Variables, Expressions, and Equations

A variable is used to express the unknown; we usually use the letter \( x \).

An expression is a collection of numbers, variables, and variable symbols [For example \(+, -\)].

Example 1:

Evaluate the expression:

\[ x + 4 \quad \text{when} \quad x = 9 \]

Here we replace \( x \) with 9 and simplify

\[ x + 4 \quad \rightarrow \quad 9 + 4 = ____ \]

An equation is a statement that two variable expressions are equal.

Example 2:

a) \( x + 2 = 5 \) is an equation. Translated into words, it states that the quantity \( x + 2 \) is the same as 5, and asks what number do you add 2 to, in order to get 5?

Answer: \( x = _____ \)

Example 3:
Translate $14 - x = 10$ into a word statement and then solve for $x$.

**Translation:** What number do you subtract from 14 to get 10?

**Answer:** $x =$ \\

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**Example 4:**

Evaluate $x + 9$ for the given values of $x$.

a) $x = 6$

If $x = 6$, then $x + 9$ becomes $6 + 9 = 15$.

b) $x = 2$

**Answer:** $x =$ \\

c) $x = 10$

**Answer:** $x =$ \\

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**Example 5:**


Evaluate:
\[
\frac{6x + y^2}{5x + 4y} \quad \text{for } x = 2, y = 1
\]
To evaluate this expression, we replace \( x \) with 2 and \( y \) with 1, then simplify. (Remember your order of operations, PEMDAS).

\[
= \frac{6(2) + (1)^2}{5(2) + 4(1)}
\]

\[
= \frac{6(2) + 1}{5(2) + 4(1)} \quad \text{exponents first}
\]

\[
= \frac{12+1}{10+4} \quad \text{then multiplication}
\]

\[
= \frac{13}{14}
\]

**NOTE:** Always check to see if the fraction can be reduced.

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**Example 6:**

Is \( x = 4 \) a solution to the equation \( 3 - x = 1 \)?

First we replace \( x \) with 4, then simplify. Then determine if the equation is true.

\[
3 - x = 1? \quad \text{replace } x \text{ with } 4
\]

\[
3 - 4 = 1 \quad \text{simplify}
\]

\[
-1 = 1 \quad \text{Is this true?}
\]

**NO,** therefore \( x = 4 \) is not a solution to \( 3 - x = 1 \).
1. Evaluate
\[ x + 7 \quad \text{for} \quad x = 9 \]

2. Evaluate
\[ \frac{x + 2y}{x^2 + y} \quad \text{for} \quad x = 3, y = 1 \]

3. Is \( x = 3 \) a solution to the equation \( 2x^2 - 1 = 35 \)?