Algebra Worksheet
Solving Word problem by using Linear System Equations

Example 1:
The sum of two numbers is 181. Their difference is 29. Find the two numbers.
Let $x =$ one number, and $y =$ another number

Step 1: Translate word sentence to algebraic equation:
From the first sentence: $x + y = 181$,
From the second sentence: $x - y = 29$

Step 2: Solve two unknown linear system equations by Elimination Method by adding two equations:

\[ x + y = 181 \]
\[ +) x - y = 29 \]
\[ 2x = 210, \quad x = 105, \]

Substitute $x = 105$ into the first (or second) equation to solve $y$,
\[ y = 181 - 105, \quad y = 76, \]

Answer: One number is 105, and the other number is 76.
Example 2:

Find three numbers if the sum of three numbers is 368. The sum of the first two numbers equals to the third number, and triple of the second number would be twelve greater than twice the first number.

Step 1: Translate word sentence to algebraic equation:

\[ x + y + z = 368 \]  \hspace{1cm} \text{(1)}
\[ x + y = z \]  \hspace{1cm} \text{(2)}
\[ 3y = 12 + 2x \]  \hspace{1cm} \text{(3)}

Step 2: Solve (1) and (2) by substitution:

Substitute \( x + y = z \) to (1): \( z + z = 368 \), \( 2z = 368 \), \( z = 184 \)

Step 3: Substitute \( z = 184 \) to (2): \( x + y = 184 \) \hspace{1cm} \text{(4)}

Solve (4) and (3) by substitution method:

\[ x + y = 184 \]  \hspace{1cm} \text{(4)}
\[ 3y = 12 + 2x \]  \hspace{1cm} \text{(3)} \hspace{1cm} \rightarrow \hspace{1cm} y = 4 + \frac{2}{3}x \hspace{1cm} \text{(4)}

\[ x + 4 + \frac{2}{3}x = 184 \]  \hspace{1cm} \rightarrow \hspace{1cm} \frac{5}{3}x = 184 - 4 \hspace{1cm} \rightarrow \hspace{1cm} x = 108, \hspace{1cm} \text{(4)}

\[ x + y = 184 \]  \hspace{1cm} \rightarrow \hspace{1cm} y = 184 - x = 184 - 108 = 76, \hspace{1cm} y = 76

Answer: The three numbers are: 108, 76, and 184.