www.MathWorksheetsGo.com
On Twitter: twitter.com/mathprintables

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

Web Resources

Equations of Lines
www.mathwarehouse.com/algebra/linear_equation/equation-of-a-line-formula.php

YouTube Point Slope Form
www.mathwarehouse.com/algebra/linear_equation/point-slope-form-of-a-line.php

We Recommend Meta Calculator- A Free Graphing Calculator

I. Model Problems

The **"point-slope" form** of a line with slope m that passes through the point (x_1, y_1) is given by the formula $y - y_1 = m(x - x_1)$.

When you are given the slope of a line and a point, or two points on a line, it is easier to find the equation of the line in point-slope form than in slope-intercept or standard form.

Example 1 Write the equation of the line with slope 2 that passes through the point (-1, 5).

$y - y_1 = m(x - x_1)$	Write point-slope formula.
$y - (5) = m(x - (-1))$	Substitute $m = 2$ and $(x_1, y_1) = (-1, 5)$
$y - 5 = 2(x + 1)$	Simplify.

The answer is $y - 5 = 2(x + 1)$.

You can also use the point-slope form to find the equation of a line that passes through two given points.

Example 2 Write the equation of the line that passes through the points (3, 5) and (-1, 6).

$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$	Write the slope formula
$m = \frac{6-5}{-1-3} = -\frac{1}{4}$	Substitute $(x_1, y_1) = (3, 5)$ and $(x_2, y_2) = (-1, 6)$
$y - y_1 = m(x - x_1)$	Write the point-slope form
$y - 5 = -\frac{1}{4}(x - 3)$	Substitute $m = -\frac{1}{4}$ and $(x_1, y_1) = (3, 5)$.

The answer is $y - 5 = -\frac{1}{4}(x - 3)$.

You can also use this form to write the equation of a line using data from a table.

Example 3 Write the equation of the line that passes through the points in the table:

x	y
-3	5
-1	8
1	11
3	14

$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$ Write the slope formula

$m = \frac{8-5}{-1-(-3)} = \frac{3}{2}$ Substitute $(x_1, y_1) = (-3, 5)$ and $(x_2, y_2) = (-1, 8)$

$y - y_1 = m(x - x_1)$ Write the point-slope form

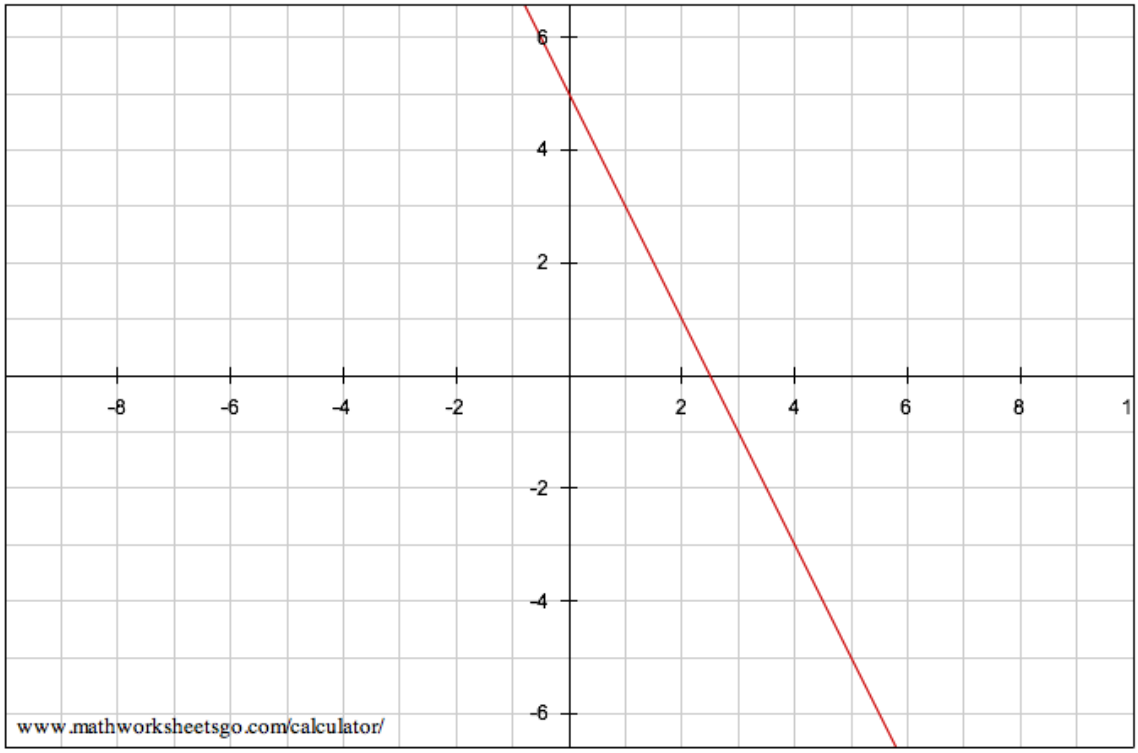
$y - (5) = \frac{3}{2}(x - (-3))$ Substitute $m = \frac{3}{2}$ and $(x, y) = (-3, 5)$.

