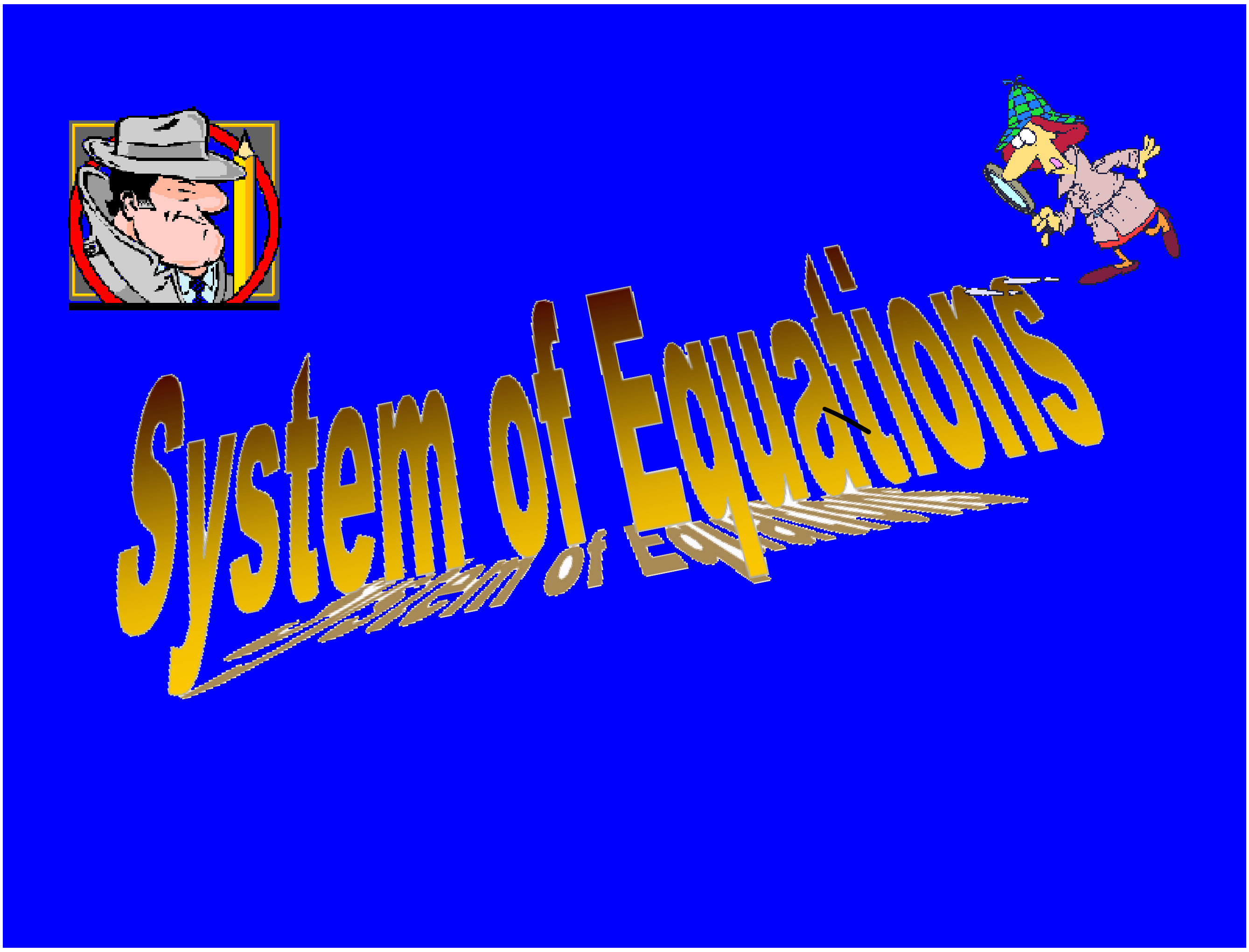
