

# Hsc Higher Math 1st Paper Formulae

Hsc Higher Math 1st Paper Formulae Mastering the HSC Higher Math 1st Paper A Comprehensive Guide to Essential Formulas

The HSC Higher Math 1st Paper is a significant hurdle for students aspiring to excel in their academic pursuits. It tests not only your understanding of complex mathematical concepts but also your ability to apply them effectively in solving problems. One crucial element in achieving success in this exam is having a firm grasp of the essential formulas. This article aims to provide you with a comprehensive guide to the key formulas that will be vital in tackling the HSC Higher Math 1st Paper. We will cover a wide range of topics including Algebra, The backbone of mathematics, algebra is used extensively throughout the exam. We will cover essential formulas for linear equations, quadratic equations, simultaneous equations, and inequalities. Trigonometry: Dealing with angles, triangles, and their relationships, trigonometry is crucial for solving geometric problems. We will explore key formulas for trigonometric ratios, identities, and the unit circle. Coordinate Geometry: This section involves analyzing and manipulating geometric shapes using coordinates. We will cover formulas for finding distance, midpoint, slope, equations of lines, and equations of circles. Calculus: The study of change and rates of change, calculus forms a significant portion of the exam. We will explore formulas for derivatives, integrals, and applications of calculus. Vectors: Vectors are essential for representing quantities that have both magnitude and direction. We will examine formulas for vector addition, subtraction, scalar multiplication, dot product, and cross product. Matrices and Determinants: These tools are valuable for solving systems of equations and analyzing linear transformations. We will cover formulas for matrix operations, determinant calculation, and finding inverses.

**Algebra 1: Linear Equations**

Slope-intercept form:  $y = mx + c$  where  $m$  is the slope and  $c$  is the y-intercept.

Point-slope form:  $y - y_1 = m(x - x_1)$  where  $m$  is the slope and  $(x_1, y_1)$  is a point on the line.

**2. Standard form:**  $Ax + By = C$  where  $A$ ,  $B$ , and  $C$  are constants.

**2. Quadratic Equations**

Quadratic formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  where  $a$ ,  $b$ , and  $c$  are coefficients of the quadratic equation  $ax^2 + bx + c = 0$ .

Vertex form:  $y = a(x - h)^2 + k$  where  $(h, k)$  is the vertex of the parabola.

Discriminant:  $b^2 - 4ac$  determines the nature of the roots.

**3. Simultaneous Equations**

Substitution method: Solve one equation for one variable and substitute it into the other equation.

Elimination method: Multiply equations by constants to make the coefficients of one variable the same, then add or subtract the equations to eliminate that variable.

**4. Inequalities**

Linear inequalities: Use the same principles as linear equations but remember to flip the inequality sign when multiplying or dividing by a negative number.

Quadratic inequalities: Factorize the

quadratic expression and use a sign chart to determine the solution set

**Trigonometry 1** Trigonometric Ratios Sine  $\sin$  opposite hypotenuse Cosine  $\cos$  adjacent hypotenuse Tangent  $\tan$  opposite adjacent

**2** Trigonometric Identities Pythagorean Identity  $\sin^2 \theta + \cos^2 \theta = 1$  Other identities  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ ,  $\sec \theta = \frac{1}{\cos \theta}$ ,  $\cot \theta = \frac{1}{\tan \theta}$ ,  $\csc \theta = \frac{1}{\sin \theta}$

**3** Unit Circle Radian measure  $2\pi$  radians  $360^\circ$  degrees Trigonometric values of special angles  $0^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ$  CAST rule helps determine the signs of trigonometric ratios in different quadrants

**Coordinate Geometry 1** Distance Formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$  where  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points

**2** Midpoint Formula  $M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$  where  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points

**3** Slope Formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$  where  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points

**4** Equation of a Line Slope-intercept form  $y = mx + c$  Point-slope form  $y - y_1 = m(x - x_1)$  Standard form  $Ax + By = C$

**5** Equation of a Circle  $(x - h)^2 + (y - k)^2 = r^2$  where  $(h, k)$  is the center and  $r$  is the radius

**Calculus 1** Derivatives Power rule  $\frac{d}{dx} x^n = nx^{n-1}$  Product rule  $\frac{d}{dx} uv = u \frac{d}{dx} v + v \frac{d}{dx} u$  Quotient rule  $\frac{d}{dx} \frac{u}{v} = \frac{v \frac{d}{dx} u - u \frac{d}{dx} v}{v^2}$  Chain rule  $\frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$

**2** Integrals Power rule  $\int x^n dx = \frac{x^{n+1}}{n+1} + C$  where  $n \neq -1$  Integration by parts  $\int u \frac{d}{dx} v = uv - \int v \frac{d}{dx} u$  Substitution method Substitute a new variable to simplify the integral

**3** Applications of Calculus Finding maximum and minimum values Setting the derivative equal to zero to find critical points Finding areas and volumes Using integration to calculate definite integrals Rates of change and related rates Using derivatives to analyze changing quantities

**Vectors 1** Vector Addition and Subtraction Head-to-tail method Adding vectors by placing them head-to-tail

**4** Component method Adding corresponding components of vectors

**2** Scalar Multiplication Multiplying a vector by a scalar changes its magnitude but not direction

**3** Dot Product Geometric definition  $\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}| |\mathbf{b}| \cos \theta$  where  $\theta$  is the angle between vectors  $\mathbf{a}$  and  $\mathbf{b}$  Component definition  $\mathbf{a} \cdot \mathbf{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$

**4** Cross Product Geometric definition  $|\mathbf{a} \times \mathbf{b}| = |\mathbf{a}| |\mathbf{b}| \sin \theta$  where  $\theta$  is the angle between vectors  $\mathbf{a}$  and  $\mathbf{b}$  Component definition  $\mathbf{a} \times \mathbf{b} = (a_2 b_3 - a_3 b_2)\mathbf{i} + (a_3 b_1 - a_1 b_3)\mathbf{j} + (a_1 b_2 - a_2 b_1)\mathbf{k}$

**Matrices and Determinants 1** Matrix Operations Addition and subtraction Add or subtract corresponding elements of matrices Scalar multiplication Multiply each element of a matrix by a scalar Matrix multiplication Multiply rows of the first matrix by columns of the second matrix

**2** Determinant of a Matrix  $2 \times 2$  matrix  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$  where  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$   $3 \times 3$  matrix Use cofactor expansion or other methods

**3** Inverse of a Matrix  $2 \times 2$  matrix  $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$   $A^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$   $3 \times 3$  or larger matrices Use Gaussian elimination or other methods

Conclusion Mastering these formulas is essential for success in the HSC Higher Math 1st Paper Regular practice and understanding the concepts behind the formulas are crucial for achieving a strong grasp of the subject matter Remember to revisit and reinforce these formulas throughout your preparation and don't hesitate to seek help from your teachers or tutors if you encounter any difficulties

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soit  $f$  une fonction dérivable en un point  $x_0$  montrer que  $\lim_{h \rightarrow 0} \frac{f(x_0 + h) - f(x_0)}{h} = f'(x_0)$  réciproquement si la limite

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soient  $n$  et  $p$  deux entiers naturels non nuls et soit  $P$  un polynôme de degré  $n$  à coefficients réels pour

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donner les ensembles de définition des fonctions suivantes  $\begin{array}{l} \text{III} \quad \sqrt{2x^2 + 12x + 18} \\ \text{quad} \quad \ln x^2 + 4x \end{array}$

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