$y - 5 = \frac{3}{2}(x + 3)$ Simplify.

The answer is The answer is $y - 5 = \frac{3}{2}(x + 3)$.

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, 5) and (2, 1).

$m = \dfrac{\text{rise}}{\text{run}} = \dfrac{y_2 - y_1}{x_2 - x_1}$ Write the slope formula

$m = \dfrac{1-5}{2-0} = \dfrac{-4}{2} = -2$ Substitute $(x_1, y_1) = (2, -2)$ and $(x_2, y_2) = (0, 5)$

$y - y_1 = m(x - x_1)$ Write the point-slope form

$y - 5 = -2(x - 0)$ Substitute $m = -2$ and $(x_1, y_1) = (0, 5)$ into the point-slope formula.

$y - 5 = -2x$ Simplify.

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

Sometimes you will need to convert the equation of a line in point-slope form into slope-intercept form.

Example 5 Write $y - 3 = -5(x + 1)$ in slope-intercept form.

$y - 3 = -5(x + 1)$	Equation in point-slope form.
$y - 3 = -5x - 5$	Use Distributive property.
$y = -5x - 2$	Add 3 to each side.

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

The slope (m) is -5 and the y-intercept (b) is -2.

Worksheet Problems start on next page

II. Practice

Find the equation of the line with the given slope that passes through the given point. Write the equation of the line in point-slope form.

1. $m = 2$ and (-1, -3)

2. $m = -7$ and (1, -1)

3. $m = -2$ and (-5, -2)

4. $m = 6$ and (2, 5)

5. $m = 3$ and (0, 10)

6. $m = -9$ and (8, 9)

7**.** $m = -1$ and (-6, 12)

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

Find the equation of the line that passes through the given points. Write the equation in point-slope form.

9. (-1, 3) and (-2, 5)

10. (-7, 7) and (5, -6)

11. (1, 12) and (-3, 5)

12. (1, 9) and (-2, -2)

13. (-6, 10) and (2, -5)

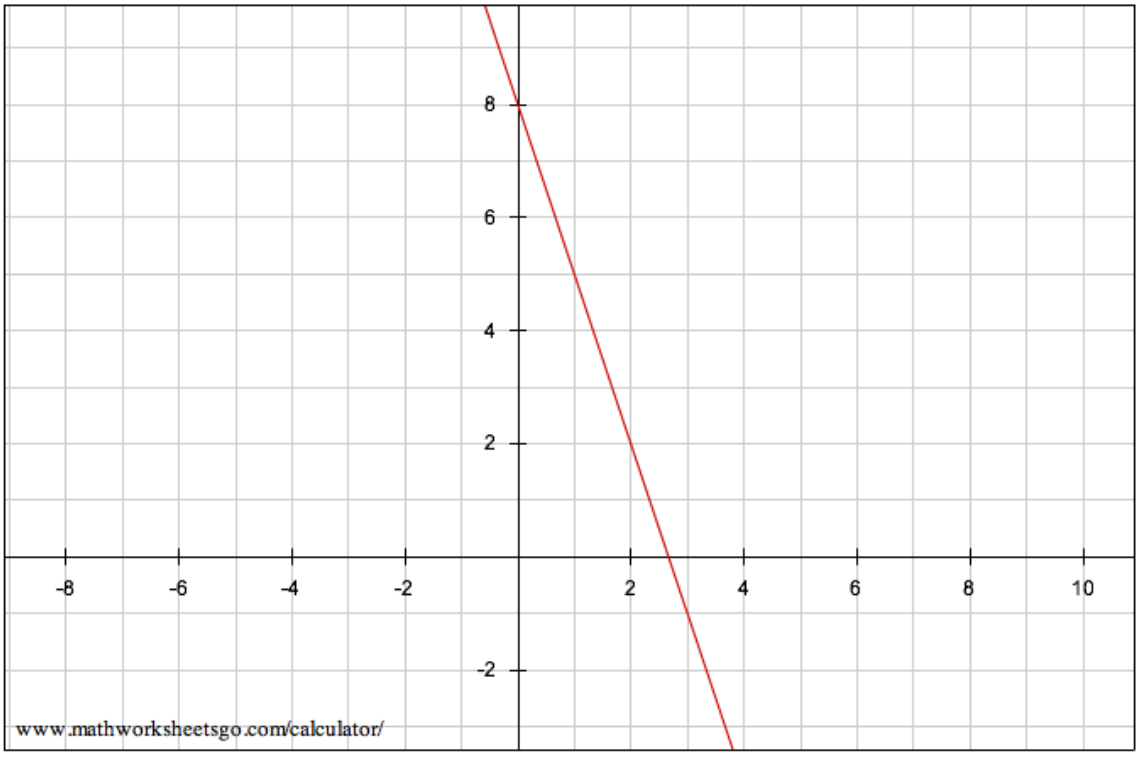
14. (-8, 7) and (-3, -5)

