FORMULAE TO LEARN (not given in exam)

Straight Line
Gradient: \( m = \frac{y_2 - y_1}{x_2 - x_1} \) or \( m = \tan \theta \)

Equation of a line: \( y - b = m(x - a) \)

Distance formula: \( d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \) (Pythagoras)

Midpoint formula: \( \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \) (Averages)

Perpendicular lines: \( m_1 \times m_2 = -1 \)

Algebra
Limit of a recurrence relation: for a recurrence relation \( u_{n+1} = au_n + b \), where \(|a| < 1\), the limit is given by \( L = \frac{b}{1-a} \)

Quadratic formula: the solutions of \( ax^2 + bx + c = 0 \) are given by \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)

Discriminant: \( b^2 - 4ac \)

Logarithms
\( y = \log_a x \iff x = a^y \)
\( \log_a a = 1, \quad \log_a 1 = 0 \)

Trigonometry
SOH CAH TOA: \( \sin x = \frac{\text{opposite}}{\text{hypotenuse}}, \quad \cos x = \frac{\text{adjacent}}{\text{hypotenuse}}, \quad \tan x = \frac{\text{opposite}}{\text{adjacent}} \)

Identities:
\( \sin^2 x + \cos^2 x = 1, \quad \tan x = \frac{\sin x}{\cos x} \)

Area of a triangle: \( A = \frac{1}{2}ab \sin C \)

Exact values: See triangles on right

Areas and Volumes (optimisation type questions)
Area of a rectangle/triangle, Area/circumference of a circle, volume of a cuboid