pieces of information: the **slope** ( $m$ ) and a **point** (or the  $y$ -intercept). **From a graph:** read the  $y$ -intercept directly off the  $y$ -axis, then count rise/run to a clean grid intersection for slope. **From a table:** pick any two rows and use  $m = \frac{\Delta y}{\Delta x}$ , then use any one point to find  $b$ . **From two points:** compute slope first, then substitute one point into  $y = mx + b$  to solve for  $b$ . A common mistake: using rise/run in the wrong order. Pick a direction and stay consistent — if you go right by  $\Delta x$ , your  $y$  change goes *from* the left point to the right point.

## PRACTICE

Write the equation of each line.

- A line has slope 2 and crosses the  $y$ -axis at 3. Write its equation. \_\_\_\_\_
- Through (1, 5), (3, 11) \_\_\_\_\_
- Through (0, 4), (2, 0) \_\_\_\_\_
- Table: (1, 2), (2, 4), (3, 6), (4, 8) \_\_\_\_\_
- A table shows (0, 5), (1, 8), and (2, 11). Write the linear equation. \_\_\_\_\_
- Through (-1, -3), (2, 3) \_\_\_\_\_
- Through (0, -7), (5, 3) \_\_\_\_\_
- Table: (1, 10), (2, 8), (3, 6) \_\_\_\_\_
- Write the equation of the horizontal line through (3, 5). \_\_\_\_\_
- Vertical through (4, 7) \_\_\_\_\_
- Through (2, 6),  $m = \frac{1}{2}$  \_\_\_\_\_
- Through (4, -2), (8, -6) \_\_\_\_\_
- A line goes through the origin and has slope -3. Write its equation. \_\_\_\_\_
- Table: (0, 0), (1, 4), (2, 8), (3, 12) \_\_\_\_\_
- Write the equation of the line through (1, -1) and (4, 5). \_\_\_\_\_
- A line has  $y$ -intercept -4 and slope  $\frac{1}{3}$ . Write its equation. \_\_\_\_\_
- Write the equation of the line through (6, 2) and (6, 9). \_\_\_\_\_
- Write the equation of the line through (3, 1) and (7, 1). \_\_\_\_\_
- A line passes through (-2, 5) and has slope -1. Write its equation. \_\_\_\_\_
- Table: (5, 12), (10, 17), (15, 22) \_\_\_\_\_

## VISUAL PRACTICE

Use the graph, table, chart, or diagram to answer the question.

21. Use the table to write the linear equation.

$x$	0	1	2	3
$y$	3	7	11	15

Answer: \_\_\_\_\_

22. Write the equation of the graphed line.

Answer: \_\_\_\_\_



## ◆ Word Problems

23. A gym costs \$30 to join and \$10 a month. Write the equation for total cost after  $m$  months.

Model: \_\_\_\_\_

Answer: \_\_\_\_\_

24. At  $t = 0$ , a young tree is 3 feet tall. After 5 years, it is 13 feet tall. Write a linear equation for the tree's height.

Model: \_\_\_\_\_

Answer: \_\_\_\_\_

25. A printer costs \$80 to buy plus \$0.05 per page. Write total cost after printing  $p$  pages.

Model: \_\_\_\_\_

Answer: \_\_\_\_\_

26. A scooter rental: 30 min costs \$10, 90 min costs \$22. Write the cost equation.

Model: \_\_\_\_\_

Answer: \_\_\_\_\_



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## Answer Keys

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. <math>y = 2x + 3</math></li> <li>2. <math>y = 3x + 2</math></li> <li>3. <math>y = -2x + 4</math></li> <li>4. <math>y = 2x</math></li> <li>5. <math>y = 3x + 5</math></li> <li>6. <math>y = 2x - 1</math></li> <li>7. <math>y = 2x - 7</math></li> <li>8. <math>y = -2x + 12</math></li> <li>9. <math>y = 5</math></li> <li>10. <math>x = 4</math></li> <li>11. <math>y = \frac{1}{2}x + 5</math></li> <li>12. <math>y = -x + 2</math></li> <li>13. <math>y = -3x</math></li> </ol> | <ol style="list-style-type: none"> <li>14. <math>y = 4x</math></li> <li>15. <math>y = 2x - 3</math></li> <li>16. <math>y = \frac{1}{3}x - 4</math></li> <li>17. <math>x = 6</math></li> <li>18. <math>y = 1</math></li> <li>19. <math>y = -x + 3</math></li> <li>20. <math>y = x + 7</math></li> <li>21. <math>y = 4x + 3</math></li> <li>22. <math>y = 2x - 1</math></li> <li>23. <math>C = 10m + 30</math></li> <li>24. <math>h = 2t + 3</math></li> <li>25. <math>C = 0.05p + 80</math></li> <li>26. <math>C = 0.20t + 4</math></li> </ol> |
|--|---|