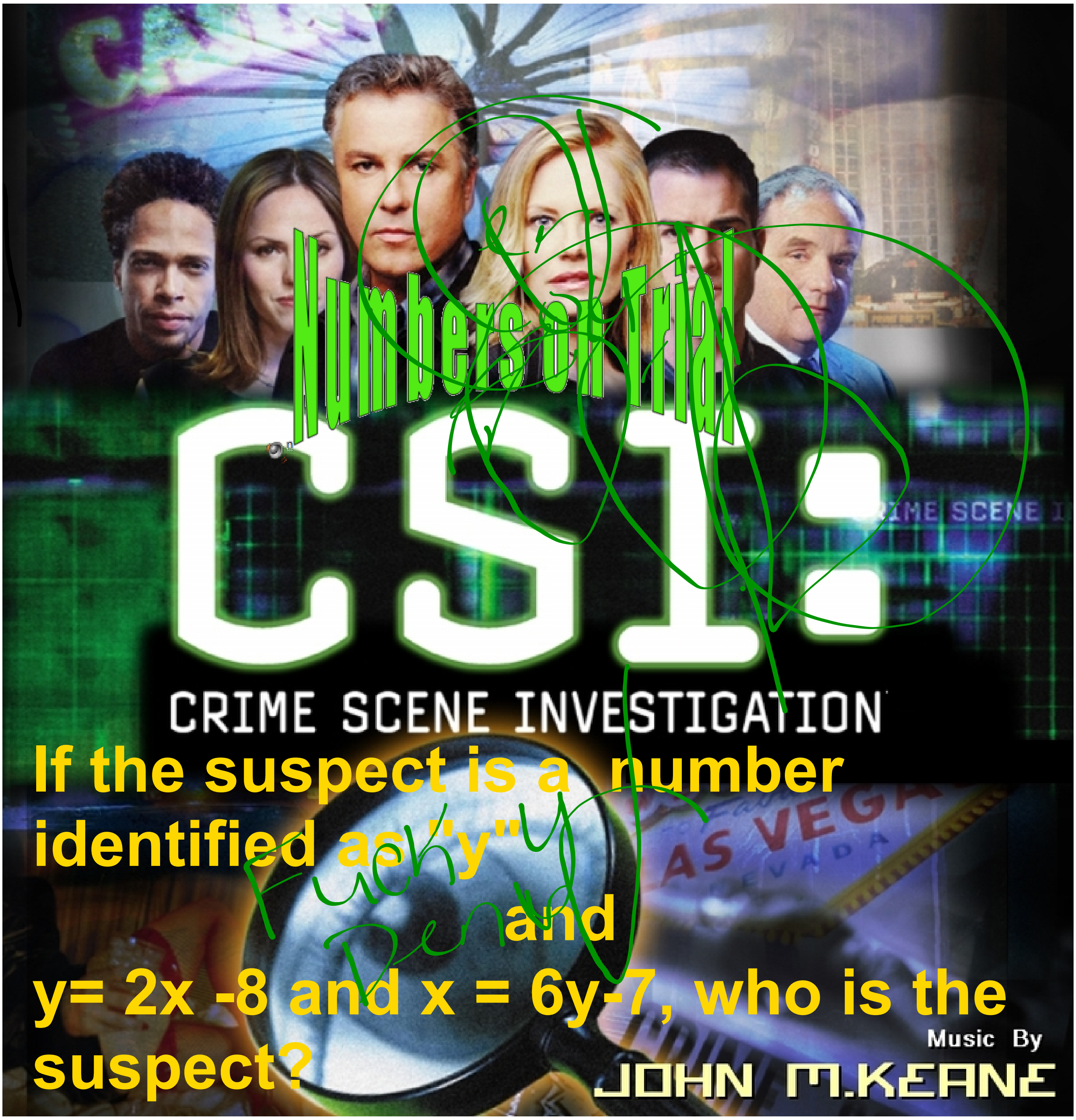