15. (-3, 3) and (4, 10)

16. (0, 9) and (-2, 11)

Find the equation of each line graphed below.

17.



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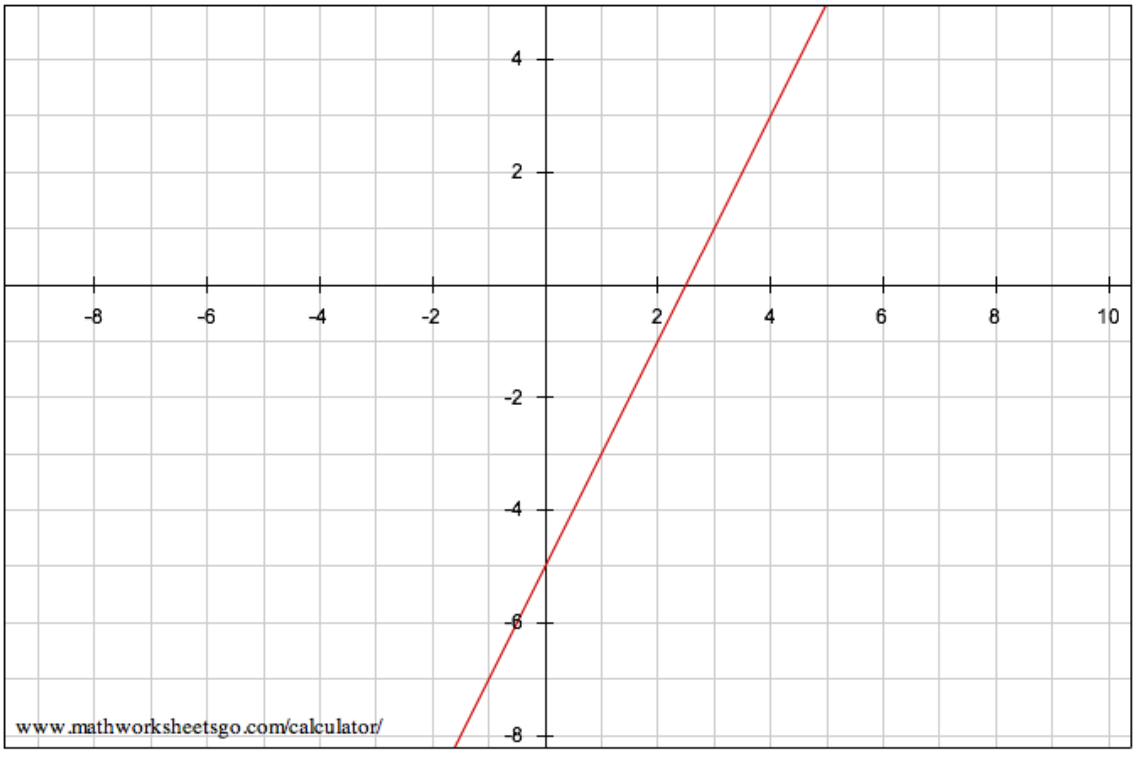

