GR: 8 MATHEMATICS

ALGEBRAIC EXPRESSIONS

SIMPLIFY:

1. Terms may contain fractions (division) or brackets (multiply).
2. Terms are separated by "+" or "−" signs.
3. Simplify expressions by grouping like terms together.

eg: $3a + 2b - 6a + 4b^2 - b + 2a$

$= 3a - 6a + 2a + 2b - b + 4b^2$

$= -a + b + 4b^2$

EXERCISE 6.1

1. Which of these expressions are polynomials? If the expression is a polynomial, describe the polynomial by the number of terms it has.
   a) $-13x^2y + 52y$
   b) $2a^2 - 3b^2 + 16$
   c) $y + y^2 + 12$
   d) $-\frac{1}{2}xyz^3$
2. Write down whether these polynomials are monomials, binomials or trinomials.
   a) $-4xyz$
   b) $17a^2bc + bcd - 112ac$
   c) $2a + (3a - 4)b^2$
   d) $24mn - 6(mn)^2 - 2$
   e) $(3a - 4b + 6c)$
   f) $41bc + 42bd - 43ac$
3. Simplify if possible.
   a) $26a + 4a - 8a$
   b) $17x - 12x + 33x$
   c) $3a - 2a^2$
   d) $15abc - 22bca + 13acb$
   e) $y + 2y - 3y$
   f) $10m^2n - 6m^2n + 4m^2n$
4. Simplify if possible.
   a) $2a - 3b + 4a - 5b$
   b) $6xy + 2xy - xy$
   c) $n + n + n + n$
   d) $n + m + n + m$
   e) $9s - s$
   f) $7cd + 4df + 3cd - 4df$

DEGREE OF EXPRESSION

1. Degree of expression → highest power of the variable.

eg: $8x^4 + 4x - 3x^2 - 12 + x^3$

a) Write the expression in descending powers of x.

$8x^4 + x^3 - 3x^2 + 4x - 12$

b) What is the degree of this expression? 4

c) What is the value of the expression when $x = -1$?

$8(-1)^4 + (-1)^3 - 3(-1)^2 + 4(-1) - 12$

$= 8(1) + (-1) - 3(1) + 4(-1) - 12$

$= 8 - 1 - 3 - 4 - 12$

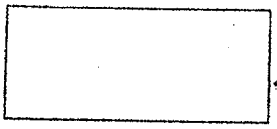
$= -12$

EXERCISE 32

1. Write down the constant term in each of these expressions.
   a) $5x^2 - 2x^3 + 3 - 6x$
   b) $4x^3 + 13 - x^3 + 4x^2$
   c) $-2x^2 - 2x^3 - 6 - 5x^3$
   d) $-36 - 6x + 3x^3 - 12x^2$

2. Use this expression to answer the questions that follow.
   $7x^2 + 5x - 3x^2 + 12 - 6x - 4 + x^2$
   a) Simplify the expression and write the simplified expression in descending powers of x.
   b) How many terms are in the simplified expression?
   c) Write down the value of the constant term.
   d) Write down the coefficient of the x term.
   e) What is the value of the expression if $x = 1$?

3. a) Write an expression for the perimeter of a rectangle where the length is $(x + 4)$ m and the breadth is $(x - 1)$ m.
   b) Simplify the expression.
   c) If $x = 5$ m, calculate the perimeter of the rectangle.



EXERCISE 33

1. a) Write this expression in descending powers of x and simplify where possible: $-6x^2 + 5 - x^3 + 7x^2 - 11 + x$
   b) What is the degree of the polynomial?

2. If $x = 3$ and $y = -2$, find the value of these polynomials.
   a) $4x - 3y$
   b) $xy^2 - 2x$
   c) $3x^2y + 2y^2$
   d) $4(2y)^2$
   e) $(x - y)^2$
   f) $x^3 - y^3$

3. Sam is x years old. Write down a formula to show how old he will be:
   a) in 4 years' time
   b) in x years' time
   c) in $3a$ years' time.

