Section 3–3A: Solving Word Problems

Applied Number Problem Examples

To get credit you must show all the following steps.

1. List the unknown that $x$ will represent.
2. List the other unknowns in terms of $x$.
3. Write an equation in terms of $x$.
4. Solve for $x$.
5. Find the value for all the unknowns by putting the value of $x$ back into each expression.
6. List the solution.

Example 1: Sam and Bill score a total of 177 points on the last test. Sam scores 7 more points than Bill on the test. How many points did each one score on the test?

Let Bill’s points $= x$  
(Sam was mentioned second in the first sentence)

$\text{Sam’s points } = x + 7$  
(7 more than Bill $x$)

$x + x + 7 = 177$  
(the total points of Bill and Sam is 177)

$2x + 7 = 177$

$2x = 170$

$x = 85$  
(Bill’s points)

and  $x + 7 = 92$  
(Sam’s points)

Bill scored 85 points and Sam scored 92 points.

CK: 85 and 92 total 177 and 92 is 7 more than 85

Example 2: The FLC football team scored 5 points more than three times the points that ARC’s team scored. Find out how many points each team scored if the total points scored in the game was 85.

Let $\text{ARC} = x$  
(ARC was mentioned second in the first sentence)

Let $\text{FLC} = 3x + 5$  
(5 more than three times ARC $x$

$x + 3x + 5$ is 85  
(the sum of ARC and FLC is 85)

$4x + 5 = 85$

$4x = 80$

$x = 20$  
(ARC)

and  $3x + 5 = 65$  
(FLC)

ARC scored 20 points and FLC scored 65 points.
Example 3: Mary’s workout requires that she runs 4 less than twice the miles that she walks. It also requires that she swim 8 less miles than she walks. If Mary’s workout is a total of 40 miles, how many miles does she walks, run and swim?

Let Mary walks = x

Mary runs = 2x – 4 (4 less than twice the miles she walks (x))

Mary swims = x – 8 (8 less miles than she walks (x))

\[ x + 2x - 4 + x - 8 = 40 \] (their sum is 40)
\[ 4x - 12 = 40 \]
\[ 4x = 52 \]
\[ x = 13 \] (Mary walks)

and \[ 2x - 4 = 22 \] (Mary runs) and \[ x - 8 = 5 \] (Mary swims)

Mary walks 13 miles, runs 22 and swims 5 miles

Ck: 13 + 22 + 5 total 40
22 is 4 less than twice 13
5 is 8 less than 13

Example 4: Sam, Bill and Tom work on a class project together. Sam works 3 more hours on the project than Bill. Tom works 8 more hours on the project than Sam. They worked a total of 62 hours on the project. How many hours did each of them work on the project?

Let Bill’s Hours = x

Sam’s Hours = x + 3 (3 more than Bill)

Tom’s Hours = x + 3 + 8 (8 more than Sam and Sam was (x + 3))

\[ x + x + 3 + x + 3 + 8 = 62 \] (their total was 62 hours)
\[ 3x + 14 = 62 \]
\[ 3x = 48 \]
\[ x = 16 \] (Bill’s Hours)

\[ x + 3 = 19 \] (Sam’s Hours) and \[ x + 3 + 8 = 27 \] (Tom’s Hours)

Bill worked 16 hours, Sam worked 19 and Tom worked 27 hours

Ck: 16 + 19 + 27 total 62
Sam is 3 more than Bill
Tom is 8 more than Sam
The Perimeter of a Rectangle Example

**Example 5:** Find the sides of a rectangle if the **length** is 8 less than twice the **width** and the **perimeter** is 68 feet.

Let $\text{Width} = x$

Length $= 2x - 8$

The perimeter $(x + x + 2x - 8 + 2x - 8)$ is equal to 68

$6x - 16 = 68$

$6x = 84$

$x = 14$

and

$2x - 8 = 2(14) - 8 = 20$

The width is 14 feet and the length is 20 feet

Check: $14 + 14 + 20 + 20 = 68$

The Perimeter of a Triangle Example

**Example 6:** Find the 3 sides of a triangle if the **second side** is 10 more than the **first side** and the **third side** is 5 less than 2 times the **first side**. The **perimeter** is 41 cm.

Let First Side $S_1 = x$

Second Side $S_2 = x + 10$

Third Side $S_3 = 2x - 5$

The perimeter $(x + x + 10 + 2x - 5)$ is equal to 41

$4x + 5 = 41$

$4x = 36$

$x = 9$

and

$x + 10 = 19$

and

$2x - 5 = 2(9) - 5 = 13$

The sides are 9 cm., 19 cm., and 13 cm.

