Algebra 1 – Unit 7
Solving Linear Systems by Elimination (Day 1) - NOTES

You will learn how to solve by elimination in two different situations:

1. One variable has opposite coefficients.
2. One variable has coefficients that are the same.

When one variable has **opposite coefficients**:

- Put the equations in standard form ($Ax + By = C$)
- Add the like terms between the two equations
- One variable will cancel out
- Solve for the remaining variable – substitute this answer into either original equation to find the value of the other variable.
- Write the solution for each variable as an ordered pair. Check the solution in both equations.

2
+3
5

Example 1:

$$\begin{array}{r} 4x+3y=16 \\ +\ 2x-3y=8 \\ \hline 6x=24 \end{array}$$

$\frac{6x}{6}=\frac{24}{6}$

$x=4$

$4(4)+3y=16$

$16+3y=16$

$-16 \quad -16$

$\frac{3y}{3}=\frac{0}{3}$

$y=0$

Solution: $(4, 0)$

Example 2:

$$\begin{array}{r} 2x+3y=11 \\ +\ -2x+5y=13 \\ \hline 8y=24 \end{array}$$

$\frac{8y}{8}=\frac{24}{8}$

$y=3$

$2x+3(3)=11$

$2x+9=11$

$-9 \quad -9$

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

$x=1$

Solution: $(1, 3)$

Example 3:

$$\begin{array}{r} -3x-5y=-7 \\ +\ -4x+5y=14 \\ \hline -7x=7 \end{array}$$

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

$x=-1$

$-3(-1)-5y=-7$

$3-5y=-7$

$-3 \quad -3$

$-5y=-10$

$\frac{-5y}{-5} = \frac{-10}{-5}$

$y=2$

Solution: $(-1, 2)$

Example 4:

$$\begin{array}{r} 6x-4y=14 \\ +\ -6x+8y=2 \\ \hline 4y=16 \end{array}$$

$\frac{4y}{4} = \frac{16}{4}$

$y=4$

$6x-4(4)=14$

$6x-16=14$

$+16 \quad +16$

$6x=30$

$\frac{6x}{6} = \frac{30}{6}$

$x=5$

Solution: $(5, 4)$

When one variable has **the same coefficients**:

- Put the equations in standard form (Ax + By = C)
- multiply one equation by -1 **(change all of the signs in one of the equations)**
  - **this will make the one of the variables have opposite coefficients**
- Add the like terms between the two equations
- One variable will cancel out
- Solve for the remaining variable – substitute this answer into either original equation to find the value of the other variable.
- Write the solution for each variable as an ordered pair. Check the solution in both equations.

Example 1:

$-1(3y+2x=6)$

$-5y+2x=-10$

$-3y-2x=-6$

$+\ -5y+2x=-10$

$-8y=-16$

$\frac{-8y}{-8}=\frac{-16}{-8}$

$y=2$

$3(2)+2x=6$

$6+2x=6$

$-6\quad -6$

$2x=0$

$\frac{2x}{2}=\frac{0}{2}$

$x=0$

Solution: (0, 2)

Example 2:

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

$5x+3y=2$

$-4x-3y=-2$

$+\ 5x+3y=2$

$x=0$

$4(0)+3y=2$

$0+3y=2$

$\frac{3y}{3}=\frac{2}{3}$

$y=\frac{2}{3}$

Solution: $(0, \frac{2}{3})$

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

Solution: (3, -2)

$-x+y=-1$

$+\ 2x+y=4$

$x=3$

$3+y=1$

$-3 \quad -3$

$y=-2$

Example 4: $-1(4x+3y=2)$, $5x+3y=-2$

Solution: (-4, 6)

$-4x-3y=-2$

$+\ 5x+3y=-2$

$x=-4$

$4(-4)+3y=2$

$-16+3y=2$

$+16 \quad +16$

$\frac{3y}{3}=\frac{18}{3}$

$y=6$