Solving Systems of Equations

System of Equations - 2 or more equations.

2x2 => 2 equations with 2 unknowns

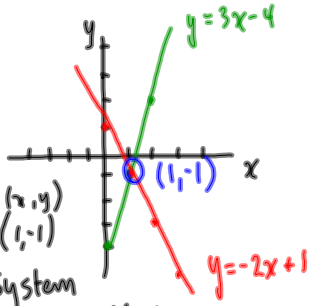
3x3 => 3 equations with 3 unknowns.

The number of equations must match the the number of variables in order to determine a numerical answer for each of the variables.

Example - Graphing

Solve: $y = 3x - 4$

$y = -2x + 1$



(x, y)

The intersection point $(1, -1)$ is the solution for this system of equations

Example - Substitution

$y = 3x - 4$

$y = -2x + 1$

$3x - 4$

$3x - 4 = -2x + 1$ (+2x, +2x)

$5x - 4 = 1$ (+4, +4)

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

$x = 1$

$y = 3x - 4$

$y = 3(1) - 4$

$y = 3 - 4$

$y = -1$

The solution is $(1, -1)$

Example - Substitution

① $2x + y = 7$ => $y = -2x + 7$

② $3x + 2y = 0$

Sub $y = -2x + 7$ into ②

$3x + 2y = 0$

$3x + 2(-2x + 7) = 0$

$3x - 4x + 14 = 0$

$-x + 14 = 0$ (+x, +x)

$14 = x$

Sub $x = 14$ in ①:

$2x + y = 7$

$2(14) + y = 7$

$28 + y = 7$ (-28, -28)

$y = -21$

The solution is $(14, -21)$

Example ~ Elimination

Solve: ① $2x+y=7$ $\xrightarrow{\times 2}$ $4x+2y=14$

② $3x-2y=7$ $\longrightarrow$ $+\ 3x-2y=7$

$7x=21$

$\frac{7x}{7}=\frac{21}{7}$

$\boxed{x=3}$

Sub $x=3$ into ①:

$2x+y=7$

$2(3)+y=7$

$6+y=7$

$\boxed{y=1}$

The solution is

$(3,1)$

(x,y)

Example ~ Application

Jill is looking at her last 3 phone bills:

	LD(NS)	LD(other)	Bill
Sept	210 min	40 min	$41.50
Oct	150 min	55 min	$36.25
Nov	100 min	90 min	$37.50

Jill wants to know the per minute charge for NS-LD calls and other LD calls.

Let x be the per minute charge for NS-LD
y be the per minute charge for other-LD

Sept: $210x + 40y = 41.50$ (x: charge per minute; 210: number of minutes)

Oct: $150x + 55y = 36.25$

Nov: $100x + 90y = 37.50$

You only need two equations to be able to solve.

Best bet .... use ELIMINATION