PRINCIPLES - LESSON 8B
STANDARD & POINT-SLOPE FORMS

Recall: The Slope-Intercept Form of a Linear Equation

The Slope-Intercept Form

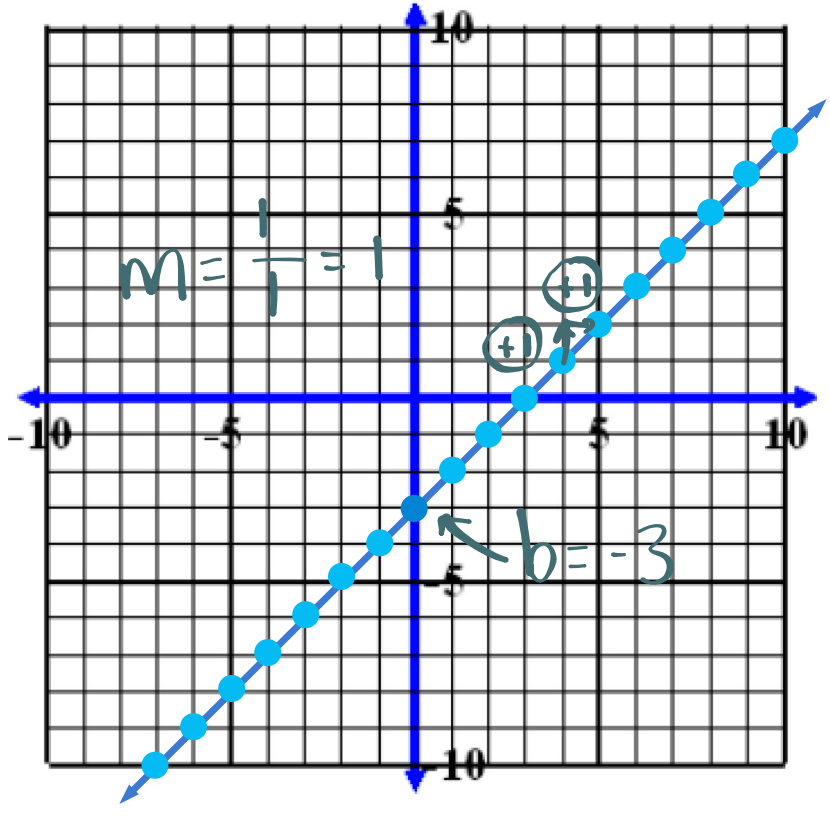
$$y = mx + b$$

slope (m) y-intercept (b)

We need to know the slope and the y-intercept.

$m = 1$ $b = -3$

$$y = 1x - 3$$



STANDARD FORM

Standard Form just makes a linear equation look differently.

Instead of

The Slope-Intercept Form

$$y = mx + b$$

slope, y-intercept

we have:

The Standard Form

$$Ax + By = C$$

where A, B, and C are integers

STANDARD FORM

In plain English, standard form can be broken down into 3 rules.

The Standard Form

$$Ax + By = C$$

where A, B, and C are integers

1. No fractions allowed.
2. x and y terms must be alone on the left side of the equation.
3. x term must be first and positive.

WRITING EQUATIONS OF LINES IN STANDARD FORM

ex1) Write the linear equation $y = -\frac{2}{3}x - 4$ in standard form.

The Standard Form

$$Ax + By = C$$

1. No fractions allowed.
2. x and y terms must be alone on the left side of the equation.
3. x term must be first and positive.

$$y \cdot 3 = -\frac{2}{3}x \cdot 3 - 4 \cdot 3$$

Multiply all terms by 3 to clear fractions.

$$3y = -2x - 12$$
$$+2x \quad +2x$$

Add 2x to both sides of equation to move x and y terms to left side.

$$2x + 3y = -12$$

Make sure that you write the x term first and that the coefficient of x is a positive number.

WRITING EQUATIONS OF LINES IN STANDARD FORM

ex2) Write the linear equation $y = \frac{3}{5}x - \frac{1}{2}$ in standard form.

The Standard Form

$$Ax + By = C$$

1. No fractions allowed.
2. x and y terms must be alone on the left side of the equation.
3. x term must be first and positive.

$$y = \frac{3}{5}x - \frac{1}{2} \quad \cdot 10$$

Multiply all terms by 10 to clear fractions.

$$10y = 6x - 5$$
$$-6x \qquad -6x$$

Subtract 6x from both sides of equation to move x and y terms to left side.

$$-6x + 10y = -5 \quad \cdot(-1)$$

Make sure that you write the x term first. To make the coefficient of x a positive number, we'll need to multiply all terms by -1.

$$\boxed{6x - 10y = 5}$$

WRITING EQUATIONS OF LINES IN STANDARD FORM

ex3) Write the equation of the line in standard form that passes through the points (4, -2) and (8, -5).

x_1 y_1 x_2 y_2

① Find slope. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$m = \frac{(-5) - (-2)}{(8) - (4)} = \frac{-3}{4}$$

$$m = -\frac{3}{4}$$

② Find y-intercept.

$$y = mx + b$$

$$(-2) = \left(-\frac{3}{4}\right)(4) + b$$

$$-2 = -3 + b$$

$$1 = b$$

③ Write equation of the line in slope-intercept form.

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

The Slope-Intercept Form

y = mx + b

m: slope; b: y-intercept

④ Convert to standard form

The Standard Form

Ax + By = C

1. No fractions allowed.
2. x and y terms must be alone on the left side of the equation.
3. x term must be first and positive.

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

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

$$+3x \quad +3x$$

$$3x + 4y = 4$$

POINT-SLOPE FORM

Point-Slope Form is the last form of an equation we will study.

If we clear fractions out of the slope formula, we get the point-slope form of an equation. This form gives us another way to find the equation of any line without having to find the y-intercept.

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

We only need 1 point. Let's remove the 2's and clear fractions.

$$m \cdot (x - x_1) = \frac{y - y_1}{x - x_1} \cdot (x - x_1)$$

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

The Point-Slope Form

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

where (x_1, y_1) is any point on the line and m is the slope.

WRITING EQUATIONS OF LINES IN POINT-SLOPE FORM

To write the equation of a line in point-slope form, you need 2 things:

1. **SLOPE (m)**
2. **ANY point on the line**

Use point-slope form whenever it is annoying to find the y-intercept.

WRITING EQUATIONS OF LINES IN POINT-SLOPE FORM

ex4) Write the equation of the line in point-slope form that passes through the point (5 , 4) and has slope -3.

x_1 y_1 m

The Point-Slope Form

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

where (x_1, y_1) is any point on the line and m is the slope.

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

$$y - 4 = -3(x - 5)$$

THE THREE FORMS OF LINEAR EQUATIONS

The Slope-Intercept Form

$$y = mx + b$$

slope y-intercept

The Standard Form

$$Ax + By = C$$

where A, B, and C are integers

The Point-Slope Form

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

where (x_1, y_1) is any point on the line and m is the slope.

WRITING EQUATIONS OF LINES

ex5) Write the equation of the line in point-slope form that passes through the points (-5, 10) and (5, 2) and then rewrite the equation in slope-intercept form. (x_1, y_1) (x_2, y_2)

To use point-slope form, we need the slope and any point on the line.

① Find slope $m = \frac{y_2 - y_1}{x_2 - x_1}$

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

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

② Choose any point on the line

I'll choose (5, 2).

③ Write equation in point-slope form

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

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

The Point-Slope Form

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

where (x_1, y_1) is any point on the line and m is the slope.

④ Convert to slope-intercept form by solving for y

The Slope-Intercept Form

$y = mx + b$

slope, y-intercept

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

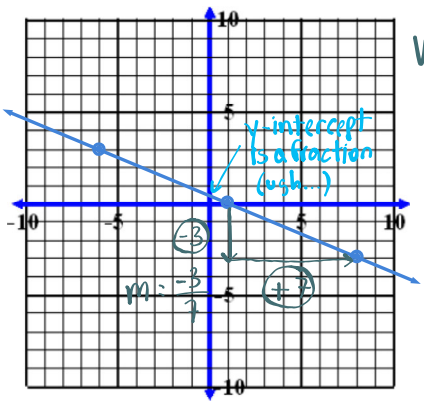
$y - 2 = -\frac{4}{5}x + 4$

$+2 \quad +2$

$y = -\frac{4}{5}x + 6$

WRITING EQUATIONS OF LINES

ex6) Write the equation of the line graphed below in standard form.



We can do this problem 1 of 2 ways.

① Method 1: use slope-intercept

② Method 2: use point-slope

Since the y-intercept is a fraction and would be annoying to find, I will use method 2, point-slope.

① Find slope.

Choose 2 pretty points and count the rise and run between them

$m = -\frac{3}{7}$

② Choose any point on the line.

I'll choose $(1, 0)$

③ Write equation in point-slope form

The Point-Slope Form

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

where (x_1, y_1) is any point on the line and m is the slope.

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

$y - 0 = -\frac{3}{7}(x - 1)$

④ Convert to standard form

The Standard Form

$$Ax + By = C$$

1. No fractions allowed.
2. x and y terms must be alone on the left side of the equation.
3. x term must be first and positive.

$y - 0 = -\frac{3}{7}(x - 1)$

$7 \cdot y = -\frac{3}{7}x \cdot 7 + \frac{3}{7} \cdot 7$

$7y = -3x + 3$

$+3x \quad +3x$

$\boxed{3x + 7y = 3}$