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

$10y=18$

$\frac{10y}{10}=\frac{18}{10}$

$y=\frac{9}{5}$ ...⑤

sub ⑤ into ③

$3x+2\left(\frac{9}{5}\right)=6$

$15x+18=30$

$15x=30-18$

$15x=12$

$x=\frac{12}{15}$

$=\frac{4}{5}$

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

check $\left(\frac{9}{5}=1.8\right)\left(\frac{4}{5}=0.8\right)$

LS	RS
$\frac{0.8}{2}+\frac{1.8}{3}$	1
$0.4+0.6$	
1	LS=RS ✓
$\frac{0.8}{4}-\frac{2(1.8)}{3}$	-1
$0.2-1.2$	
	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!!!

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

①+② $3y=-3$

$y=-1$ ..③

Sub ③ into ①

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

$-8x-7=1$

$-8x=8$

$x=-1$ $(-1,-1)$

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

① $y=-3x-2$ ...③

Sub ③ into 2

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

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

$11x=-33$

$x=-3$ ..... ④

Sub ④ into ③

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

$=9-2$

$=7$

$(-3,7)$

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

$5x+7y=27$ ①

$3x+4y=1$ ②

①×3 $15x+21y=81$ ③

②×5 $15x+20y=5$ ④

③−④ $y=76$ .... ⑤

Sub ⑤ into ②

$3x+4(76)=1$

$3x+304=1$

$3x=-303$

$x=-101$

$(-101,76)$

Classifying Systems of Equations:

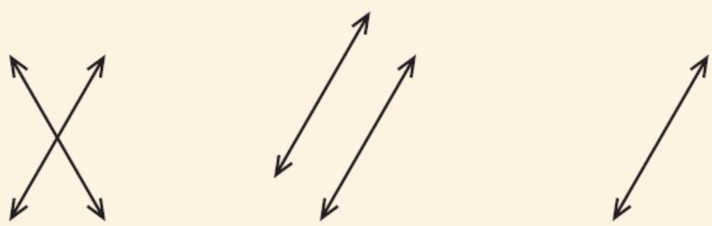
If a system of linear equations has one or more solutions, the system is said to be a **consistent system**. If a linear equation has no solution, it is said to be an **inconsistent system**.

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??

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

F A dependent system is a system that has no solution.

T If two lines coincide, the system is dependent.

T If two lines are parallel, the system is independent.

Inconsistent System (Parallel lines)

- sometimes there may be no solutions when the lines are parallel.
- indicator is getting $0 = \#$ in your solution.

Example: Solve... $y = 3x - 5$ & $y = 3x + 2$

$$\begin{array}{r} y = 3x + 2 \\ \hline 0 = -7 \end{array}$$

Dependent System (Same line)

- sometimes there may be infinitely many solutions when the lines are the same.
- indicator is getting $0 = 0$ in your solution.
- will have an infinite number of solutions. * develop a parametric solution

Example: Solve... $3x - y = 5$ & $-15 + 9x = 3y$

$-5 + 3x = y$

$3x - y = 5$

Subtract

$0 = 0$

Dependent Systems:

How many solutions?....

$3x + 5y = 9$ ①

$6x = 18 - 10y$ ②

② $6x + 16y = 18$ .. ③

③÷2 $3x + 5y = 9$ ... ④

④=①

infinite # solutions

$2x + 3y - 4 = 0$ ①

$6y - 8 = -4x$ ②

① $2x + 3y = 4$ --- ③

② $4x + 6y = 8$ .... ④

④÷2 $2x + 3y = 4$ ... ⑤

①=⑤

Homework...

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