

Linear Relationships -
 Point-slope and Standard Forms
 Parallel and Perpendicular Lines

Point-slope form: related to the formula for slope

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

Suppose instead of knowing 2 points, we know a point and the slope.

Problem 1 Writing an Equation Given a Point and the Slope

A line passes through $(-5, 2)$ with slope $\frac{3}{5}$. What is an equation of the line?

- A $y - 2 = \frac{3}{5}(x + 5)$
- B $y + 2 = \frac{3}{5}(x - 5)$
- C $y - 5 = \frac{3}{5}(x + 2)$
- D $y + 5 = \frac{3}{5}(x - 2)$
- E $y + 2 = \frac{3}{5}(x + 5)$

2. a. A line passes through $(-5, 0)$ and $(0, 7)$. What is an equation of the line in point-slope form?

- A $y = \frac{5}{7}x + 5$
- B $y = -\frac{5}{7}x + 7$
- C $y = \frac{5}{7}x + 7$
- D $y = \frac{7}{5}x + 5$

Problem 2 Writing an Equation Given Two Points

A line passes through $(3, 2)$ and $(5, 8)$. What is an equation of the line in point-slope form?

Know

Two points

Need

An equation written in point-slope form

Plan

Substitute the slope and either point in the point-slope form.

Problem 3 Writing an Equation in Standard Form

What is an equation of the line $y = \frac{3}{4}x - 5$ in standard form? Use integer coefficients.

- A $3x - 4y = -20$
- B $3x + 4y = 20$
- C $3x - 4y = 20$
- D $4x - 3y = 20$

Take note **Concept Summary Writing Equations of Lines**

<p>Slope-Intercept Form $y = mx + b$</p> <p>Use this form when you know the slope and the y-intercept.</p>	<p>Point-Slope Form $y - y_1 = m(x - x_1)$</p> <p>Use this form when you know the slope and a point, or when you know two points.</p>	<p>Standard Form $Ax + By = C$</p> <p>A, B, and C are real numbers. A and B cannot both be zero.</p>
---	--	---

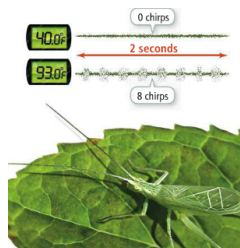
Problem 4 **Graphing an Equation Using Intercepts**

What are the intercepts of $3x + 5y = 15$? Graph the equation.

Problem 5 **Drawing and Interpreting a Linear Graph** **STEM**

Biology The number of times a cricket chirps per minute depends on the temperature. The number of chirps in 2 seconds for two temperatures are shown at the bottom right.

Make a graph to model the situation:

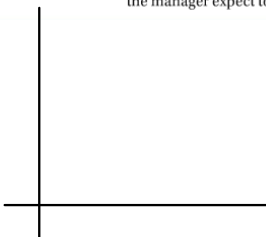


B What is an equation of the line in standard form?

C If the temperature is 70°F , how many times would a cricket be expected to chirp in one minute?

Got It? 5. The office manager of a small office ordered 140 packs of printer paper. Based on average daily use, she knows that the paper will last about 80 days.

- What graph represents this situation?
- What is the equation of the line in standard form?
- How many packs of printer paper should the manager expect to have after 30 days?



Activity

On graph paper, graph an equation: _____
 (you make up the slope and y-intercept)

Draw a line that is parallel, whose y-intercept is 3 more than that of your line.

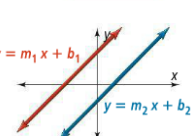
- What is the slope of the parallel line? _____
- What is the equation of the parallel line? _____

Make a line perpendicular to your line with the same y-intercept.

- What is the slope of the parallel line? _____
- What is the equation of the parallel line? _____

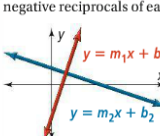
Take note **Key Concepts Parallel and Perpendicular Lines**

The slopes of **parallel lines** are equal.



$m_1 = m_2$
 $b_1 \neq b_2$

The slopes of **perpendicular lines** are negative reciprocals of each other.



No line can be vertical.

$m_1 \cdot m_2 = -1$
 $m_1 = -\frac{1}{m_2}$
 $m_2 = -\frac{1}{m_1}$

m_1 and m_2 are negative reciprocals of each other.

Problem 6 Writing Equations of Parallel and Perpendicular Lines

What is the equation of each line in slope-intercept form?

A the line parallel to $y = 6x - 2$ through $(1, -3)$

B the line perpendicular to $y = -4x + \frac{2}{3}$ through $(8, 5)$

Identify the slope, use point-slope form, and rewrite in slope-intercept form.

Cool Down:

Match the parallel and perpendicular lines:

- a** $y = \frac{2}{3}x + 7$
- b** $2x + 3y = 21$
- c** $2x - 3y = 21$
- d** $3x + 2y = 8$
- e** $3x - 2y = 11$
- f** $y = \frac{3}{2}x - 4$
- g** $y = -\frac{2}{3}x + 2$