

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 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 (Bill was mentioned second in the first sentence)

Sam's points = $x + 7$ (7 more than Bill (x))

$$x + x + 7 = 177 \quad (\text{the total points of Bill and Sam is 177})$$

$$2x + 7 = 177$$

$$2x = 170$$

$$x = 85 \quad (\text{Bill's points})$$

$$\text{and } x + 7 = 92 \quad (\text{Sam's points})$$

Bill scored 85 points and Sam scored 92 points.

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

Example 2: **FLC** football's team 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 **ARC** = x (ARC was mentioned second in the first sentence)

Let **FLC** = $3x + 5$ (5 more than three times ARC (x))

$$x + 3x + 5 = 85 \quad (\text{the sum of ARC and FLC is 85})$$

$$4x + 5 = 85$$

$$4x = 80$$

$$x = 20 \quad (\text{ARC})$$

$$\text{and } 3x + 5 = 65 \quad (\text{FLC})$$

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))

$$x + 2x - 4 + x - 8 = 40 \text{ (their sum is 40)}$$

$$4x - 12 = 40$$

$$4x = 52$$

$$x = 13 \text{ (Mary walks)}$$

$$\text{and } 2x - 4 = 22 \text{ (Mary runs) and } x - 8 = 5 \text{ (Mary swims)}$$

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 ($x + 3$))

$$x + x + 3 + x + 3 + 8 = 62 \text{ (their total was 85 hours)}$$

$$3x + 14 = 62$$

$$3x = 48$$

$$x = 16 \text{ (Bill's Hours)}$$

$$x + 3 = 19 \text{ (Sam's Hours) and } x + 3 + 8 = 27 \text{ (Tom's Hours)}$$

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

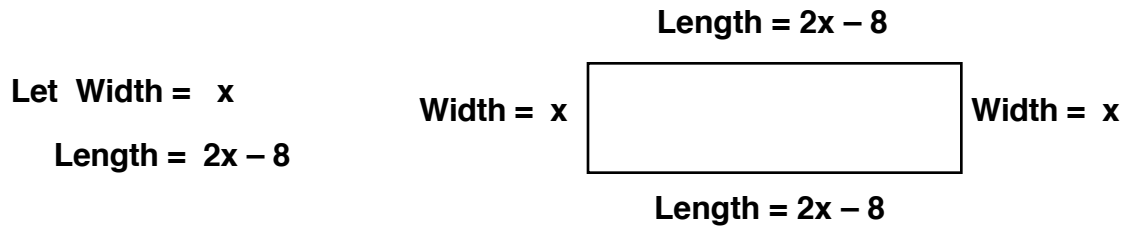
Ck: $16 + 19 + 27$ total 62

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**.



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

$$\text{Check: } 14 + 14 + 20 + 20 = 68$$

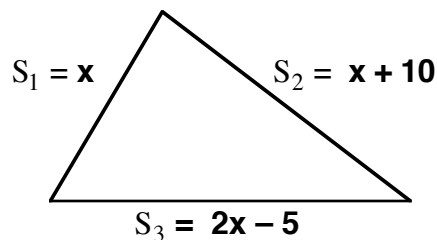
The Perimeter of a Triangle Example

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.

$$\text{Check: } 9 + 19 + 13 = 41$$

The Angles of a Triangle Example

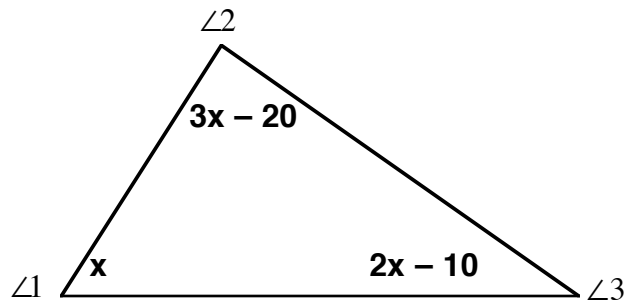
The total of the 3 angles is equal to 180 degrees in all triangles

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, 75, and 60 degrees

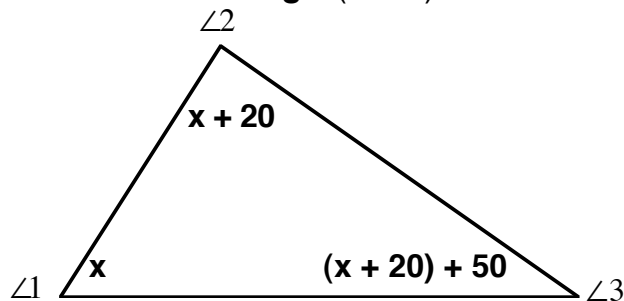
Example 8 : Find the 3 angles of a triangle if **the second angle** is 20 more than **the first angle** and the **third angle** is 50 more than the **SECOND angle**.

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

$$\angle 2 = x + 20 = 50 \quad \text{and} \quad \angle 3 = x + 20 + 50 = 100$$

The three angles are 30, 50, and 100 degrees

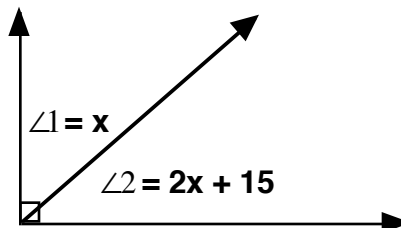
Complementary Angles Example

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 $\angle 2 = 2x + 15$



$$x + 2x + 15 = 90$$

$$3x + 15 = 90$$

$$3x = 75$$

$$x = 25$$

$$\text{so } \angle 1 = x = 25 \quad \text{and } \angle 2 = 2x + 15 = 2(25) + 15 = 65$$

The two complementary angles are 25 and 65 degrees

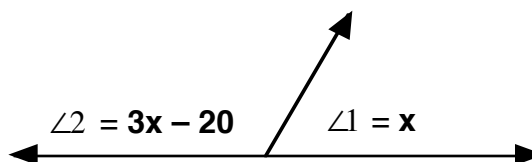
Supplementary Angles Example

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 $\angle 2 = 3x - 20$



$$x + 3x - 20 = 180$$

$$4x - 20 = 180$$

$$4x = 200$$

$$x = 50$$

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

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 $\angle A$)

$$x + x + 7 = 93 \quad (\text{Their sum is 93})$$

$$2x + 7 = 93$$

$$2x = 86$$

$$x = 43 \quad (\angle A)$$

and $\angle B = x + 7 = 50$

$\angle A = 43$ degrees and $\angle B = 50$ degrees

Check: $43 + 50 = 93$ 50 is 7 more than 43

Example 13: The sum of three angles is 93 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 $\angle A$)

$$x + 2x - 2 + 2x = 93 \quad (\text{Their sum is 93})$$

$$5x - 2 = 93$$

$$5x = 95$$

$$x = 19 \quad (\angle A)$$

and $\angle B = 2x - 2 = 36$ and $\angle C = 2x = 38$

$\angle A = 19$ degrees and $\angle B = 36$ degrees and $\angle C = 38$ degrees

Check: $19 + 36 + 38 = 93$

36 is 2 less than $2(19)$

38 is $2(19)$