1.5 Solving Systems by Substitution and Elimination

Objectives: Students will solve systems of equations using substitution or elimination.

Remember: A solution to a system is the set of all points that satisfies each equation in the system

Exactly one solution- Intersecting lines (x,y)
Infinitely many solutions(IMS) - Same Line -True statement
No solutions - Parallel Lines -False statement

Ex 1) Solve each system by substitution

1. Solve for one of the variables (get one to say y = OR x =)
2. Substitute solved variable(will be an expression) into the other equation--should now have an equation with only 1 variable
3. Solve for the 2nd variable
4. Substitute solution into one equation & solve for the other variable

A) $\begin{cases} y = x + 2 \\ x + y = 8 \end{cases}$

$x + (x+2) = 8$

$2x + 2 = 8$
$\quad -2 \quad -2$

$\frac{2x}{2} = \frac{6}{2}$

$x = 3$

$y = x + 2$

$y = 3 + 2$

$y = 5$

$(3, 5)$

B) $\begin{cases} 3x + y = 1 \\ 2y + 6x = -18 \end{cases}$

$-3x \qquad -3x$

$y = 1 - 3x$

$2(1-3x) + 6x = -18$

$2 - 6x + 6x = -18$

$2 = -18$

(False)

$\varnothing$

c) $\begin{cases} x + 4y = 8 \\ 2x - 5y = 29 \end{cases}$

$-4y \quad -4y \rightarrow x = 8 - 4y$

$\rightarrow 2(8-4y) - 5y = 29$

$16 - 8y - 5y = 29$
$-16 \qquad\qquad -16$

$-13y = 13$

$y = -1$

$(12, -1)$

$x = 8 - 4(-1)$

$x = 8 + 4$

$x = 12$

D) Ringer app A costs \$5 for the initial download and \$3 per ringer. Ringer app B costs \$3 for the initial download and \$5 per ringer. When do they cost the same?

$A: \quad C = 5 + 3R$

$B: \quad C = 3 + 5R$

$3 + 5R = 5 + \cancel{3R}$
$-3 \quad -3R \quad -3 \quad -3R$

$2R = 2$

$R = 1$

Solve each system by ELIMINATION.

1. NEED TO GET ONE LETTER TO CANCEL OUT!!--
   add/subtract the equations together OR
   multiply an equation by a number needed to cancel out a variable
2. solve for a variable
3. plug the answer into an original equation to solve for the other variable

Ex. 2

A) $\begin{cases} 2x + 3y = 34 \\ 4x - 3y = -4 \end{cases}$

add

$6x = 30$

$x = 5$

$2(5) + 3y = 34$

$10 + 3y = 34$
$-10 \qquad\quad -10$

$3y = 24$

$y = 8$

$(5, 8)$

B) $\begin{cases} 2x + 4y = -10 \\ 3x + 3y = -3 \end{cases}$

$\cdot 3$

$\cdot(-2)$

$6x + 12y = -30$

$-6x - 6y = 6$

add

$6y = -24$

$y = -4$

$3x + 3(-4) = -3$

$3x - 12 = -3$
$+12 \quad +12$

$3x = 9$

$x = 3$

$(3, -4)$

EX3) Three large popcorns and 2 small drinks cost $21 at the Cinema. 2 large popcorns and 4 small drinks cost $22. How much is a large popcorn? How much is a small drink?

$3P + 2D = 21 \rightarrow 3P + 2D = 21$

$2P + 4D = 22 \xrightarrow{\div(-2)} -P - 2D = -11$

$2P = 10$

$P = 5$

$2\overset{(5)}{\cancel{P}} + 4D = 22$

$10 + 4D = 22$

$-10 \qquad -10$

$4D = 12$

$D = 3$

Ex. 4

Tickets to a play cost $2.50 for adults and $2.00 for students. 319 tickets were sold and $694 was taken in. How many of each type of tickets were sold

$A + C = 319 \rightarrow A = 319 - C$

$-C \qquad -C$

$2.5A + 2C = 694$

$2.5(319 - C) + 2C = 694$

$797.5 - 2.5C + 2C = 694$

$-797.5 \qquad -797.5$

$\frac{-.5C}{-.5} = \frac{-103.5}{-.5}$

$C = 207$ student tickets

$A = 319 - C$

$A = 319 - 207 = 112$ adult tickets