System of Equations


Numbers on Trial
CSI:
CRIME SCENE INVESTIGATION
If the suspect is a number identified as "y" and
y= 2x -8 and x = 6y-7, who is the suspect?
LAS VEGAS
Music By
JOHN M.KEANE

**If the suspect is a number identified as "y"**

**and**

**y= 2x -8 and x = 6y-7, who is the suspect?**

$y = 2(x) - 8$

$= 2(6y-7) - 8$

$y = 12y - 14 - 8$

$y - 12y = 12y - 12y - 22$

$-11y = -22$

$\frac{-11y}{-11} = \frac{-22}{-11}$

$y = 2$

$x = 6y - 7$

$= 6(2) - 7$

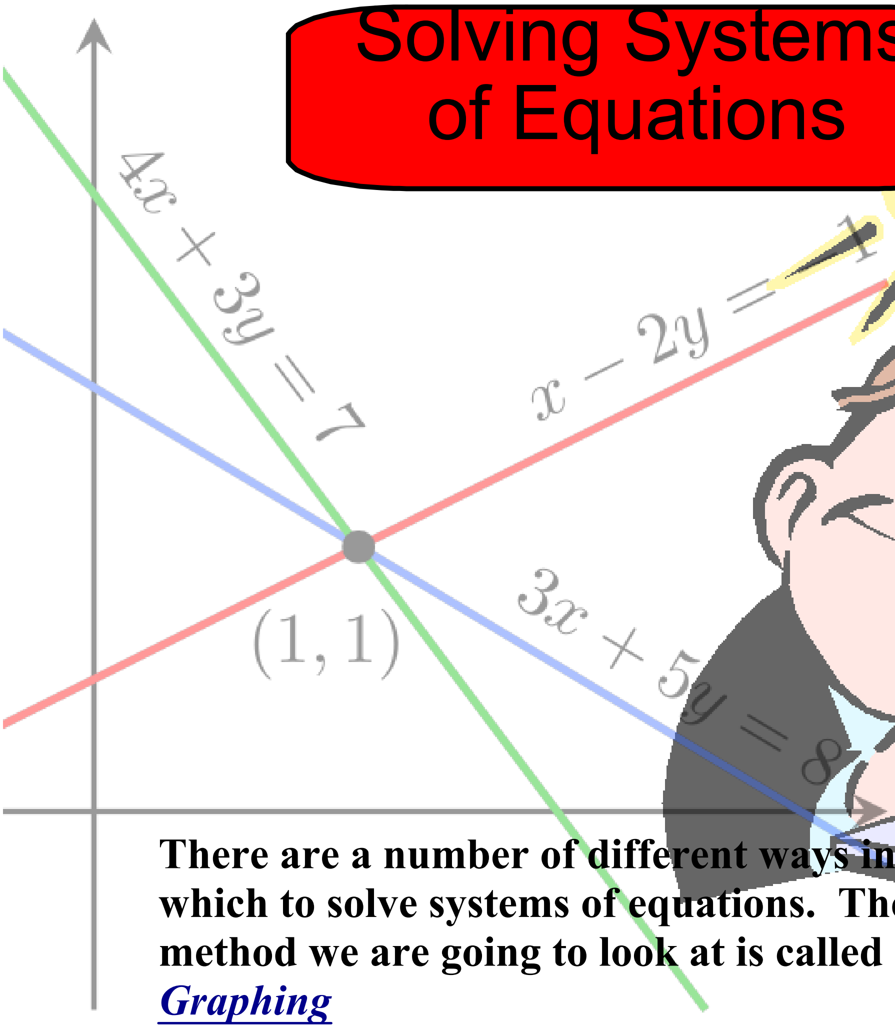
$= 12 - 7$

$x = 5$

$(x, y)$

$(5, 2)$

# Solving Systems of Equations



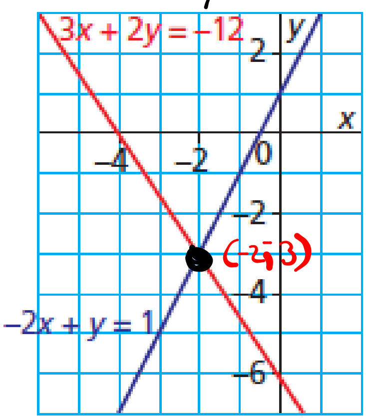

**There are a number of different ways in which to solve systems of equations. The first method we are going to look at is called** ***Graphing***