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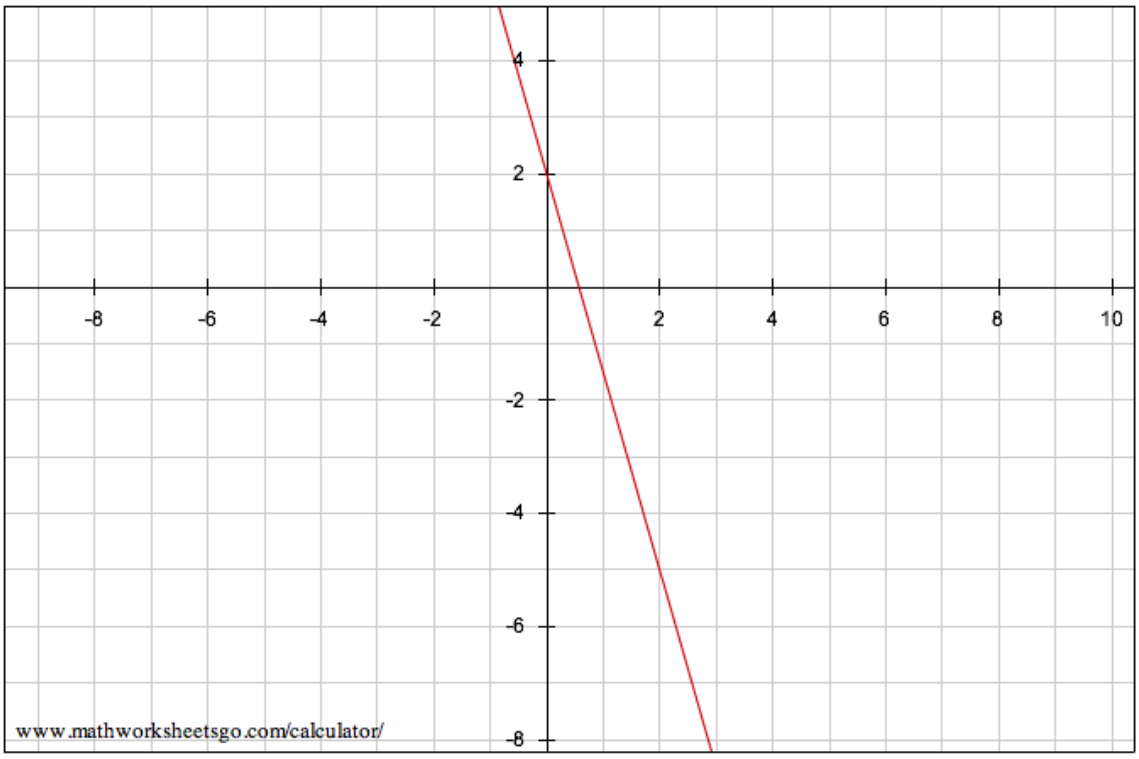
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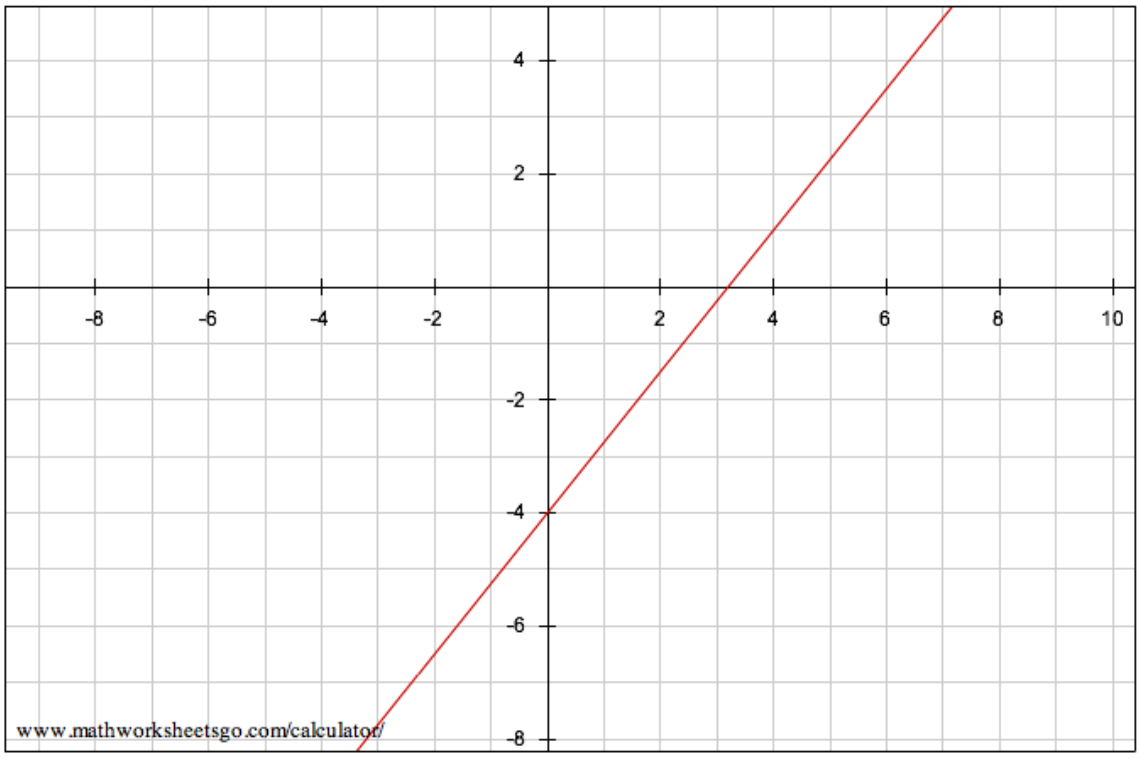
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www.mathworksheetsgo.com/calculator/

