Write a Linear Equation

Key Concept

From Slope and a Point	• Substitute the slope m and the coordinates of the point in $y - y_1 = m(x - x_1)$.
From Slope and y-intercept	• Substitute the slope m and y-intercept b in $y = mx + b$.
From a Graph	• Find the y-intercept b and the slope m from the graph, then substitute the slope and y-intercept in $y = mx + b$.
From Two Points	• Use the coordinates of the points to find the slope. Substitute the slope and coordinates of one of the points in $y - y_1 = m(x - x_1)$.
From a Table	• Use the coordinates of the two points to find the slope, then substitute the slope and coordinates of one of the points in $y - y_1 = m(x - x_1)$.

The form you use to write a linear equation is based on the information you are given.

Example

Tutor

3. **Write an equation in point-slope form and slope-intercept form for the line that passes through (8, 1) and (−2, 9).**

x_1 y_1

Step 1 Find the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Slope formula

$$m = \frac{9 - 1}{-2 - 8}$$ $(x_1, y_1) = (8, 1), (x_2, y_2) = (-2, 9)$

$$m = -\frac{8}{10} \text{ or } -\frac{4}{5}$$ Simplify.

Step 2 Use the slope and the coordinates of either point to write the equation in point-slope form.

$$y - y_1 = m(x - x_1)$$ Point-slope form

$$y - 1 = -\frac{4}{5}(x - 8)$$ $(x_1, y_1) = (8, 1), m = -\frac{4}{5}$

So, the point-slope form of the equation is $y - 1 = -\frac{4}{5}(x - 8)$.

In slope-intercept form, this is $y = -\frac{4}{5}x + \frac{37}{5}$.

$y+3 = -1(x-6)$

$y+3 = -x+6$

$-3 \quad -3$

Got It? Do these problems to find out.

c. (3, 0) and (6, −3)

$x_1 \quad y_1 \quad x_2 \quad y_2$

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

$\frac{0--3}{3-6} = \frac{3}{-3} = -1 = m$

d. (−1, 2) and (5, −10)

$y - y_1 = m(x - x_1)$

$y--3 = -1(x-6)$

① Find slope (m)

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

$\frac{1-9}{8--2} = \frac{-8 \div 2}{10 \div 2}$

$\frac{-4}{5} = m$

② Plug in values

$y - y_1 = m(x - x_1)$

Show your work

$y - 9 = -\frac{4}{5}(x--2)$

$y - 9 = -\frac{4}{5}(x+2)$

c. $y+3 = -1(x-6)$

$y = -x + 3$

d. _____

Example

4. **The cost of assistance dog training sessions is shown in the table. Write an equation in point-slope form to represent the cost y of attending x dog training sessions.**

Number of Sessions	Cost ($)
5	165
10	290

Find the slope of the line. Then use the slope and one of the points to write the equation of the line.

$m = \frac{290 - 165}{10 - 5}$ $(x_2, y_2) = (10, 290), (x_1, y_1) = (5, 165)$

$m = \frac{125}{5}$ or 25 Simplify.

$y - 165 = 25(x - 5)$ Replace (x_1, y_1) with (5, 165) and m with 25 in the point-slope form equation.

So, the equation of the line is $y - 165 = 25(x - 5)$.

Show your work.

Got It? **Do this problem to find out.**

e. _____

e. The cost for making spirit buttons is shown in the table. Write an equation in point-slope form to represent the cost y of making x buttons.

Number of Buttons	Cost ($)
100	25
150	35

Guided Practice

Write an equation in point-slope form and slope-intercept form for each line. (Examples 1–3)

1. passes through (2, 5), slope = 4

2. passes through (−3, 1) and (−2, −1)

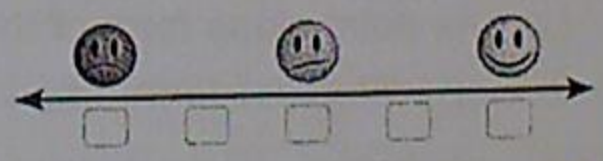
Show your work.

3. Janelle is planning a party. The cost for 20 people is $290. The cost for 45 people is $590. Write an equation in point-slope form to represent the cost y of having a party for x people. (Example 4)

4. **Building on the Essential Question** How does using the point-slope form of a linear equation make it easier to write the equation of a line?

Rate Yourself!

How confident are you about writing linear equations? Check the box that applies.



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