Simple Expressions

i. Definition and Explanation

What is a Simple Expression? Think of a simple expression as a mathematical phrase. It's a combination of numbers, variables, and mathematical operations (+, -, ×, ÷). It does not have an equals sign (=), which makes it different from an equation.

- **Phrase vs. Sentence:** An expression like x + 5 is like the phrase "a number plus five." An equation like x + 5 = 8 is like a complete sentence, "A number plus five equals eight."

In short: An expression represents a single value. For example, the expression 4 + 2 represents the value 6. The expression 3x - 1 represents a value that depends on what x is.

Examples of Simple Expressions:

- 8
- y - 3
- 4a (This means 4 times a)
- 2x + 10

ii. Key Points and Important Terms

To understand expressions, you need to know their parts. Let's break down the expression: 5x - 2y + 7

Variable: A letter or symbol that represents an unknown or changing number.

- In 5x - 2y + 7, the variables are x and y.

Constant: A number that stands by itself. Its value never changes.

- In 5x - 2y + 7, the constant is 7.

Term: A single part of an expression, separated by addition (+) or subtraction (-) signs. The sign in front of the number is part of the term.

- In 5x - 2y + 7, the terms are 5x, -2y, and 7.

Coefficient: The number that is multiplied by a variable.

- In the term 5x, the coefficient is 5.
- In the term -2y, the coefficient is -2.

- Important: If a variable stands alone, like x, its coefficient is 1 (because x is the same as 1x). If it's -x, the coefficient is -1.

Like Terms: Terms that have the exact same variable raised to the exact same power. Constants are also like terms.

- **Examples of Like Terms:** 3x and 7x | 4y and -y | 12 and 5
- **Examples of Unlike Terms**: 3x and 3y (different variables) | 5a and 8 (one has a variable, one doesn't)

iii. Detailed Examples with Solutions

A. Writing Expressions from Word Phrases

Translate the words into a mathematical expression.

Example 1: "A number n increased by 12"

Solution: n + 12

Example 2: "The product of 6 and a number y"

Solution: 6y (In algebra, we write the number before the variable and don't need the × sign).

Example 3: "9 less than a number k"

Solution: k - 9 (Be careful! "Less than" reverses the order).

Example 4: "Twice a number p, decreased by 4"

Solution: 2p - 4

B. Evaluating Expressions

To evaluate an expression, you substitute a given number for the variable and find the result.

Example 1: Evaluate x + 10 if x = 5.

Solution:

Start with the expression: x + 10

Replace x with 5: (5) + 10

Calculate the result: 15

Example 2: Evaluate 3a - 4 if a = 2.

Solution:

Start with the expression: 3a - 4

Remember 3a means 3 × a. Replace a with 2: 3(2) - 4

Multiply first: 6 - 4

Calculate the result: 2

C. Simplifying Expressions (Combining Like Terms)

Simplifying means making the expression as short and simple as possible by combining like terms.

Example 1: Simplify 4x + 9x

Solution:

Identify the like terms: Both 4x and 9x are like terms.

Add their coefficients: 4 + 9 = 13.

Keep the variable: 13x

Example 2: Simplify 8y + 5 - 3y + 2

Solution:

Identify and group the like terms: (8y - 3y) and (5 + 2).

Combine the y terms: 8y - 3y = 5y.

Combine the constants: 5 + 2 = 7.

Write the simplified expression: 5y + 7

Example 3: Simplify 6a + 4b - 2a + b

Solution:

Identify and group like terms: (6a - 2a) and (4b + b).

Remember that b is the same as 1b.

Combine the a terms: 6a - 2a = 4a.

Combine the b terms: 4b + 1b = 5b.

Write the simplified expression: 4a + 5b

iv. Summary of Main Concepts

- An expression is a mathematical phrase with numbers, variables, and operations. It does not have an equals sign.
- Terms are the parts of an expression separated by + or -.

- A variable is a letter (e.g., x). A constant is a number by itself (e.g., 5). A coefficient is a number multiplied by a variable (e.g., the 3 in 3x).
- To evaluate an expression, you replace the variables with given numbers and calculate the result.
- To simplify an expression, you combine like terms.