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- I. Model Problems.
- II. Practice
- III. Challenge Problems
- VI. Answer Key

Web Resources

 Slope Intercept Form

www.mathwarehouse.com/algebra/linear_equation/slope-intercept-form.php

Slope of a Line

www.mathwarehouse.com/slope2/

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I. Model Problems

The equation of a line is given by the formula $y = mx + b$.

m equals the slope of the line

b equals the y -intercept of the line

This equation of the line is called “**slope-intercept**” form because it easily shows both the slope and the intercept of the line.

To find the equation of a line given the slope and intercept, simply plug into the equation.

Example 1 Write the equation of the line with slope 2 that has y -intercept 5.

$$y = mx + b$$

$$y = 2x + 5$$

The answer is $y = 2x + 5$.

Write the slope-intercept formula.

Substitute $m = 2$ and $b = 5$

To find the equation of a line given the slope and one point on the line, plug in the slope and the coordinates of the point to solve for b , the y -intercept.

Example 2 Write the equation of the line with slope 3 that passes through the point $(-1, 6)$.

$$y = mx + b$$

$$6 = 2(-1) + b$$

$$6 = -2 + b$$

$$b = 8$$

$$y = 3x + 8$$

The answer is $y = 3x + 8$.

Write the slope-intercept formula

Substitute $m = 2$ and $(x, y) = (-1, 6)$

Simplify

Add 2 to each side to solve for b

Substitute $m = 3$ and $b = 8$ into the slope-intercept formula

Sometimes the slope of the equation is not given. To find the equation of a line that passes through two points, you must first calculate the slope, then follow the steps in Example 2.

Example 3 Write the equation of the line that passes through the points (3, -2) and (-2, 8).

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{8 - (-2)}{-2 - 3} = \frac{10}{-5} = -2$$

$$y = mx + b$$

$$3 = -2(-2) + b$$

$$3 = 4 + b$$

$$b = -1$$

$$y = -2x - 1$$

The answer is $y = -2x - 1$.

Write the slope formula

Substitute $(x_1, y_1) = (-2, 3)$ and $(x_2, y_2) = (8, -2)$

Write the point-slope form

Substitute $m = -2$ and

$(x, y) = (-2, 3)$.

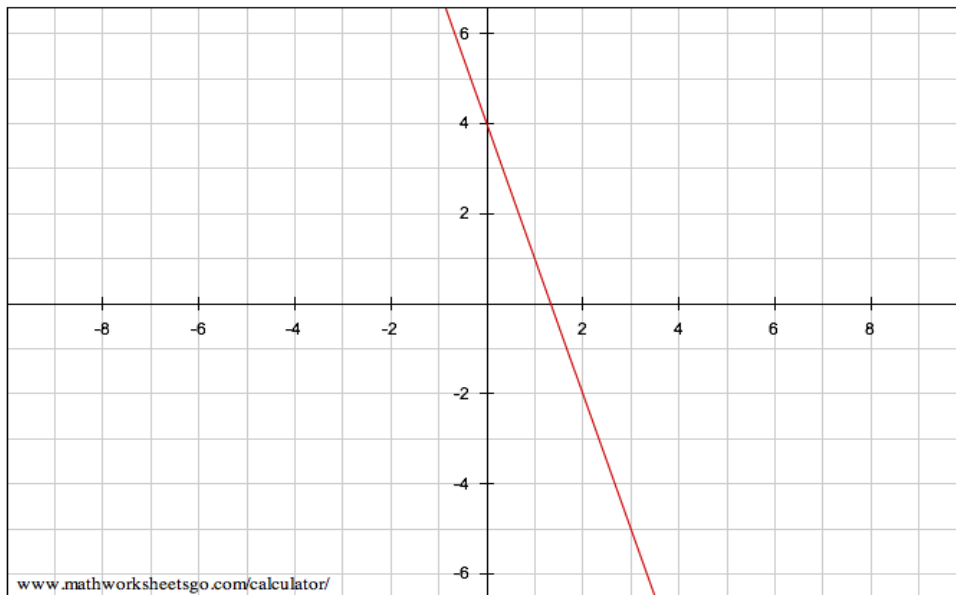
Simplify.

Subtract 4 from each side.

Substitute $m = -2$ and $b = -1$ into the point-slope formula.

Sometimes you will need to find the equation of a line given its graph.

Example 4 Write the equation of the line graphed below.



Notice that the graph passes through the points (0, 4) and (2, -2).
The y-intercept is 4. This is the value of b .

