GEOMETRY UNIT 12

Writing Linear Equations

Writing Linear Equations

- **Content Objective**: Students will be able to identify the necessary information to write Linear Equations in Slope-Intercept form using Point-Slope form

- **Language Objective**: Students will be able to write linear equations in Slope-Intercept using Point-Slope form with given information

Forms of a linear equation - Review

- Quick Review on one of the previous forms we discussed for a linear equation:

- **Slope – Intercept From:**

$$y = mx + b$$

With slope m and y-intercept b

- This form gives us points to graph a line…
- Our next form uses points to make an equation

Writing a Linear Equation – With a point and the slope

- **Point – Slope Form:**

The equation of a line that passes through a point (x_1, y_1) and has slope m is

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

Writing a Linear Equation – With a point and the slope

- **Ex (from worksheet):** Give the equation, in Slope-Intercept form, that goes through the point (1, 4) and has slope $\boldsymbol{m = -3}$.

Solution:

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

$$y - 4 = -3(x - 1)$$

$$y - 4 = -3x + 3$$

$$\boldsymbol{y = -3x + 7}$$

Give the equation, in Slope-Intercept form, for the line with following points and slopes

- **Point: (-4, -7)**
- **Slope: $m = 3$**

Solution:

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

$$y - (-7) = 3(x - (-4))$$

$$y + 7 = 3x + 12$$

$$\boldsymbol{y = 3x + 5}$$

- **Point: (6, 1)**
- **Slope: $m = {}^1/_2$**

Solution:

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

$$y - 1 = {}^1/_2 (x - 6)$$

$$y - 1 = {}^1/_2 x - 3$$

$$\boldsymbol{y = \frac{1}{2}x - 2}$$

Writing Linear Equations

- Give the equation, in Slope-Intercept form, for the line with the following points: **(0, 1) and (3,-8)**

Solution: You must first find the slope, then use point-slope form.

Slope:

$$\boldsymbol{m = \frac{-8-1}{3-0}}$$

$$\boldsymbol{= \frac{-9}{3} = -3}$$

Equation: Pick either point, along with the slope

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

$$y - 1 = -3(x - 0)$$

$$y - 1 = -3x$$

$$\boldsymbol{y = -3x + 1}$$

Writing Linear Equations

- Give the equation, in Slope-Intercept form, for the line with the following points: **(4, 1) and (-4, 7)**

Slope:

$$\boldsymbol{m = \frac{7-1}{-4-4}}$$

$$\boldsymbol{= \frac{6}{-8} = -\frac{3}{4}}$$

Equation: I chose (4, 1)

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

$$y - 1 = {}^{3}/_{4}\,(x - 4)$$

$$y - 1 = {}^{3}/_{4}\,x - 3$$

$$\boldsymbol{y = {}^{3}/_{4}\,x - 2}$$

Parallel and Perpendicular Lines

- Recall our rules for the slopes of the following types of lines:

- Parallel: Their slopes are equal.

- Perpendicular: Their slopes have a product of -1.

Parallel and Perpendicular Lines

- Given the following equation, already in slope-intercept form, identify the slope of a line that is parallel and perpendicular to it:

$$y = -{}^{2}/_{3}\,x + 5$$

Solution: The slope of this line is $\boldsymbol{m = {}^{-2}/_{3}}$

Thus

Slope of Parallel Line:

$$\boldsymbol{m_{\parallel} = {}^{-2}/_{3}}$$

Slope of Perpendicular Line:

$$\boldsymbol{m_{\perp} = {}^{3}/_{2}}$$

Equations for Horizontal and Vertical Lines

- Horizontal: $y = b$, where b can be any number

Recall: The slope is always Zero

- Vertical: $x = a$, where a can be any number

Recall: The slope is always undefined

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

1.) Slope: -2; Passes Through (8, 6)

Equation:

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

$$y - 6 = -2\,(x - 8)$$

$$y - 6 = -2x + 16$$

$$\boldsymbol{y = -2x + 22}$$

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

2.) Slope: $-\frac{1}{4}$; Passes Through (3, 1)

Equation:

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

$$y - 1 = -\frac{1}{4}(x - 3)$$

$$y - 1 = -\frac{1}{4}x + \frac{3}{4}$$

$$\boldsymbol{y = -\frac{1}{4}x + \frac{7}{4}}$$

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

3.) y-intercept: -3; Parallel to $y = -\frac{4}{5}x + 2$

Recall: $\boldsymbol{y = mx + b}$

$\boldsymbol{b = -3}$

$\boldsymbol{m_{\parallel} = -{}^{4}/_{5}}$

Thus,

Equation: $\boldsymbol{y = -\frac{4}{5}x - 3}$

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

4.) y-intercept: 4; Perpendicular to $y = -\frac{7}{4}x + 9$

Recall: $\boldsymbol{y = mx + b}$

$\boldsymbol{b = 4}$

$\boldsymbol{m_{\perp} = {}^{4}/_{7}}$

Thus,

Equation: $\boldsymbol{y = \frac{4}{7}x + 4}$

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

5.) A vertical line through the point (5, 20)

Equation:

$x = 5$ **Why?**

Practice: All the Lines

- Write the linear equation, in Slope-Intercept Form, for a line the given information.

6.) A horizontal line through the point (100, 4)

Equation:

$y = 4$ **Why?**