The solution of a linear system can be estimated by graphing both equations on the same grid. If the two lines intersect, the coordinates $(x, y)$ of the point of intersection are the solution of the linear system.

$$2y = -3x - 12 \quad \text{(each term } \div 2\text{)}$$
$$y = -\frac{3}{2}x - 6 \qquad m = \frac{-3}{2} \quad b = -6$$

$$3x + 2y = -12 \qquad ①$$
$$-2x + y = 1 \qquad ②$$

$y = 2x + 1$, $m = 2$, $b = 1$




We can use the graphs to estimate the solution of the linear system.
The set of points that satisfy equation ① lie on its graph.
The set of points that satisfy equation ② lie on its graph.
The set of points that satisfy both equations lie where the two graphs inter
From the graphs, the point of intersection appears to be $(-2, -3)$.

$(x, y) = (-2, -3)$ — Read off graph

Check LHS to RHS in Both Equation

① LHS / RHS: $3x + 2y = -12$

$3(x) + 2(y)$
$3(-2) + 2(-3)$
$-6 + -6$
$-12$ ← Same
So Works

② LHS / RHS: $-2x + y = 1$

$-2(x) + (y)$
$-2(-2) + (-3)$
$4 + -3$
$1$ ← Same
So works

## Example 1 Solving a Linear System by Graphing

Solve this linear system.

① $x + y = 8$

② $3x - 2y = 14$

### SOLUTION

$x + y = 8$ ①

$3x - 2y = 14$ ②

Determine the $x$-intercept and $y$-intercept of the graph of equation ①.
Both the $x$- and $y$-intercepts are 8.

Write equation ② in slope-intercept form.

$$3x - 2y = 14$$

$$-2y = -3x + 14 \quad \text{Divide by } -2 \text{ to solve for } y.$$

$$y = \frac{3}{2}x - 7$$

The slope of the graph of equation ② is $\frac{3}{2}$, and its $y$-intercept is $-7$.

(Solution continues.)

$y = mx + b$

Solve this linear system.

① $x + y = 8$ → $y = \frac{-1x}{1} + 8$  $m = \frac{-1}{1}$  $b = +8$

② $3x - 2y = 14$

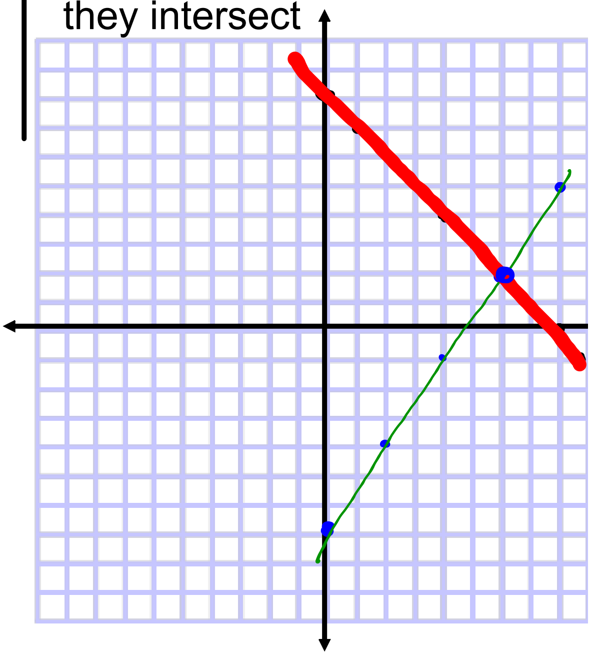
$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{14}{-2}$

$y = \frac{3}{2}x - 7$  $m = \frac{3}{2}$  $b = -7$

Step 1) Find the x and y intercept for equation 1 or put in slope intercept form then graph it

Step 2) For equation 2, solve for slope intercept form (Then Graph it)

