**KEY**

# Writing Equations in STANDARD FORM

**STANDARD FORM:** $Ax + By = C$  ✱ NO FRACTIONS ✱

To write an equation in STANDARD FORM, first write the equation in:

1. slope-intercept

2. point - slope

2) Then, manipulate your equation so that the variables are on the __SAME__ __SIDE__.

3) Eliminate any fractions. The __coefficients__ must be __integers__.
(#s attached to variables)    (positive or negative whole #s)

$Ax + By = C$

1. Write an equation in $\boxed{\text{standard form}}$ for a line that passes through the points:

   a.  (4, -2) and (7, 4)
   $\overset{x}{} \overset{y}{}$

   $m = \dfrac{4 - {}^-2}{7 - 4} = \dfrac{6}{3} = \boxed{2}$

   slope-intercept → standard

   $y = mx + b$
   $4 = 2(7) + b$
   $4 = 14 + b$
   $\boxed{-10 = b}$

   $y = 2x - 10$
   $\underline{-2x \quad -2x}$
   $\boxed{-2x + y = -10}$

   b.  (3, 7) and (5, -15)

   $m = \dfrac{-15 - 7}{5 - 3} = \dfrac{-22}{2} = \boxed{-11}$

   ✱ point-slope → standard

   $y - 7 = -11(x - 3)$
   $y - 7 = -11x + 33$
   $\underline{+11x \qquad +11x}$
   $11x + y - 7 = 33$
   $\phantom{11x + y}+7 \quad +7$
   $\boxed{11x + y = 40}$

2. Using either method, write an equation in standard form for a line that passes through the following points.

   a.  (-2, 5) and (7, -2)
   $\overset{x_1 \; y_1}{}$

   $m = \dfrac{-2 - 5}{7 - {}^-2} = \boxed{\dfrac{-7}{9}}$

   $\left[ y - 5 = \dfrac{-7}{9}(x + 2) \right] \cdot 9$

   $9y - 45 = -7(x + 2)$
   $9y - 45 = -7x - 14$
   $\underline{+7x \quad +45 \qquad +7x \quad +45}$
   $\boxed{7x + 9y = 31}$

   b.  (9, -2) and (6, -10)
   $\overset{x_1 \; y_1}{}$

   $m = \dfrac{-10 - {}^-2}{6 - 9} = \dfrac{-8}{-3} = \boxed{\dfrac{8}{3}}$

   $\left[ y + 2 = \dfrac{8}{3}(x - 9) \right] \cdot 3$

   $3y + 6 = 8(x - 9)$
   $3y + 6 = 8x - 72$
   $\boxed{-8x + 3y = -78}$

   c.  (-4, 2) and (3, -1)
   $\overset{x_1 \; y_1}{}$

   $m = \dfrac{-1 - 2}{3 - {}^-4} = \boxed{\dfrac{-3}{7}}$

   $\left[ y + 1 = \dfrac{-3}{7}(x - 3) \right] \cdot 7$

   $7y + 7 = -3(x - 3)$
   $7y + 7 = -3x + 9$
   $\boxed{3x + 7y = 2}$

<u>Partner Think Tank!</u>
Convert the standard form equations to slope-intercept form.

$y = mx + b$

a. $2x - 4y = 8$

$$\frac{-4y}{-4} = \frac{-2x}{-4} + \frac{8}{-4}$$

$$\boxed{Y = \tfrac{1}{2}x - 2}$$

← SAME! →

b. $-12x + 24y = -48$

$$\frac{24y}{24} = \frac{12x}{24} - \frac{48}{24}$$

$$\boxed{y = \tfrac{1}{2}x - 2}$$

**Reflect!** What did you observe between the two equations? How were they originally similar (in standard form)? Different?

Can multiply the first equation by -6 and it becomes the second equation!

**BIG IDEA:** To write an equivalent equation, you must keep your equation __BALANCED__.

a. Write at least two equations in standard form that are equivalent to $2x - 6y = 4$.

