

- Expressions Using Letter-Numbers

Expressions Using Letter-Numbers

Algebra uses letters to represent numbers, allowing us to write general expressions for real-life situations and mathematical patterns. These letters, called variables, help us form expressions that can be simplified, evaluated, and used to find unknown values.

Concept Explanation

Letters stand for numbers. For example, if Shabnam is 3 years older than Aftab, and Aftab's age is a , then Shabnam's age is $a + 3$. This is an algebraic expression.

Formula Derivation

Expressions combine variables and numbers using operations. For example, the perimeter P of a rectangle with length l and breadth b is:

$$P = l + b + l + b = 2l + 2b$$

Similarly, the perimeter of a square with side q is:

$$P = 4q$$

Worked Illustrations

Example: If $l = 5$ and $b = 6$, then perimeter of rectangle:

$$P = 2 \times 5 + 2 \times 6 = 10 + 12 = 22$$

Solved Examples

Example 1: Simplify $4r + 3s + 6r - 2s$.

Group like terms:

$$(4r + 6r) + (3s - 2s) = 10r + s$$

Example 2: Simplify $5a + 3(b - a) + 2a$.

Expand brackets:

$$5a + 3b - 3a + 2a = (5a - 3a + 2a) + 3b = 4a + 3b$$

Practice Set

- **Level 1 – Easy**
- Simplify: $3x + 5x$
- Find the perimeter of a square with side length 7.
- Evaluate: If $a = 4$, find $a + 6$.
- **Level 2 – Moderate**
- Simplify: $2m + 3n - m + 4n$
- Find the perimeter of a rectangle with length l and breadth b given $l = 8$, $b = 3$.
- Expand and simplify: $4(p + 2) - 3p$
- **Level 3 – Challenging**
- Find the simplified form of: $3x + 2y - (x - y) + 4(x - 2y)$
- A triangle has sides x , $x + 2$, and $x + 3$. Find its perimeter.
- Evaluate the expression $5a - 3(b - a) + 2b$ when $a = 3$ and $b = 5$.

Answer Key

- **Level 1**
- $3x + 5x = 8x$
- Perimeter = $4 \times 7 = 28$
- $a + 6 = 4 + 6 = 10$
- **Level 2**
- $2m + 3n - m + 4n = (2m - m) + (3n + 4n) = m + 7n$
- Perimeter = $2l + 2b = 2 \times 8 + 2 \times 3 = 16 + 6 = 22$
- $4(p + 2) - 3p = 4p + 8 - 3p = p + 8$
- **Level 3**
- $3x + 2y - (x - y) + 4(x - 2y) = 3x + 2y - x + y + 4x - 8y = (3x - x + 4x) + (2y + y - 8y) = 6x - 5y$
- Perimeter = $x + (x + 2) + (x + 3) = 3x + 5$
- $5a - 3(b - a) + 2b = 5 \times 3 - 3(5 - 3) + 2 \times 5 = 15 - 3 \times 2 + 10 = 15 - 6 + 10 = 19$

Quick Reference

Concept	Formula/Rule
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Perimeter of Square	$P = 4s$
Perimeter of Rectangle	$P = 2l + 2b$
Like Terms	Terms with same variables and exponents can be added/subtracted
Distributive Property	$a(b + c) = ab + ac$

Glossary

- **Variable:** A letter representing a number.
- **Coefficient:** The numerical factor of a term.
- **Like Terms:** Terms with the same variable parts.
- **Expression:** A combination of numbers, variables, and operations.
- **Perimeter:** The total length around a shape.
- **Distributive Property:** Multiplying a sum by a number equals the sum of each addend multiplied by the number.