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{4 - (-2)}{0 - 2} = \frac{6}{-2} = -3$$

$$y = mx + b$$

$$y = -3x + 4$$

Write the slope formula

Substitute $(x_1, y_1) = (2, -2)$ and
 $(x_2, y_2) = (0, 4)$

Write the point-slope form

Substitute $m = -3$ and

$b = 4$ into the point-slope formula.

II.

Practice

Find the equation of the line that has given slope and y-intercept.

1. $m = 2$ and $b = 7$

2. $m = -3$ and $b = 10$

3. $m = 10$ and $b = -3$

4. $m = -7$ and $b = 11$

5. $m = 4$ and $b = -20$

6. $m = -12$ and $b = -8$

7. $m = 6$ and $b = 6$

8. $m = -5$ and $b = -10$

Find the equation of the line with the given slope that passes through the given point.

9. $m = 2$ and $(-1, 5)$

10. $m = -4$ and $(1, 1)$

11. $m = -2$ and $(-2, -2)$

12. $m = 6$ and $(2, 0)$

13. $m = 3$ and $(0, 7)$

14. $m = -1$ and $(4, 5)$

15. $m = 1$ and $(-2, 5)$

16. $m = 0$ and $(10, 7)$

Find the equation of the line that passes through the given points.

17. (1, 2) and (-1, 5)

18. (-7, -7) and (-1, 4)

19. (1, 8) and (-3, 4)

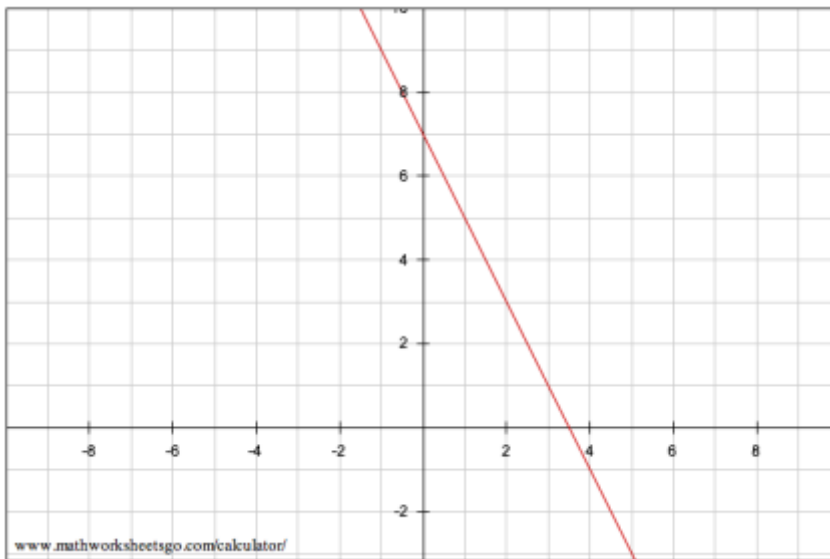
20. (1, 5) and (2, 0)

21. (6, 10) and (2, 8)

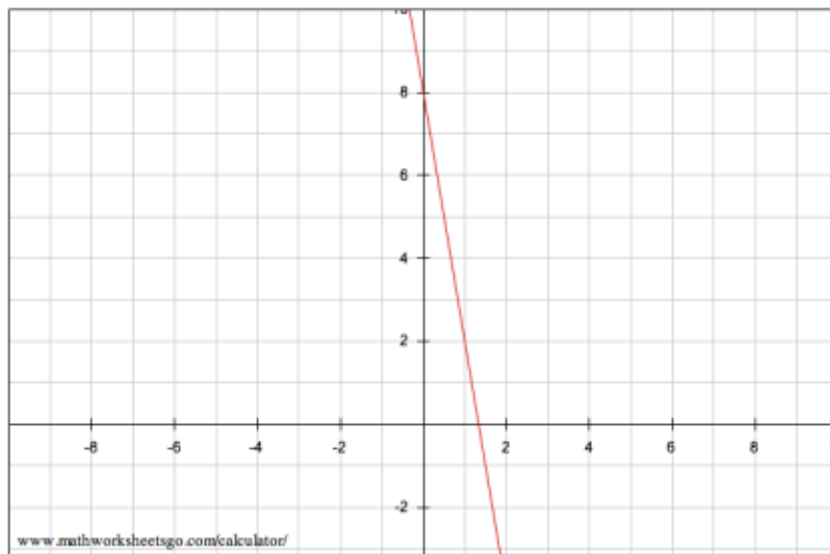
22. (-8, 4) and (2, -1)

Find the equation of each line graphed below.