Check: $9 + 19 + 13 = 41$
The Angles of a Triangle Example

The total of the 3 angles is equal to 180 degrees in all triangles

Example 7 : Find the 3 angles of a triangle if the second angle is 20 less than three times the first angle and the third angle is 10 less than 2 times the first angle.

Let First Angle $\angle 1 = x$

Second Angle $\angle 2 = 3x - 20$

Third Angle $\angle 3 = 2x - 10$

The sum of the three angles $(x + 3x - 20 + 2x - 10)$ is equal to 180

$6x - 30 = 180$

$6x = 210$

$x = 35$

and

$\angle 2 = 3x - 20 = 3(35) - 20 = 85$

and

$\angle 3 = 2x - 10 = 2(35) - 10 = 60$

The three angles are 35, 85, and 60 degrees

Example 8 : Find the 3 angles of a triangle if the second angle is 20 more than the first angle and the third angle is 50 more than the second angle.

Note: The third angle is 50 more than the second angle $(x + 20)$ not the first angle $x$

Let First Angle $\angle 1 = x$

Second Angle $\angle 2 = x + 20$

Third Angle $\angle 3 = (x + 20) + 50$

The sum of the three angles $(x + x + 20 + x + 20 + 50)$ is equal to 180

$3x + 90 = 180$

$3x = 90$

$x = 30$

and

$\angle 2 = x + 20 = 50$ and $\angle 3 = x + 20 + 50 = 100$

The three angles are 30, 50, and 100 degrees
Complementary Angles Example

Complementary Angles are 2 angles whose sum is 90 degrees.

Example 9: Find two complementary angles if the second angle is 15 more than twice the first angle.

Let First Angle $\angle 1 = x$

Second Angle $\angle 2 = 2x + 15$

\[
x + 2x + 15 = 90
\]
\[
3x + 15 = 90
\]
\[
3x = 75
\]
\[
x = 25
\]

so $\angle 1 = x = 25$ and $\angle 2 = 2x + 15 = 2(25) + 15 = 65$

The two complementary angles are 25 and 65 degrees.

Supplementary Angles Example

Supplementary Angles are 2 angles whose sum is 180 degrees.

Example 10: Find two supplementary angles if the second angle is 20 less than three times the first angle.

Let First Angle $\angle 1 = x$

Second Angle $\angle 2 = 3x - 20$

\[
x + 3x - 20 = 180
\]
\[
4x - 20 = 180
\]
\[
4x = 200
\]
\[
x = 50
\]

so $\angle 1 = x = 50$ and $\angle 2 = 3x - 20 = 3(50) - 20 = 130$

The two supplementary angles are 50 and 130 degrees.
Angle Problem Examples

Example 12: The sum of two angles is 93 degrees. **Angle A** is 7 degrees more than **Angle B**. Find the measure of both angles.

Let \( \angle A = x \)

Let \( \angle B = x + 7 \) (7 more than \( \angle 1 \))

\[
x + x + 7 \text{ is } 93 \quad \text{(Their sum is 93)}
\]

\[
2x + 7 = 93
\]

\[
x = 43 \quad (\angle A)
\]

and \( \angle B = x + 7 = 50 \)

\( \angle A = 43 \text{ degrees and } \angle B = 50 \text{ degrees} \)

Check: \( 43 + 50 = 93 \) \quad 50 is 7 more than 43

Example 13: The sum of three angles is 88 degrees. **Angle B** is 2 degrees less than twice as large as **Angle A**. **Angle C** is twice as large as **Angle A**. Find the measure of all 3 angles.

Let \( \angle A = x \)

Let \( \angle B = 2x - 2 \) (2 less than twice \( \angle A \))

Let \( \angle C = 2x \) (twice \( \angle A \))

\[
x + 2x - 2 + 2x \text{ is } 88 \quad \text{(Their sum is 88)}
\]

\[
5x - 2 = 88
\]

\[
x = 18 \quad (\angle A)
\]

and \( \angle B = 2x - 2 = 34 \) and \( \angle C = 2x = 36 \)

\( \angle A = 18 \text{ degrees and } \angle B = 34 \text{ degrees and } \angle C = 36 \text{ degrees} \)

Check: \( 18 + 34 + 36 = 88 \)

34 is 2 less than 2(18)

36 is 2(18)