3.2 Part 2 The Elimination Method

The purpose of the elimination method (also called the linear combination method) is to eliminate one of the variables.

How can we eliminate variables?

Adding opposites

1.
$$\begin{array}{r} 4x - 2y = 2 \\ + \quad 3x + 2y = 12 \\ \hline 7x \qquad = 14 \end{array}$$

$$\frac{7x}{7} = \frac{14}{7}$$

$$\boxed{x = 2}$$

$3x + 2y = 12$

$3(2) + 2y = 12$

$6 + 2y = 12$

$-6 \qquad -6$

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

$$\boxed{y = 3}$$

2.
$$\begin{array}{r} 5x + 2y = -4 \\ + \quad -5x + 3y = 19 \\ \hline 5y = 15 \end{array}$$

$$\frac{5y}{5} = \frac{15}{5}$$

$$\boxed{y = 3}$$

$5x + 2y = -4$

$5x + 2(3) = -4$

$5x + 6 = -4$

$-6 \qquad -6$

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

$$\boxed{x = -2}$$

3. $2(2x - 3y = 4)$

$-4x + 5y = -8$

$+\ 4x - 6y = 8$

$-1y = 0$

$\frac{-1y}{-1} = \frac{0}{-1}$

$\boxed{y=0}$

$-4x + 5y = -8$

$-4x + \cancel{5(0)} = -8$

$\frac{-4x}{-4} = \frac{-8}{-4}$

$\boxed{x=2}$

4. $9x - 3y = 15$

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

$9x - 3y = 15$

$+\ -9x + 3y = -15$

$0 = 0$

Infinite Solutions

5. $2(-3x + 2y = 7)$

$6x - 4y = 14$

$+\ -6x + 4y = 14$

$0 \neq 28$

NO SOLUTION

6. $4(3x + 5y = 6)$

$3(-4x + 2y = 5)$

$12x + 20y = 24$

$+\ -12x + 6y = 15$

$26y = 39$

$\frac{26y}{26} = \frac{39}{26}$

$\boxed{y = \frac{39}{26} = \frac{3}{2}}$

$-4x + 2y = 5$

$-4x + \cancel{2}\left(\frac{3}{\cancel{2}}\right) = 5$

$-4x + 3 = 5$

$\quad\ -3 \quad -3$

$\frac{-4x}{-4} = \frac{2}{-4}$

$\boxed{x = \frac{2}{-4} = \frac{1}{-2}}$

7. $3x + 2y = 8$

$2y = 12 - 5x$

$+5x \quad +5x$

$-1(3x + 2y = 8)$

$5x \cancel{+2y} = 12$

$+ \; -3x \cancel{-2y} = -8$

$\frac{2x}{2} = \frac{4}{2}$

$\boxed{x=2}$

$2y = 12 - 5x$

$2y = 12 - 5(2)$

$2y = 12 - 10$

$\frac{2y}{2} = \frac{2}{2}$ $\boxed{y=1}$

8. $7y = -4x - 9$

$+4x \quad +4x$

$3x = 3y + 18$

$-3y \quad -3y$

$3(4x + 7y = -9)$

$7(3x - 3y = 18)$

$12x \cancel{+21y} = -27$

$+ \; 21x \cancel{-21y} = 126$

$\frac{33x}{33} = \frac{99}{33}$

$\boxed{x=3}$

$7y = -4x - 9$

$7y = -4(3) - 9$

$7y = -12 - 9$

$\frac{7y}{7} = \frac{-21}{7}$ $\boxed{y=-3}$

9. Elise purchases shirts for $28 and skirts for $15. If she spends a total of $131 and buys a total of 7 items, how many of each did she purchase? Define the variables, write a system of equations and solve.

10. A fruit company plans to make 13.25 lb gift boxes of oranges and grapefruits. Each box is to have a retail value of $21. Each orange weighs 0.50 lb and has a retail value of $0.75, while each grapefruit weighs 0.75 lb and has a retail value of $1.25. How many oranges and grapefruits should be included in each box? Define the variables, write a system of equations and solve.