Statement of Syllabus Topics
Mathematics HSC Course

Coordinate Methods in Geometry

2.5 Application of geometric properties to simple theoretical problems requiring one or more steps of reasoning.

Probability

3.1 Random experiments, equally likely outcomes; Probability of a given result.

3.2 Sum and product of results.

3.3 Experiments involving successive outcomes; Tree diagrams.

Applications of Geometrical properties

6.8 Coordinate methods in geometry.

Series and Applications

7.1 Arithmetic series. Formulae for the nth term and sum of n terms.

7.2 Geometric series. Formulae for the nth term and sum of n terms.

7.3 Geometric series with a ratio between –1 and 1. The limit of x^n, as $n \to \infty$, for $|x| < 1$, and the concept of limiting sum for a geometric series.

7.5 Applications of arithmetic series.

Applications of geometric series: compound interest, simplified hire purchase and repayment problems.

Applications to recurring decimals.

Geometrical Applications of Differentiation

10.1 Significance of the sign of the derivative.

10.2 Stationary points on curves.

10.3 The second derivative. The notations $f''(x)$, $\frac{d^2y}{dx^2}$, y''.

10.4 Geometrical significance of the second derivative.

10.5 The sketching of simple curves.

10.6 Problems on maxima and minima.

10.7 Tangents and normals to curves.

10.8 The primitive function and its geometrical interpretation.

Integration

11.1 The definite integral.

11.2 The relation between the integral and the primitive function.

11.3 Approximate methods: trapezoidal rule and Simpson’s rule.

11.4 Applications of integration: areas and volumes of solids of revolution.

Logarithmic and exponential functions

12.1 Review of index laws, and definition of a^r for $a > 0$, where r is rational.

12.2 Definition of logarithm to the base a. Algebraic properties of logarithms and exponents.

12.3 The functions $y = a^x$ and $y = \log_a x$ for $a > 0$ and real x. Change of base.

12.4 The derivatives of $y = a^x$ and $y = \log_a x$. Natural logarithms and exponential function.

12.5 Differentiation and integration of simple composite functions involving exponentials and logarithms.

Trigonometric functions

13.1 Circular measure of angles. Angle, arc, sector.

13.2 The functions sin x, cos x, tan x, cosec x, sec x, cot x and their graphs.

13.3 Periodicity and other simple properties of the functions sin x, cos x and tan x.

13.4 Approximations to sin x, cos x, tan x, when x is small.

The result $\lim_{x \to 0} \frac{\sin x}{x} = 1$

13.5 Differentiation of cos x, sin x, tan x.

13.6 Primitive functions of sin x, cos x, $\sec^2 x$.

13.7 Extension of 13.2 – 13.6 to functions of the form $a \sin(bx + c)$, etc.

Applications of calculus to the physical world

14.1 Rates of change as derivatives with respect to time.

The notation $\dot{x}$, $\ddot{x}$, etc.

14.2 Exponential growth and decay; rate of change of population; the equation

$\frac{dN}{dt} = kN$, where k is the population growth constant.

14.3 Velocity and acceleration as time derivatives. Applications involving:

(i) the determination of the velocity and acceleration of a particle given its distance from a point as a function of time;

(ii) the determination of the distance of a particle from a given point, given its acceleration or velocity as a function of time together with appropriate initial conditions.