COMBINED OPERATIONS

1. The sum of positive terms is positive. eg: $2x + 2x = 4x$
2. The sum of negative terms is negative. eg: $-3x + (-3x) = -6x$
3. Adding positive and negative terms → subtract but the answer takes the sign of the bigger number.

eg: Add $(6a + 4b - 7c)$ and $(12a - 10b + 15c)$.

$6a + 4b - 7c + 12a - 10b + 15c$

$= 6a + 12a + 4b - 10b - 7c + 15c$

$= 18a - 6b + 8c$

4. Subtracting expressions → Start with the expression that comes after the word "from". Then change the signs of the second expression.

eg: Subtract $(3x + 8y - 10z)$ from $(7x - 12y + 18z)$.

$7x - 12y + 18z - (3x + 8y - 10z)$

$= 7x - 12y + 18z - 3x - 8y + 10z$

$= 7x - 3x - 12y - 8y + 18z + 10z$

$= 4x - 20y + 28z$

EXERCISE 6A

1. Add these polynomials.
   a) $(6x + 13y - 10z) + (14x - 11y + 12z)$
   b) $(a - 15b + 11c) + (-8a + 17b - 11c)$
   c) $(-4m^2 + 7m + 8) + (-3m^2 - 8m - 9)$
   d) $(3x^2 - 4x - 6) + (-3x^2 + 4x + 6)$
2. Subtract these polynomials.
   a) $(15a + 24b + 13c) - (12a + 18b + 11c)$
   b) $(10x + 12y - 8z) - (9x - 10y + 2z)$
   c) $(8a - 5b + 14c) - (18a + 7b - 25c)$
   d) $(2m^2 - 6m + 9) - (-2m^2 - 12m - 9)$
3. Subtract $(5m + 6n - 4p)$ from $(8m - 2n - 7p)$.
4. From $(x^2 + 7x - 9)$, subtract $(2x^2 - 3x + 4)$.

MULTIPLY AND DIVIDE

1. Like and unlike terms can be multiplied and divided.
2. Multiplication → add exponents. eg: $25a^3 \times 4a^2 = 100a^5$
3. Division → subtract exponents. eg: $24a^3b \div 4a^2b = 6ab^0$

$= 6a(1)$

$= 6a$

4. Any term multiplied or divided by 1 remains the same.

eg: a) $-36a^3 \times 1 = -36a^3$

b) $42b^2 \div 1 = 42b^2$

5. Any term multiplied by 0 is zero. eg: $2c \times 0 = 0$

6. Terms cannot be divided by 0. eg: $6a \div 0 =$ undefined

7. Brackets indicate multiplication. eg: $2(3c^2) = 6c^2$

8. Factorise expression → pull out common factor and write the remainder of the terms within brackets.

eg: $4x + 12 = 4(x + 3)$

9. Expand expression → multiply every term inside the bracket by the number outside the bracket.

eg: $3(x^2 + 2x - 3) = 3x^2 + 6x - 9$

EXERCISE 8.5

1. Simplify.
   a) $12m \times 30mn$
   b) $36p^2 \div 9p$
   c) $2p \times 3p^2 \times 4p^3$
   d) $144x^2y^2 \div 12xy$

2. Simplify.
   a) $18a^2b^3 \times 2ab \div 12a^3b^2$
   b) $50c^2 \div 25c \times 8c^3$
   c) $2m \times 3mn \div 6n$
   d) $14p^2 \div 7p \times 2p^3$

3. Simplify.
   a) $\frac{4a + 2b}{2}$
   b) $\frac{3a + a^2}{a}$
   c) $\frac{6x + 1}{x}$
   d) $\frac{6a + 18b - 12c}{6}$

4. Expand the following:
   a) $3(5x + 6)$
   b) $8(x - 2y)$
   c) $-4(2x + 4)$
   d) $-(x - 7y)$

5. Expand these expressions and simplify where possible.
   a) $3(b + 3) + 2(b - 6)$
   b) $-(6 + 2m) + 3(2m - 1)$
   c) $5(2x - 6) - 6(4x + 9)$
   d) $2(5x + y) - 3(x - 4y)$