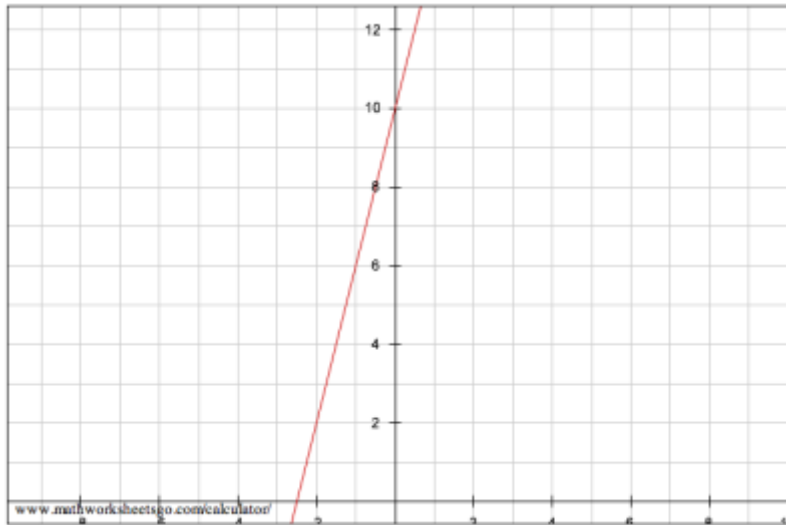
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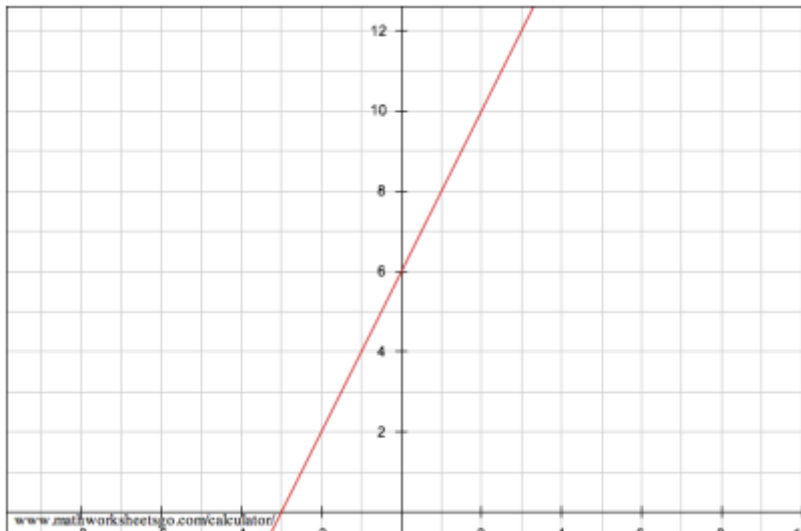
24.



25.



26.



III. Challenge Problems

27. Explain why you cannot use $y = mx + b$ to find the equation of a vertical line.

28. What is the equation of a line that passes through the points $(-0.72, 1.42)$ and $(4.22, 5.83)$?

29. Correct the Error

There is an error in the student work shown below:

Question: Find the equation of the line that passes through the points (-1, 4) and (2, 7).

Solution:

The slope is given by the formula rise over run.

$$= \frac{7 - 4}{2 - (-1)} = \frac{3}{3} = 1$$

Plug into $y = mx + b$;

$$y = mx + 1.$$

Substitute (-1, 4) to solve for m .

$$4 = -1 \cdot m + 1 \text{ so } m = -3$$

The equation of the line is $y = -3x + 1$.

What is the error? Explain how to solve the problem.

IV. Answer Key

1. $y = 2x + 7$

2. $y = -3x + 10$

3. $y = 10x - 3$

4. $y = -7x + 11$

5. $y = 4x - 20$

6. $y = -12x - 8$

7. $y = 6x + 6$

8. $y = -5x - 10$

9. $y = 2x + 7$

10. $y = -4x + 5$

11. $y = -2x + 6$

12. $y = 6x - 12$

13. $y = 3x + 7$

14. $y = -x + 9$

15. $y = x + 7$

16. $y = 7$

17. $y = -1.5x + 3.5$

18. $y = 1.833x + 5.833$

19. $y = x + 7$

20. $y = -5x + 10$

21. $y = 0.5x + 7$

22. $y = -0.5x$

23. $y = -2x + 7$

24. $y = -6x + 8$

25. $y = 4x + 10$

26. $y = 2x + 6$

27. The equation of a vertical line is an equation in the form $x = a$ constant. Vertical lines have infinite slope and typically do not have a y -intercept.

28. $y = 0.893x + 2.06$

29. The student switched the y -intercept and the slope in the equation of a line formula (the student mistakenly thought b was the slope)