

## GRADE 11 STUDY GUIDE | 2024

# Measurement and Algebra Review

Mathematics

## 1. Surface Area and Volume

Cylinder:  $V = \pi r^2 h$  |  $SA = 2\pi r^2 + 2\pi r h$ Cone:  $V = \frac{1}{3}\pi r^2 h$  |  $SA = \pi r^2 + \pi r l$  ( $l$  = slant height)Sphere:  $V = \frac{4}{3}\pi r^3$  |  $SA = 4\pi r^2$ Pyramid:  $V = \frac{1}{3} \text{base area} \cdot h$  |  $SA = \text{base area} + \frac{1}{2} \text{perimeter} \cdot \text{slant height}$ 

- Always check units -- convert to the same unit before calculating
- $l$  (slant height) of a cone:  $l = \sqrt{r^2 + h^2}$
- Volume in  $\text{cm}^3$ , convert to litres: 1 litre = 1000  $\text{cm}^3$

## 2. Algebraic Expressions -- Review

### Factoring Techniques

- Common factor:  $6x^2 + 9x = 3x(2x + 3)$
- Difference of squares:  $a^2 - b^2 = (a+b)(a-b)$
- Sum/difference of cubes:  $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
- Trinomial:  $ax^2 + bx + c$  -- find factors of  $ac$  that sum to  $b$
- Grouping: four terms -- factor pairs then common bracket

### Algebraic Fractions

Factor numerator and denominator, then cancel common factors. For addition/subtraction: find LCD first.

**Example: Simplify:**  $(x^2 - 4)/(x^2 - 4x + 4)$ Numerator:  $(x+2)(x-2)$ Denominator:  $(x-2)^2$ Simplified:  $(x+2)/(x-2)$ 

## 3. Equations and Inequalities

### Quadratic Equations

Standard:  $ax^2 + bx + c = 0$ Formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$



Factoring: fastest when applicable; set each factor to zero

- Completing the square: transform to  $(x+p)^2 = q$  form
- Quadratic formula: always works, works even for irrational roots

### Quadratic Inequalities

Solve the equality first (find roots). Then test a value in each interval, or use the parabola shape.

**Example: Solve  $x^2 - x - 6 < 0$**

Roots:  $x=3$  or  $x=-2$  (from  $(x-3)(x+2)=0$ )

Parabola opens upward  $\Rightarrow$  negative between roots

Answer:  $-2 < x < 3$

### Simultaneous Equations

Linear + quadratic: substitute the linear into the quadratic. You will get a quadratic to solve, giving up to 2 solution pairs.