## Warm-Up:

Solve the following system of equations:

$$\frac{x}{2}+\frac{y}{3}=1 \quad (1)$$
$$\frac{x}{4}-\frac{2y}{3}=-1 \quad (2)$$

(1) × 6 $3x+2y=6$ (3)

(2) × 12 $3x-8y=-12$ (4)

(3) − (4)

$$\frac{10y}{10}=\frac{18}{10}$$
$$y=\frac{9}{5} \quad \ldots (5)$$

Sub (5) into (3)

$$3x+2\left(\frac{9}{5}\right)=6$$
$$3x=6-\frac{18}{5}$$
$$3x=\frac{30-18}{5}$$
$$3x=\frac{12}{5}$$
$$x=\frac{12}{5(3)}=\frac{4}{5}$$

$\left(\frac{4}{5}, \frac{9}{5}\right)$

Check ✓

$$\frac{\frac{4}{5}}{2}+\frac{\frac{9}{5}}{3} \quad \Big| \quad 1$$
$$\frac{4}{10}+\frac{9}{15}$$
$$\frac{2}{5}+\frac{3}{5}$$
$$\frac{5}{5}$$
$$1$$

LS = RS

# Solving Systems of Equations with 2 Unknowns

I. By **Graphing** - takes too much time and sometimes difficult to be accurate.

II. By **Substitution** - ONE equation is rearranged to either " $x=$ " or " $y=$ ".
- then, substitute into the other equation.

| *** Choose this method when ONE has the a variable with a coefficient of 1 or -1. |
|---|

III. By **Elimination** - will create "equivalent equations".
- you can multiple/divide by a constant in an equation.
- you can add/subtract equations to get a new equation.
- setup to eliminate a variable by finding a lowest common multiple for the coefficients.
- then, substitute to get the other unknown.

| *** Choose this method when either variable DOES NOT HAVE a coefficient of 1 or -1. |
|---|

## YOUR TURN...

Solve each of the following systems of equations...use ANY method!!!

$$\boxed{\begin{array}{l} -8x+7y=1 \\ 8x-4y=-4 \end{array}} \quad \begin{array}{l} ① \\ ② \end{array}$$

①+② $3y = -3$

$\frac{3y}{3} = \frac{-3}{3}$

$y = -1$ ... ③

sub ③ into ①

$-8x+7(-1)=1$

$-8x-7=1$

$-8x=1+7$

$\frac{-8x}{-8} = \frac{8}{-8}$

$x=-1$

$(-1,-1)$

$$\boxed{\begin{array}{l} 3x+y=-2 \\ -4x-5y=-23 \end{array}} \quad \begin{array}{l} ① \\ ② \end{array}$$

① $y = -3x-2$ ... ③

Sub ③ into ②

$-4x-5(-3x-2)=-23$

$-4x+15x+10=-23$

$11x=-23-10$

$\frac{11x}{11} = \frac{-33}{11}$

$x=-3$ ...... ④

Sub ④ into ③

$y=-3(-3)-2$

$=9-2$

$=7$

$(-3,7)$

$$\boxed{\begin{array}{l} 5x-27+7y=0 \\ 4y=-3x+1 \end{array}}$$

$5x+7y=27$ .... ①

$3x+4y=1$ ...... ②

①×4 $20x+28y=108$ .. ③

②×7 $21x+28y=7$ ... ④

③-④ $-x=101$

$x=-101$ ...... ⑤

Sub ⑤ into ②

$3(-101)+4y=1$

$-303+4y=1$

$\frac{4y}{4}=\frac{304}{4}$

$y=76$ $(-101,76)$

## Classifying Systems of Equations:

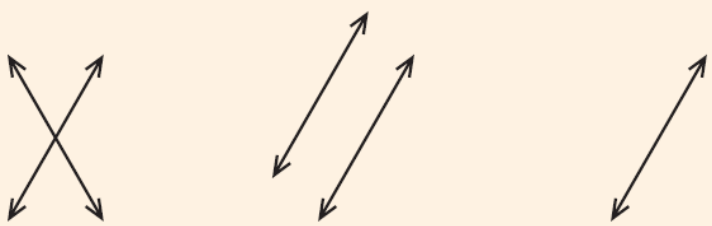
If a system of linear equations has one or more solutions, the system is said to be a **consistent system**. If a linear equation has no solution, it is said to be an **inconsistent system**.

If two equations represent the same line, then all points along the line are solutions to the system of equations. In such a case, the system is characterized as a **dependent system**. An **independent system** is one in which the two equations represent different lines.

Three possibilities when solving systems of equations in two variables...

**Solutions to Systems of Linear Equations in Two Variables**

| One unique solution | No solution | Infinitely many solutions |
|---|---|---|



| One point of intersection | Parallel lines | Coinciding lines |
|---|---|---|
| System is consistent. | System is inconsistent. | System is consistent. |
| System is independent. | System is independent. | System is dependent. |

# True or False??

A consistent system is a system that always has a unique solution.

A dependent system is a system that has no solution.

If two lines coincide, the system is dependent.

If two lines are parallel, the system is independent.