

Grade 11 / A level IGCSE

1. Sets

Sets and their representations, empty sets, finite and infinite sets, equal sets, subsets, and subsets of a set of real numbers, especially intervals (with notations), universal set, Venn diagrams, union and intersection of sets, difference of sets, complement of a set and properties of complement.

2. Relations & Functions

Ordered pairs, Cartesian product of sets, number of elements in the Cartesian product of two finite sets, Cartesian product of the set of reals with itself (upto $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$), definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

3. Trigonometric Functions

Positive and negative angles, measuring angles in radians and in degrees and conversion from one measure to another, definition of trigonometric functions with the help of unit circle, truth of the identity, signs of trigonometric functions, domain and range of trigonometric functions and their graphs, expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$, $\cos x$ & $\cos y$ and their simple applications.

Unit-II: Algebra

1. Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by the inability to solve some of the quadratic equations. Algebraic properties of complex numbers, Argand plane.

2. Linear Inequalities

Linear inequalities, algebraic solutions of linear inequalities in one variable and their representation on the number line.

3. Permutations and Combinations

The fundamental principle of counting. Factorial n . $(n!)$ Permutations and combinations, derivation of Formulae for ${}^n P_r$ and ${}^n C_r$ and their connections, simple applications.

4. Binomial Theorem

Historical perspective, statement and proof of the binomial theorem for positive integral indices, Pascal's triangle, simple applications.

5. