

5.4 Write Linear Equations in Standard Form

Goal • Write equations in standard form.

Example 1 - Write equivalent equations in standard form

Write two equations in standard form that are equivalent to $4x + 2y = 12$.

Solution

$$2(4x + 2y) = 12(2)$$

$$\textcircled{1} 8x + 4y = 24$$

$$\frac{1}{2}(4x + 2y) = (12)\left(\frac{1}{2}\right)$$

$$\textcircled{2} 2x + y = 6$$

$\frac{2}{2}$ } same $\frac{4x}{2} + \frac{2y}{2} = \frac{12}{2}$

Checkpoint Complete the following exercises.

1. Write two equations in standard form that are equivalent to $6x - 4y = 6$

$$2(6x - 4y) = (6) \cdot 2$$

$$\boxed{12x - 8y = 12}$$

$$4(6x - 4y) = 6(4)$$

$$\boxed{24x - 16y = 24}$$

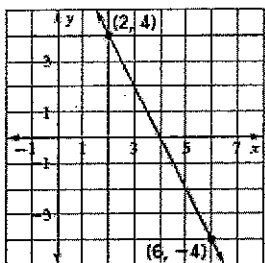
$$\frac{6x - 4y = 6}{2} = \frac{6}{2}$$

$$\boxed{3x - 2y = 3}$$

Example 2 - Write an equation from a graph

$$Ax + By = C$$

Write an equation in standard form of the line shown.



$$(2, 4)$$

$$x_1, y_1$$

$$(6, -4)$$

$$x_2, y_2$$

All linear equations can be written in standard form, $Ax + By = C$

But sometimes put in $y = mx + b$ or $y - y_1 = m(x - x_1)$

Step 1 Calculate the slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 4}{6 - 2} = \frac{-8}{4} = -2 = m$$

Step 2 Write an equation in point-slope form. Use (2, 4).

$$y - 4 = -2(x - 2)$$

$$y - 4 = -2x + 4$$

$$+4$$

Step 3 Rewrite the equation in standard form.

$$y = -2x + 8$$

$$+2x$$

$$2x + y = 8$$

$$Ax + By = C$$

$$A = 2$$

$$B = 1$$

$$C = 8$$

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

Checkpoint Complete the following exercise.

3. Write an equation in standard form of the line through (3, -1) and (2, -4).

$$m = \frac{-4 - (-1)}{2 - 3} = \frac{-3}{-1} = \frac{3}{1} = 3$$

$x_1 \ y_1 \ x_2 \ y_2$

$$y = mx + b$$

$$-1 = 3(3) + b$$

$$-1 = 9 + b$$

$$-10 = b$$

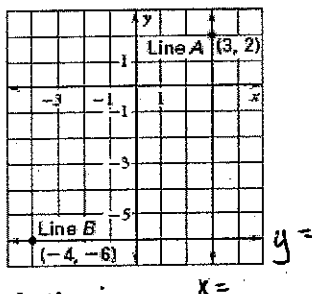
$$y = 3x - 10$$

$$-3x + y = -10$$

Example 3 - Write an equation of a line

Write an equation of the specified line.

- Line A
- Line B



Horizontal
0 = slope

$$Y = \#$$

Vertical
Undefined slope

$$X = \#$$

Solution

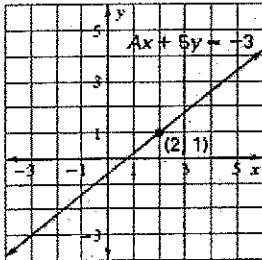
a. The x-coordinate of the given point on Line A is 3. This means that all points on the line have an x-coordinate of 3. An equation of the line is $x = 3$.

b. The y-coordinate of the given point on Line B is -6. This means that all points on the line have a y-coordinate of -6. An equation of the line is $y = -6$.

Example 4 - Complete an equation in standard form

$$A = ?$$

Find the missing coefficient in the equation of the line shown. Write the completed equation.



$$Ax + 5y = -3$$

Solution

Step 1 Find the value of A . Substitute the coordinates of the given point for x and y in the equation.

$$Ax + 5y = -3 \quad \begin{matrix} (2, 1) \\ x \quad y \end{matrix} \quad \text{Write equation.}$$

$$A \cdot 2 + 5(1) = -3$$

$$2A + \frac{5}{1} = \frac{-3}{1}$$

$$\frac{2A}{2} = \frac{-8}{2}$$

$$A = -4$$

$$A = -4$$

Step 2 Complete the equation.

$$-4x + 5y = -3$$

Substitute -4 for A .

Checkpoint Complete the following exercises.

4. Write equations of the horizontal and vertical lines that pass through $(-10, 5)$.

$$y = 5 \quad x = -10$$

5. Find the missing coefficient in the equation of the line that passes through $(-2, 2)$. Write the completed equation.

$$6x + By = 4$$

$$6(-2) + B(2) = 4$$

$$-12 + 2B = 4$$

$$\frac{+12}{+12}$$

$$\frac{2B}{2} = \frac{16}{2}$$

$$B = 8$$

$$6x + 8y = 4$$

5.4 addition to notes Story problem example.

— total → C

— rate B/A

Guitar Picks You have \$5 to spend on guitar picks. You want to buy some nylon picks for \$.35 each and celluloid picks for \$.25 each. — rate A/B

- a. Write an equation in standard form that models the possible combinations of nylon and celluloid picks you can buy.

x = # of nylon picks
y = # of celluloid picks

$$.35x + .25y = 5 \quad 35x + 25y = 500$$

- b. Graph the equation from part (a). Explain what the intercepts of the graph mean in this situation.

$$.35x + .25y = 5$$

x-int. let y = 0

$$.35x + .25(0) = 5$$

$$\frac{.35x}{.35} = \frac{5}{.35}$$

$$x = 14.28$$

(14.28, 0)

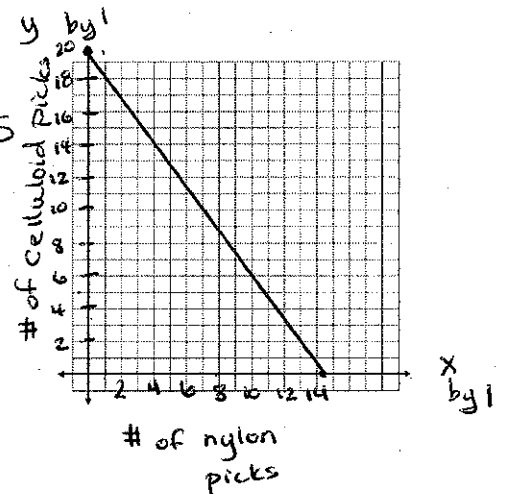
y-int. let x = 0

$$.35(0) + .25y = 5$$

$$\frac{.25y}{.25} = \frac{5}{.25}$$

$$y = 20$$

(0, 20)



- c. List three possible pick combinations.