Key

Notes: Solving Systems using Elimination

Methods For Solving
Systems of Equations

1) Graphing

2) Elimination

3) Substitution

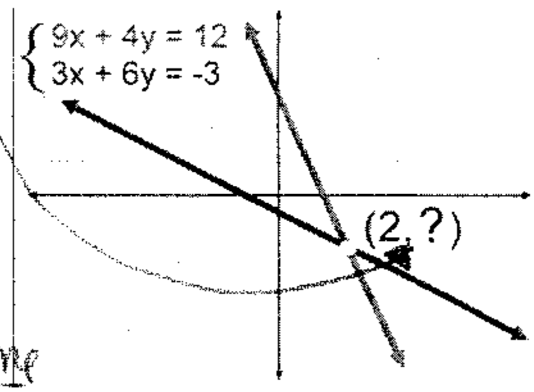
Example 1) Answer: (2, -1.5)

Find the solution to the system using substitution.

Make sure to check the solution.

$$\begin{cases} 9x + 4y = 12 \\ 3x + 6y = -3 \end{cases}$$

many ways to solve to get the same answer



St 1) $9x+4y=12$

$-3(3x+6y=-3) \rightarrow -9x-18y=9$

step 2) $9x+4y=12$

$+\ -9x-18y=9$

step 3) $-14y=21$

$\frac{-14y}{-14} = \frac{21}{-14}$

$\boxed{y=-1.5}$

Step 4) & Step 5)

$9x+4y=12$

$9x+4(-1.5)=12$

$9x-6=12$

$+6\quad +6$

$\frac{9x}{9} = \frac{18}{9}$

$\boxed{x=2}$

$3x+6y=-3$

$3x+6(-1.5)=-3$

$3x-9=-3$

$+9\quad +9$

$\frac{3x}{3}=\frac{6}{3}$

$\boxed{x=2}$

Example 2)

Catering: A caterer is planning a **party for 64 people.** The **customer has $150 to spend.** A **$39 pan of pasta feeds 14 people** and a **$12 sandwich tray feeds 6 people.** How many pans of pasta and how many sandwich trays should the caterer make? Write a system of equations and then use elimination to answer the question. Then algebraically check your solution. Make sure to show all work.

Hint, one equation represents people at the party, the other equation represents money to spend on food.

Let x=pans of pasta, Let y=Sandwich trays.

Answer: 2 pans of pasta, 6 sandwich trays

people: $14x + 6y = 64$

money: $39x + 12y = 150$

step 1) $-2(14x + 6y = 64) \rightarrow -28x - 12y = -128$

$39x + 12y = 150$

step 2) $-28x - 12y = -128$

$+ \ 39x + 12y = 150$

$11x = 22$

step 3) $\frac{11x}{11} = \frac{22}{11}$

$\boxed{x = 2 \text{ pans of pasta}}$

step 4 & 5)

$14x + 6y = 64$	$39x + 12y = 150$
$14(2) + 6y = 64$	$39(2) + 12y = 150$
$28 + 6y = 64$	$78 + 12y = 150$
$6y = 36$	$12y = 72$
$\frac{6y}{6} = \frac{36}{6}$	$\frac{12y}{12} = \frac{72}{12}$
$\boxed{y = 6}$	$\boxed{y = 6}$

Example 3)

A store sold 28 pairs of cross-trainer shoes for a total of $2220. Style A sold for $70 per pair and Style B sold for $90 per pair. How many of each style were sold?

x = Style A y = Style B

Shoes: $x + y = 28$

cost: $70x + 90y = 2220$

Answer: 15 style A, 13 style B

step 1.) $-70(x + y = 28) \rightarrow -70x - 70y = -1960$

$70x + 90y = 2220$

step 2.) $-70x - 70y = -1960$

$+ \ 70x + 90y = 2220$

$20y = 260$

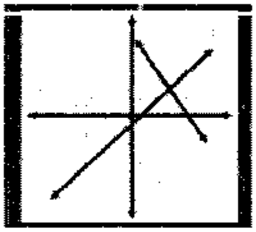
step 3.) $\frac{20y}{20} = \frac{260}{20}$ 13 style

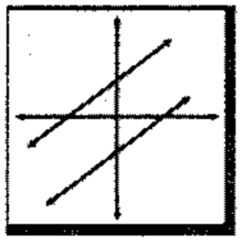
$\boxed{y = 13 \text{ style B}}$

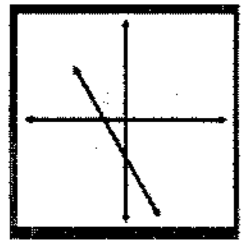
step 4 & 5)

$x + y = 28$	$70x + 90y = 2220$
$x + 13 = 28$	$70x + 90(13) = 2220$
$x = 15$	$70x + 1170 = 2220$
	$70x = 1050$
	$x = 15$

Special Types of Linear Systems

ONE Solution 

NO Solution 

Infinite Solutions 

Example 4.) Determine how many solutions there are to the system of equations. Solve using elimination

$-2x + y = 3$
$-4x + 2y = 6$

Step1.) $-2(-2x+y=3) \rightarrow 4x-2y=-6$
$-4x+2y=6$

Step2.) $4x-2y=-6$
$+\ -4x+2y=6$
$0x+0y=0$ TRUE
$0=0$ ~~false~~ 0 ~~[illegible]~~ equal 0

Thus the lines are the same, there are infinite solutions!

thus the lines never touch, there is no solution the lines are parallel

Example 5.)
Determine how many solutions there are to the system of equations.

$2x + y = 5$
$2x + y = 1$

Step 1.) $-1(2x+y=5) \rightarrow -2x-y=-5$
$2x+y=1$

Step2.) $-2x-y=-5$
$+\ 2x+y=1$
$0x+0y=-4$
$0=-4$ False $0 \neq -4$

Thus, the lines never touch, there is no solution the lines are parallel

Elimination

To solve a system using elimination:

Step 1.) Look at each variable. Both coefficients in front of x OR y need to be the same, one positive and one negative. If this is not the case, you need to use multiplication to make the coefficients the same.

Step 2.) Add the systems together. (One letter should disappear/eliminate)

Step 3.) Solve for the variable left over.

Step 4.) Substitute the answer you get from step 3 into the original equations to find the other variable.

Step 5.) Check to make sure the solution works in BOTH equations, to make sure the solution is a solution to the SYSTEM.