Mathematics
Grade 8

TOPIC:
Algebraic Expressions

ALGEBRAIC LANGUAGE

Rules and Relationships

1. Write each rule in symbolic form:

   a) A number multiplied by 5, then add 3

   b) The perimeter of a rectangle with length l and breadth b

   c) Three less than twice a number

   d) The area of a triangle with base b and height h

Variables and Constants

2. Identify the variables and constants in each formula or equation:

   a) $P = 2l + 2b$ b) $A = \pi r^2$ c) $5x - 7 = 18$

Types of Algebraic Expressions

3. State the number of terms in each of the following algebraic expressions and state the type of expression.

   a) $5x + y$ c) $2x + 3(5x + y)$ e) $\frac{x+y}{4} + 10 - 3x^2$

   b) $(10x + 3y)$ d) $\frac{2x+3}{5x-y}$ f) $(2x + 3)(5x) - y$

Conventions and Classification

4.1 Rewrite these expressions using correct algebraic conventions:

   a) $x \times 5 \times y$ b) $a \div 3$ c) $m \times m \times n \times n \times n$

4.2 Classify the following terms as like or unlike:

Term 1	Term 2	Like or Unlike?
$3x$	$5x$	
$4ab$	$4a$	
$-2y^2$	$7y^2$	
$6mn$	$6nm$	

4.3 Identify the coefficient and exponent in each term:

a) $7x^3$ b) $-5y^2$ c) $\frac{3}{4}a^4$

SIMPLIFYING ALGEBRAIC EXPRESSIONS

Adding and Subtracting Like Terms

1. Simplify the following expressions:

a) $5x + 3x - 2x$

b) $8a - 3a + 6a$

c) $3 \times 4x + 4 \times x$

d) $3 \times 2 \times m - 1 \times 3 \times m$

e) $4m + 7n - 2m + 5n$

f) $9p^2 - 4p^2 + 2p^2$

g) $3yx + 5xy - 7yx + 2xy$

h) $4y - (5y \times 2 - 3y)$

Expanding and Simplifying

2. Expand and simplify:

a) $3(x + 4)$

b) $5(2a - 3)$

c) $2(3m + 5) + 4(m - 2)$

d) $6(2x - 1) - 3(x + 4)$

e) $-4(y - 3) + 2(3y + 5)$

Exponents of Algebraic Terms

3. Simplify:

a) $(2x)^2$

b) $(3a)^3$

c) $\sqrt{25x^2}$

d) $\sqrt[3]{(8m^3)}$

e) $(4y^2)^2$

LAWS AND PROPERTIES

Applying Mathematical Laws

1. State which law is being used and simplify:

a) $3x + 5x = (3 + 5)x$

b) $2(a + 4) = 2a + 8$

c) $5m + 7n = 7n + 5m$

Mixed Operations

2. Simplify completely:

a) $4a^2 + 3a - 2a^2 + 5a$

b) $3(x^2 + 2x) - 2(x^2 - 3x)$

c) $5xy + 3x^2y - 2xy + x^2y$

SUBSTITUTION

Evaluating Expressions

1. Find the value of each expression when $\boldsymbol{x = 3}$ and $\boldsymbol{y = -2}$:

   a) $5x + 7$

   b) $3x - 2y$

   c) $x^2 + y^2$

   d) $4xy$

   e) $2x^2 - 3y =$ _____

   f) $(x + y)^2$

Problem Solving with Substitution

2.1 The formula for the area of a trapezium is $A = \frac{1}{2}(a + b)h$

Find A when $a = 8$ cm, $b = 12$ cm, and $h = 5$ cm.

2.2 The cost of hiring a car is given by $C = 250 + 15d$, where d is the number of days.

Calculate the cost for hiring a car for 7 days.

CHALLENGE QUESTIONS

Advanced Simplification

1. Simplify completely:

   a) $2(3x - 4) + 3(2x + 5) - (4x - 7)$

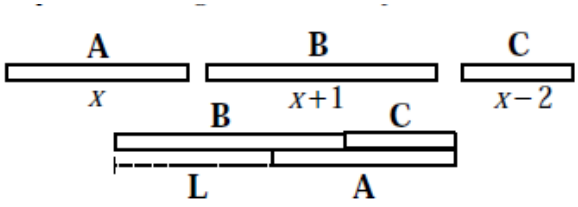
   b) $5a^2b - 3ab^2 + 2a^2b - 7ab^2$

Problem Solving

2.1 The perimeter of a rectangle is given by $P = 2(l + b)$. If the length is $3x + 5$ and the breadth is $2x - 1$, write an expression for the perimeter in its simplest form.

2.2 If $m = 4$ and $n = -3$, evaluate: $2m^2 - 3mn + n^2$

2.3 Three rectangles have lengths shown below. Express the length indicated by L in terms of x.



CAPS CLARRIFICATION:

Algebraic language

- **Revise** the following done in Grade 7:
  - recognize and interpret rules or relationships represented in symbolic form
  - identify variables and constants in given formulae and equations
- Recognize and identify conventions for writing algebraic expressions
- Identify and classify like and unlike terms in algebraic expressions
- Recognize and identify coefficients and exponents in algebraic expressions

Expand and simplify algebraic expressions

Use commutative, associative and distributive laws for rational numbers and laws of exponents to:

- Add and subtract like terms in algebraic expressions
- Determine the squares, cubes, square roots and cube roots of single algebraic terms or like algebraic terms
- Determine the numerical value of algebraic expressions by substitution