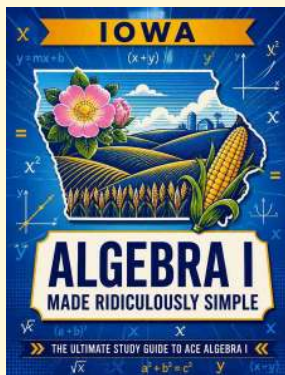
### Step-by-Step Tutor Notes

1. In  $y = mx + b$ , the slope is  $m$  and the  $y$ -intercept is  $b$ . Here  $m = 2$  and  $b = 3$ , so  $y = 2x + 3$ .
2. Use the labels on the display first; they tell you which count or total belongs in the answer.  $m = \frac{11-5}{3-1} = 3$ .  $5 = 3 + b \Rightarrow b = 2$ . This gives  $y = 3x + 2$ .
3. Line up the two changes first; that keeps the rate from getting mixed up.  $b = 4$ . Slope:  $\frac{0-4}{2-0} = -2$ . So the requested value is  $y = -2x + 4$ .
4. For a table question, slow down and locate the exact row, column, or cell before calculating. Slope 2.  $(1, 2): 2 = 2 + b \Rightarrow b = 0$ . Line through origin. This gives  $y = 2x$ .
5. The outputs increase by 3 each time  $x$  increases by 1, so the slope is 3. The row with  $x = 0$  gives  $b = 5$ .
6. Read the table by matching the correct row and column first, then use the count or total that fits the question.  $m = \frac{3-(-3)}{2-(-1)} = 2$ .  $3 = 2(2) + b \Rightarrow b = -1$ . This gives  $y = 2x - 1$ .
7. Think of slope as the amount the output changes for each 1-unit change in the input.  $b = -7$ . Slope:  $\frac{3-(-7)}{5} = 2$ . So the requested value is  $y = 2x - 7$ .
8. For a table question, slow down and locate the exact row, column, or cell before calculating. Slope  $-2$ .  $10 = -2 + b \Rightarrow b = 12$ . This gives  $y = -2x + 12$ .
9. A horizontal line keeps one constant  $y$ -value. Since this line passes through  $y = 5$ , its equation is  $y = 5$ .
10. Take it one clear step at a time and keep the original question in mind. Vertical means  $x$  is constant. Not a function. So the answer is  $x = 4$ .
11. Use the labels on the display first; they tell you which count or total belongs in the answer.  $6 = \frac{1}{2}(2) + b \Rightarrow 6 = 1 + b \Rightarrow b = 5$ . This gives  $y = \frac{1}{2}x + 5$ .
12. For a table question, slow down and locate the exact row, column, or cell before calculating.  $m = \frac{-6-(-2)}{8-4} = -1$ .  $-2 = -4 + b \Rightarrow b = 2$ . This gives  $y = -x + 2$ .
13. The origin gives a  $y$ -intercept of 0. With slope  $-3$ , the equation is  $y = -3x$ .
14. Take it one clear step at a time and keep the original question in mind. Constant ratio  $\frac{y}{x} = 4$ . Through origin. So the answer is  $y = 4x$ .
15. The slope is  $\frac{5-(-1)}{4-1} = 2$ . Use  $(1, -1)$  in  $y = 2x + b$ :  $-1 = 2 + b$ , so  $b = -3$ .
16. The slope becomes the coefficient of  $x$ , and the intercept is the constant term. That gives  $y = \frac{1}{3}x - 4$ .
17. Both points have  $x = 6$ , so this is a vertical line. Vertical lines are written  $x = \text{constant}$ .
18. Both points have  $y = 1$ , so this is a horizontal line. Horizontal lines are written  $y = \text{constant}$ .
19. Use  $y = mx + b$  with  $m = -1$ . Substituting  $(-2, 5)$  gives  $5 = -(-2) + b = 2 + b$ , so  $b = 3$ .
20. Use the labels on the display first; they tell you which count or total belongs in the answer. Slope 1.  $12 = 5 + b \Rightarrow b = 7$ . This gives  $y = x + 7$ .
21. The  $y$ -intercept is 3 and the rate of change is 4, so  $y = 4x + 3$ .
22. Compare the change in output to the change in input, because slope is a rate of change. The slope is 2 and the  $y$ -intercept is  $-1$ . So the requested value is  $y = 2x - 1$ .
23. The joining fee is the starting value, so it is the  $y$ -intercept 30. The monthly charge is the slope 10, giving  $C = 10m + 30$ .
24. The starting height is 3 ft, so  $b = 3$ . The tree grows  $\frac{13-3}{5-0} = 2$  ft per year, so the model is  $h = 2t + 3$ .
25. The printer purchase is the starting cost, so  $b = 80$ . Each page adds \$0.05, so the cost model is  $C = 0.05p + 80$ .
26. Slope:  $\frac{22-10}{90-30} = \frac{12}{60} = 0.20$ .  $10 = 0.20(30) + b = 6 + b \Rightarrow b = 4$ . So  $C = 0.20t + 4$  (a \$4 base + \$0.20/min).



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