Once both are graphed read off the graph where they intersect



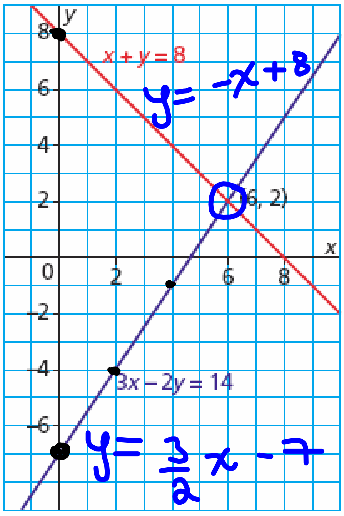
line 1  $m = \frac{-1 \text{ rise}}{1 \text{ run}}$  $b = +8$

line 2  $m = \frac{3 \text{ rise}}{2 \text{ run}}$  $b = -7$

Point of intersection (6, 2)

## Example 1 Solving a Linear System by Graphing

Graph each line.
The point of intersection appears to be (6, 2).




Check it (6, 2)

LHS = RHS for both

$x + y = 8$
$6 + 2$
$8$ same ✓

on next page

$3x - 2y = 14$
$3(6) - 2(2)$
$18 - 4$
$14$ same ✓

(Solution continues.)

## Example 1 Solving a Linear System by Graphing

Verify the solution. In each equation, substitute: $x = 6$ and $y = 2$

$x + y = 8$

$$\begin{aligned} \text{L.S.} &= x + y \\ &= 6 + 2 \\ &= 8 \\ &= \text{R.S.} \end{aligned}$$

$3x - 2y = 14$

$$\begin{aligned} \text{L.S.} &= 3x - 2y \\ &= 3(6) - 2(2) \\ &= 18 - 4 \\ &= 14 \\ &= \text{R.S.} \end{aligned}$$

For each equation, the left side is equal to the right side.
So, $x = 6$ and $y = 2$ is the solution of the linear system.

**1.** Solve this linear system.

① $2x + 3y = 3$

② $x - y = 4$

$y = mx + b$ for Both

Using graphing method

① $2x + 3y = 3$

$\frac{3y}{3} = \frac{-2x}{3} + \frac{3}{3}$

$y = -\frac{2}{3}x + 1$

$m = \frac{-2}{3}\frac{\text{rise}}{\text{run}}$

$b = +1$

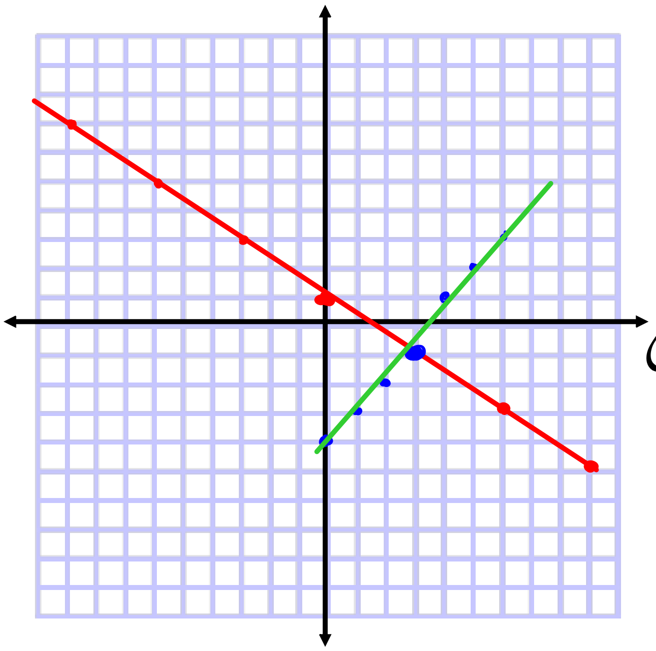
Plot y-intercept then use $m = \frac{-2}{3}\frac{\text{rise}}{\text{run}}$ to graph this line