<u>divide by 2</u>        <u>multiply by 2</u>

$x - 3y = 2$          $4x - 12y = 8$    ,    etc.
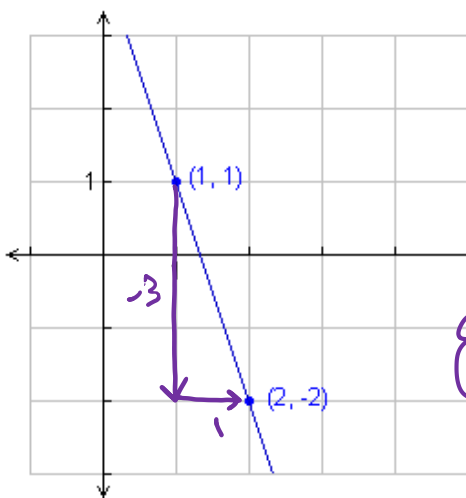
b. Write at least two equations in standard form that are equivalent to $3x + 9y = -27$.

<u>multiply by -1</u>        <u>multiply by 100</u>
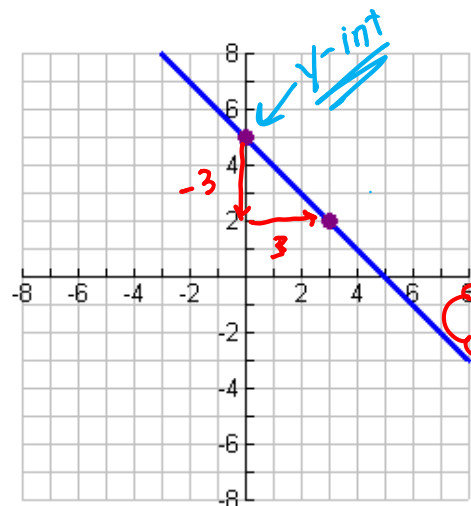
$-3x - 9y = 27$        $300x + 900y = -2700$    , etc.

3. Write an equation in standard form from the graph.

a.



(1, 1)   (2, -2)   -3

$m = \frac{-3}{1} = \boxed{-3}$

Pt - slope
$y - 1 = -3(x - 1)$

$y - 1 = -3x + 3$

$\boxed{3x + y = 4}$

b.



y-int   -3   3

$m = \frac{-1}{1} = \boxed{-1}$

Slope-Int

$y = -1x + 5$

$\boxed{x + y = 5}$

## A Few Applications.

4. Keri has $19.95 in <mark>quarters</mark> and <mark>dimes</mark> after a bake sale for Peer Buddies. Write an equation in standard form to model the number of quarters and dimes that Keri has collected. Define your variables.

$x = $ # of quarters
$y = $ # of dimes

$$.25x + .10y = 19.95$$

If Keri has 27 quarters, how many dimes does she have?

$x = 27$

$.25(27) + .10y = 19.95$
$6.75 + .10y = 19.95$
$.10y = 13.20$

$y = 132$ dimes

5. The Chicago Bulls scored a total of 80 points in a basketball game against the Pacers. Write an equation in standard form to model the number of 3-pointers compared to two-point baskets in the game. *Define your variables.*

$x = $ 2-pointers
$y = $ 3-pointers

$$2x + 3y = 80$$

If the Bulls scored six 3-pointers, how many two-point baskets must they have made?

$y = 6$

$2x + 3(6) = 80$
$2x = 62$

$x = 31$ 2-pointers

6. During a HC lacrosse game, parents sell popcorn and hot pretzels with cheese to raise money for new equipment. They charge $1.50 for a bag of popcorn and $3 for a soft pretzel with cheese. The parents collect $180. Write an equation in standard form to represent the amount of money raised from the sale of pretzels and popcorn. *Define your variables.*

$x = $ popcorn
$y = $ pretzels

$$1.50x + 3y = 180$$
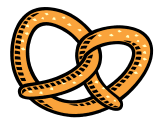
Can you determine how many pretzels and how much popcorn they sold from the given information? Yes? Explain how. No? Explain why.

No, because there would be different combinations of x and y that would work