

**Algebra 1 - Unit 7**  
**Solving Systems of Linear Equations - Word Problems**

Systems of linear equations can be helpful in solving word problems. Here are some important steps to remember:

1. Define the variables
2. Write the equations.
3. Solve for each variable.

Example 1

The sum of two numbers is 18. Their difference is 6. Find the numbers.

1. Define your variables:

Let one number =  $x$

Let the other number =  $y$

2. Write the equations:

$$\begin{array}{r} x + y = 18 \\ + \quad x - y = 6 \\ \hline 2x = 24 \\ \frac{2x}{2} = \frac{24}{2} \\ \boxed{x = 12} \end{array}$$

$$\begin{array}{r} (12) + y = 18 \\ -12 \quad -12 \\ \hline \boxed{y = 6} \end{array}$$

3. Solve for each variable:

$$\boxed{x = 12}$$

$$\boxed{12 \text{ and } 6}$$

Example 2

Tickets for a high school basketball game cost \$3 for students and \$5 for adults. If 350 tickets were sold and a total of \$1450 was collected, how many of each type of ticket was sold?

1. Define your variables:

Let student tickets =  $s$

Let adult tickets =  $a$

$$\begin{array}{l} -3(s + a = 350) \quad (\text{quantity}) \\ 3s + 5a = 1450 \quad (\text{price}) \end{array}$$

2. Write the equations:

$$\begin{array}{r} -3s - 3a = -1050 \\ + \quad 3s + 5a = 1450 \\ \hline 2a = 400 \\ \frac{2a}{2} = \frac{400}{2} \\ \boxed{a = 200} \end{array}$$

3. Solve for each variable:

$$\begin{array}{r} s + (200) = 350 \\ -200 \quad -200 \\ \hline \boxed{s = 150} \end{array}$$

$$\boxed{a = 200}$$

200 adult tickets  
 150 student tickets

Example 3

A high school band sells erasers for \$2 per box and pencils for \$5 per box. The band sells 220 boxes in all and earns a total of \$695. Find the number of each type of item sold.

1. Define your variables:

Let a box of erasers =  $e$   
Let a box of pencils =  $p$

$$\begin{aligned} -2(e + p) &= -440 \\ 2e + 5p &= 695 \end{aligned}$$

quantity  
price

2. Write the equations:

3. Solve for each variable:

$$\begin{aligned} e + (85) &= 220 \\ -85 \quad -85 & \\ \hline \end{aligned}$$

$$e = 135$$

$$\begin{aligned} -2e - 2p &= -440 \\ + 2e + 5p &= 695 \\ \hline \end{aligned}$$

$$\begin{aligned} 3p &= 255 \\ \frac{3p}{3} &= \frac{255}{3} \end{aligned}$$

$$p = 85$$

135 boxes of erasers  
85 boxes of pencils