② $x - 1y = 4$

$\frac{-1y}{-1} = \frac{-1x}{-1} + \frac{4}{-1}$

$y = 1x - 4$

$m = \frac{1}{1}$ $b = -4$



Point of intersectn

$(3, -1)$

Check

① $2x + 3y = 3$

$2(3) + 3(-1)$

$6 + -3$

$3$ ← same ✓

② $x - y = 4$

$(3) - (-1)$

$3 + (+1)$

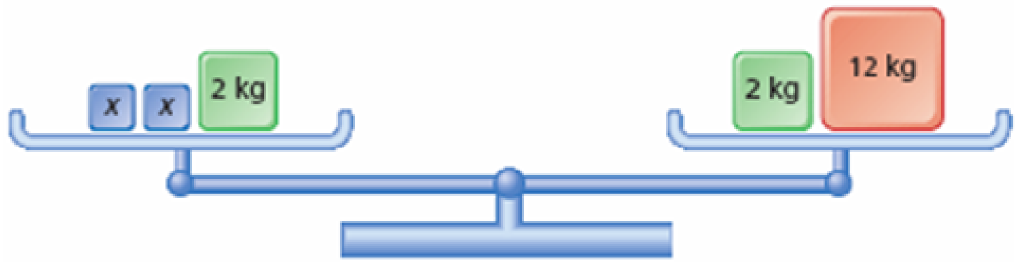
$4$ ← same ✓

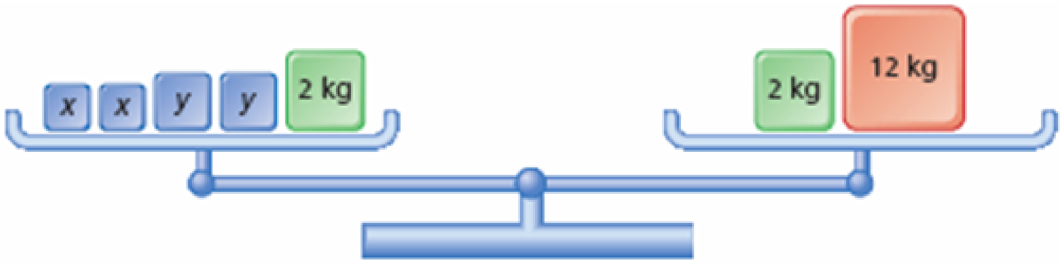
Method 2: Substitution

I like this one better

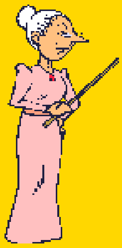
# 7.4 Using a Substitution Strategy to Solve a System of Linear Equations

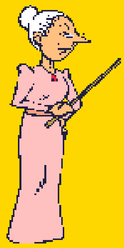
Save for tomorrow



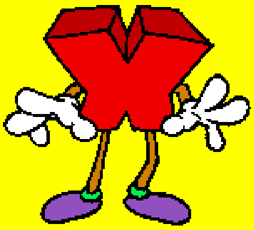



# Solving Systems of Equations

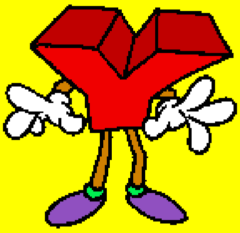




**There are a number of different ways in which to solve systems of equations. The second method we are going to look at is called *substitution.***



When we refer to solving a system of equations, we want to **solve for a numerical value** **for one variable**.



## Rules for Substitution as a method for solving a system of equations.

- **There must be the same number of equations as variables.**

  - If there are two variables, there must be two equations; three variables, three equations, etc.

- **One of the equations can easily be substituted into the other equation to solve for one variable**

Steps when solving systems of equations using substitution

① $-8x + y = 0$

② $x + 2y + 17 = 0$

Doesn't matter which you start with

Step 1: Isolate one of the variables with the coefficient 1.

Step 2: Substitute into the other equation.

Step 3: Solve for the variable Using step 1's equation

You try with Substitution

Solve the follwoing systems of equations using substitution

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