Key Words:

- Addition – sum, added to, increased by, more than
- Subtraction – difference, minus, decreased by, subtracted from
- Multiplication – product, times, double (2x), tripled (3x)
- Division – quotient, ratio, divided by

Formulas:

- Area of square:
$$\boxed{A_{square} = s^2 = \text{side}^2}$$
- Area of a rectangle:
$$\boxed{A_{rectangle} = l \cdot w = \text{length} \cdot \text{width}}$$
- Area of a triangle:
$$\boxed{A_{triangle} = \frac{1}{2} \cdot b \cdot h = \frac{1}{2} \cdot \text{base} \cdot \text{height}}$$
- Area of a trapezoid:
$$\boxed{A_{trapezoid} = \frac{1}{2} \cdot h\,(b_1 + b_2) = \frac{1}{2} \cdot \text{height} \cdot (\text{sum of the bases})}$$
- Area of a circle:
$$\boxed{A_{circle} = \pi r^2 = \pi \cdot \text{radius}^2}$$
- Perimeter:
$$\boxed{P_{perimeter} = \text{distance around}}$$
In other words, add each side together.
- Circumference of a circle:
$$\boxed{C_{circle} = 2\pi r = 2\pi \cdot \text{radius}}$$

Angle Properties:

- **Vertical Angles** are opposite angles formed by intersecting lines. Vertical angles always have the same measurement.
- **Complementary Angles** are two angles whose sum is $90°$.
- **Supplementary Angles** are two angles whose sum is $180°$.

Common Mistakes to Avoid:

- For perimeter, be sure to add EACH AND EVERY side in the formula.
- Be very careful to translate the problem into correct mathematical form. When it has been translated, you should be able to read it back.
- Be careful: a minus b is translated $a - b$; whereas, a less than b is translated $b - a$.
- Be careful on the difference between these two statements:
  - The sum of four times a number and 5 is translated $4x + 5$.
  - Four times the sum of a number and 5 is translated $4(x + 5)$.
- Make sure that you answer the question being asked. If it asks for two answers, give both.

PROBLEMS

1. The sum of four and twice a number is 46. Find the number.

Let $x =$ the number.

$$\begin{aligned} 4 + 2x &= 46 \\ 2x &= 42 \\ x &= 21 \end{aligned}$$

$\boxed{x = 21}$

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2. Three times the sum of nine and a number is 48. Find the number.

Let $x =$ the number.

$$\begin{aligned} 3(9 + x) &= 48 \\ 27 + 3x &= 48 \\ 3x &= 21 \\ x &= 7 \end{aligned}$$

$\boxed{x = 7}$

3. A number decreased by 15 is 123. Find the number.

Let $x =$ the number.

$$\begin{aligned} x - 5 &= 123 \\ x &= 128 \end{aligned}$$

$\boxed{x = 128}$

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4. If seven is subtracted from a number and this difference is doubled, the result is four more than the number. Find the number.

Let $x =$ the number.

$$\begin{aligned} 2(x - 7) &= 4 + x \\ 2x - 14 &= 4 + x \\ x - 14 &= 4 \\ x &= 18 \end{aligned}$$

$\boxed{x = 18}$

5. If the quotient of three times a number and four is decreased by three, the result is ten. Find the number.

Let $x =$ the number.

$$\begin{aligned} \frac{3x}{4} - 3 &= 10 \\ 3x - 12 &= 40 \\ 3x &= 52 \\ x &= 14 \end{aligned}$$

$\boxed{x = 14}$

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6. A 19 foot piece of string is cut into two pieces so that one piece is five feet shorter than twice the shorter piece. Find the length of both pieces.

Let $x =$ the shorter piece
$2x - 5 =$ the longer piece

$$\begin{aligned} 2x - 5 + x &= 19 \\ 3x - 5 &= 19 \\ 3x &= 24 \\ x &= 8 \end{aligned}$$

$\boxed{\text{shorter piece} = 8 \text{ feet}}$

$\boxed{\text{longer piece} = 11 \text{ feet}}$

7. A stained-glass window in a church is in the shape of a square. The perimeter of the square is eight times the length of a side in feet, decreased by twelve. Find the length of a side of the window.

Let $s =$ the length of one side of the square window
$4s =$ perimeter of the window

$$\begin{aligned} 4s &= 8s - 12 \\ -4s &= -12 \\ s &= 3 \end{aligned}$$

$\boxed{s = 3 \text{ feet}}$

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8. The length of a rectangular shaped garden is five feet more than twice the width. The perimeter is 58 feet. Find the length and width of the garden.

Let $w =$ the width of the garden.
$2w + 5 =$ the length of the garden.

$$\begin{aligned} 2w + 2(2w + 5) &= 58 \\ 2w + 4w + 10 &= 58 \\ 6w + 10 &= 58 \\ 6w &= 48 \\ w &= 8 \end{aligned}$$

$\boxed{\text{width} = 8 \text{ feet}}$

$\boxed{\text{length} = 21 \text{ feet}}$

9. A lot is in the shape of a triangle. One side is 32 feet longer than the shortest side while the third side is ten feet shorter than twice the shorter side. The perimeter of the lot is 238 feet. Find the length of the sides of the lot.

$$\begin{aligned} \text{Let} \quad x &= \text{the shortest side.} \\ x + 32 &= \text{the second side.} \\ 2x - 10 &= \text{the third side.} \end{aligned}$$

$$\begin{aligned} x + x + 32 + 2x - 10 &= 238 \\ 4x + 22 &= 238 \\ 4x &= 216 \\ x &= 54 \end{aligned}$$

$\boxed{\text{shortest side} = 54 \text{ feet}}$

$\boxed{\text{second side} = 86 \text{ feet}}$

$\boxed{\text{third side} = 98 \text{ feet}}$

10. The supplement of an angle measure 15° more than four times its complement. Find the measure of the angle.

$$\begin{aligned} \text{Let} \quad x &= \text{the degree measure of the angle.} \\ 180 - x &= \text{the degree measure of supplement.} \\ 90 - x &= \text{the degree measure of complement.} \end{aligned}$$

$$\begin{aligned} 180 - x &= 15 + 4(90 - x) \\ 180 - x &= 15 + 360 - 4x \\ 180 - x &= 375 - 4x \\ 180 + 3x &= 375 \\ 3x &= 195 \\ x &= 65 \end{aligned}$$

$\boxed{x = 65^\circ}$