Day 6 – Solving Systems Using Elimination

Yesterday, you learned how to solve systems by either having to add the equations together or multiply one of the equations by a constant and then add. Sometimes, you may have to multiply both equations by a constant in order to solve. Try the following equations below:

Steps for Solving Systems by Elimination

Step 1: Arrange the equations with like terms in columns. ✓

Step 2: Analyze the coefficients of x or y. Multiply one or both equations by an appropriate number to obtain new coefficients that are opposites

Step 3: Add the equations and solve for the remaining variable.

Step 4: Substitute the value into either equation and solve.

Step 5: Check the solution by substituting the point back into both equation.

Elimination by Multiplying Both Equations by a Constant and then Adding

a. $-8(5x - 4y = -1) \Rightarrow -40x + 32y = 8$
$5(8x + 7y = -15) \Rightarrow 40x + 35y = -75$

$67y = -67$, $\frac{67y}{67} = \frac{-67}{67}$, $y = -1$

$5x - 4y = -1$
$5x - 4(-1) = -1$
$5x + 4 = -1$, $-4 \quad -4$
$\frac{5x}{5} = \frac{-5}{5}$
$x = -1$

Solution: $(-1, -1)$

b. $-5(-6x + 12y = -6) \Rightarrow 30x - 60y = 30$
$6(-5x + 10y = -5) \Rightarrow -30x + 60y = -30$

$0 = 0$

Solution: INFINITE

c. $2(-9x + 5y = 26) \Rightarrow -18x + 10y = 52$
$-5(2x + 2y = 16) \Rightarrow -10x - 10y = -80$

$-28x = -28$, $\frac{-28x}{-28} = \frac{-28}{-28}$
$x = 1$

$2x + 2y = 16$
$2(1) + 2y = 16$, $-2 \quad -2$
$2y = 14$
$y = 7$

Solution: $(1, 7)$

d. $5(2x + 2y = 10) \Rightarrow 10x + 10y = 50$
$-2(3x + 5y = 13) \Rightarrow -6x - 10y = -26$

$4x = 24$
$x = 6$

$2x + 2y = 10$
$2(6) + 2y = 10$
$12 + 2y = 10$, $-12 \quad -12$
$\frac{2y}{2} = \frac{-2}{2}$ $y = -1$

Solution: $(6, -1)$

Problem Solving with Elimination

1. Love Street is have a sale on jewelry and hair accessories. You can buy 5 pieces of jewelry and 8 hair accessories for 34.50 or 2 pieces of jewelry and 16 hair accessories for \$33.00. This can be modeled by the equations: $\begin{cases}5x+8y=34.50\\2x+16y=33.00\end{cases}$. How much is each piece of jewelry and hair accessories?

a. What does x and y represent?

x= \$ of jewelry

y= \$ of hair access.

b. Explain what the first equation represents:

5x+8y=34.50

If you buy 5 pieces of jewel. and 8 hair access., it will cost \$34.50

c. Explain what the second equation represents:

2x+16y=33.00

Two pieces of jewel. and 16 hair access. will cost \$33.00

d. Solve the system of equations:

$-2(5x+8y=34.50) \Rightarrow -10x-16y=-69$

$2x+16y=33.00 \Rightarrow 2x+16y=33$

$-8x=-36$

$x=4.5$

$2x+16y=33$

$2(4.5)+16y=33$

$9+16y=33$

$-9 \quad -9$

$16y=24$

$y=1.5$

$(4.5, 1.5)$

\$ jw. \$ h.a

2. A test has twenty questions worth 100 points. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. This can be modeled by $\begin{cases}x+y=20\\3x+11y=100\end{cases}$. How many multiple choice and True/False questions are on the test?

a. What does x and y represent?

x = # of T/F

y= # of multiple choice

b. Explain what the first equation represents:

x+y=20

T/F questions and MC ques. is a total of 20 quest.

c. Explain what the second equation represents:

3x+11y=100

For 3 points per T/F quest and 11 points per MC, equals a total of 100 pts

d. Solve the system of equations:

$-3(x+y=20) \Rightarrow -3x-3y=-60$

$3x+11y=100 \Rightarrow 3x+11y=100$

$8y=40$

$\frac{8y}{8}=\frac{40}{8}$

$y=5$

$x+y=20$

$x+5=20$

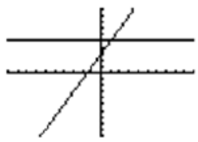
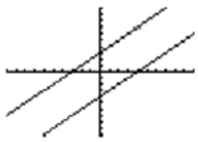
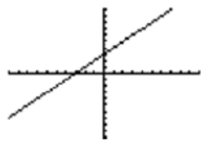
$-5 \quad -5$

$x=15$

$(15, 5)$

T/F MC

How Many Solutions to the System?

Method		One Solution	No Solutions	Infinite Solutions
Graphing	**Best to use when:** Both equations are in slope intercept form. (y = mx + b) EX: y = 3x – 1 y = -x + 4 Solutions are integer coordinate points (no decimals or fractions)	 Solution is the point of intersection. Different Slope Different y-intercept	 Lines are parallel and do not intersect. (Slopes are equal) Same Slope Different y-intercept	 Lines are identical and intersect at every point. Same Slope Same y-intercept (Same Equations)
Substitution	**Best to use when:** One equation has been solved for a variable or both equations are solved for the same variable. EX: y = 2x + 1 or y = 3x - 1 3x – 2y = 10 y = -x + 4	After substituting and simplifying, you will be left with: x = # y = # Solution will take the form of (x, y)	After substituting, variables will form **zero pairs** and you will be left with a **FALSE** equation. 3 = 6	After substituting, variables will form **zero pairs** and will leave you with a **TRUE** equation. 4 = 4
Elimination	**Best to use when:** Both equations are in standard form. (Ax + By = C) Coefficients of variables are opposites. 3x + 6y = 5 -3x – 8y = 2 Equations can be easily made into opposites using multiplication. -2(4x + 2y = 5) 8x – 6y = -5	After eliminating and simplifying, you will be left with: x = # y = # Solution will take the form of (x, y)	After eliminating, variables will form **zero pairs** and you will be left with a **FALSE** equation. 0 = 5	After eliminating, variables will form **zero pairs** and will leave you with a **TRUE** equation. 0 = 0