Applications of Linear Equations: Problems from Geometry

**Example 1**

Solve for $x$ given the triangle below. Then find each angle measurement.

Knowing that the sum of three angles in a triangle is $180^\circ$, we can set up an equation to solve for $x$.

\[
x + x + 10 + x + 20 = 180
\]

\[
3x + 30 = 180
\]

\[
-30 - 30
\]

\[
\frac{3x}{3} = \frac{150}{3}
\]

\[
x = 50
\]

Since $x = 50$, the three angles are $50^\circ$, $60^\circ$, and $70^\circ$.

**NOTE:**

Two angles are said to be **complementary** if their sum is $90^\circ$. Two angles are said to be **supplementary** if their sum is $180^\circ$. 

**NOTE:**

The sum of three angle measurements in a triangle is $180^\circ$. 

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Example 2

Find the measure of an angle whose complement is $30^\circ$ more than its measure.

Let’s call the measure of the angle $x$. Then we can express its complement $x + 30$.

Since the two angles are complementary, their sum must be $90^\circ$.

Therefore, we get the following equation:

$$(x) + (x + 30) = 90$$

Now we can solve for $x$:

$$(x) + (x + 30) = 90$$

$$
2x + 30 = 90
\quad -30 -30
\hline
2x = 60
\quad 2 2
x = 30
$$
Example 3

Find the measure of an angle whose supplement is four times its measure.

Let ______ represent the measure of the angle

Then ______ represents its supplement.

Since the two angles are supplementary, their sum must be ______.

Therefore, we get the following equation:

________ + ________ = ________

Now solve for x:
1. Find each angle measurement for the triangle below:

2. Find the measure of an angle whose complement is twice its measure.

3. Find the measure of an angle whose supplement is 9 times its measure.