Write each point-slope equation in slope-intercept ($y = mx + b$) form.

21. $y + 2 = 4(x + 5)$

22. $y - 1 = -2(x - 9)$

23. $y - 5 = 6(x - 8)$

24. $y + 3 = 1.5(x - 4)$

25. $y + 7 = -8(x + 5)$

26. $y - 7 = -3(x - 5)$

27. $y - 4 = -4(x - 11)$

28. $y - 1 = -2(x - 9)$

29. What is the point slope equation of line that passes through the point (2,-3) and has the same y intercept as y = 5x + 2

30. What is the point slope equation of line that passes through the point (5,2) and has the same y intercept as y = 3x – 9

III. Challenge Problems

1. Explain why it's sometimes helpful to use the point-slope form instead of the slope-intercept form.

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2. What is the equation of a line that passes through the points (-0.92, 2.49) and (-5.62, 9.76)? Write your answer in point-slope form.

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3. Correct the Error
Question: Find the point-slope equation of the line with slope -3 that passes through the point (2, -10).

Solution:

$$y - y_1 = m(x - x_1)$$
$$y - (2) = -3(x - (-10))$$
$$y - 2 = -3(x+10)$$
The equation of the line is $y - 2 = -3(x+10)$.

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

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IV. Answer Key

1. $y + 3 = 2(x + 1)$	16. $y - 11 = -1(x + 2)$
2. $y + 1 = -7(x - 1)$	17. $y = -3x + 8$
3. $y + 2 = -2(x + 5)$	18. $y = 2x - 5$
4. $y - 5 = 6(x - 2)$	19. $y = -3.5x + 2$
5. $y - 10 = 3(x - 0) \rightarrow y - 10 = 3x$	20. $y = 1.25x - 4$
6. $y - 9 = -9(x - 8)$	21. $y = 4x + 18$
7. $y - 12 = -1(x + 6)$	22. $y = -2x + 19$
8. $y - 7 = 0(x - 3) \rightarrow y = 7$	23. $y = 6x - 43$
9. $y - 5 = -2(x + 2)$	24. $y = 1.5x - 9$
10. $y + 6 = (-13/12)(x - 5)$	25. $y = -8x - 47$
11. $y - 5 = 1.75(x + 3)$	26. $y = -3x + 22$
12. $y + 2 = (11/3)(x + 2)$	27. $y = -4x + 48$
13. $y + 5 = -1.875(x - 2)$	28. $y = -2x + 19$
14. $y + 5 = -2.4(x + 3)$	29. $y + 3 = 5(x - 2)$
15. $y - 10 = 1(x - 4)$	30. $y - 3 = 3(x - 5)$

Answers to the Challenge Problems

1. Point-slope form is used when you are given the slope and a point or two points; slope-intercept form is used when you are given slope and the *y*-intercept.
2. $y - 9.76 = -1.547(x + 5.62)$

3. The student switched the values of x_1 and y_1; the correct equation of the line is $y + 10 = -3(x - 2)$.