

GRADE 9 | 2024

Algebra: Polynomials and Factorisation

Mathematics

CAPS ALIGNED

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1. Products of Binomials

FORMULA: $(a + b)(c + d) = ac + ad + bc + bd$ (FOIL method)

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)(a - b) = a^2 - b^2 \text{ (difference of squares)}$$

EXAMPLE: Expand

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

$$= 2x^2 - 10x + 3x - 15$$

$$= 2x^2 - 7x - 15$$

2. Factorisation

Common Factor

FORMULA: Find the HCF of all terms and factor it out.

$$6x^2 + 9x = 3x(2x + 3)$$

Difference of Squares

FORMULA: $a^2 - b^2 = (a + b)(a - b)$

Example: $x^2 - 25 = (x + 5)(x - 5)$

Trinomials ($ax^2 + bx + c$)

Find two numbers that multiply to give c and add to give b (when a = 1).

EXAMPLE: Factorise

$$x^2 + 7x + 12$$

Find two numbers: multiply to 12, add to 7 → 3 and 4

$$= (x + 3)(x + 4)$$

3. Solving Quadratic Equations

FORMULA: $ax^2 + bx + c = 0$

Step 1: Get equation = 0

Step 2: Factorise the left side

Step 3: Each factor = 0 gives a solution

EXAMPLE: Solve

$$x^2 - 5x + 6 = 0$$

$$(x - 2)(x - 3) = 0$$

$$x - 2 = 0 \text{ OR } x - 3 = 0$$

$$x = 2 \text{ OR } x = 3$$

4. Algebraic Fractions

Simplify by factorising numerator and denominator, then cancel common factors.

EXAMPLE: Simplify

$$(x^2 - 9)/(x + 3) = (x+3)(x-3)/(x+3) = x - 3$$

KEY POINT: ALWAYS factorise first before simplifying algebraic fractions.