# Algebra 2
# Unit 0, Lesson 5 - Solving Systems by Elimination

- Solve Linear Systems by Elimination

Refresher (Write this in notes):

1. Multiply the following equations by the amount specified.

Mult. by 3

$3(3x-2y=12)$

$9x-6y=36$

Mult. by -3

$-3(-x+7y=-8)$

$3x-21y=24$

Main Idea:

- Add the equations together in order to eliminate one of the variables.
- If you cannot eliminate a variable right away, multiply the equation(s) by some number.

Ex: $2x - 3y = -9$

$+ \quad 5x + 3y = 30$

$7x = 21$

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

$x = 3$

$2(3) - 3y = -9$

$6 - 3y = -9$

$-6 \qquad -6$

$-3y = -15$

$\frac{-3y}{-3} = \frac{-15}{-3}$

$y = 5$

$(3, 5)$

Notice how if you Add down, the -3y and +3y will cancel.

Step 1: Eliminate a variable by adding down.

Step 2: Solve for the remaining variable.

Step 3: Plug that value in to an equation and solve for the other variable.

Ex: $x + 4y = 2$

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

$-y = -1$

$\frac{-y}{-1} = \frac{-1}{-1}$

$y = 1$

$x + 4(1) = 2$

$x + 4 = 2$

$-4 \quad -4$

$x = -2$

What do you notice if you added down now?

$(x, y)$

$(-2, 1)$

## When you can't eliminate Immediately:

Find the "Least Common Multiple" between the two numbers you want to eliminate & Multiply the equations to cancel.

Ex:

$3(2x-5y=15)$

$-2(3x+7y=8)$

$6x-15y=45$

$-6x-14y=-16$

$-29y=29$

$-29 \quad -29$

$y=-1$

$2x-5(-1)=15$

$2x+5=15$

$-5 \quad -5$

$2x=10$

$x=5$

Notice how nothing eliminates if you add down now.

Look at the multiples of 2 & 3...

2: 2, 4, 6, 8, 10...

3: 3, 6, 9, 12...

6 is the least common multiple. So multiply the equations so that one equation has a -6x and one has a +6x. Then add down and solve.

$(5,-1)$

Ex: $2(7x+20y=-9)$

$7(-2x-3y=8)$

$14x+40y=-18$

$-14x-21y=56$

$19y=38$

$\frac{19y}{19}=\frac{38}{19}$

$y=2$

$-2x-3(2)=8$

$-2x-6=8$

$+6 \quad +6$

$\frac{-2x}{-2}=\frac{14}{-2}$

$x=-7$

$(-7, 2)$

# Infinitely Many & No Solutions:

$15x - 21y = -63$

$3(-5x + 7y = 21)$

$15x - 21y = -63$

$-15x + 21y = 63$

$0 = 0$

infinite solutions

Since the statement after adding down was true, there are infinitely many solutions (because they are the same line). If the statement were to be false, the answer would be "No Solutions" (Because they are parallel lines)

Homework:

Solving Systems using Elimination Worksheet.

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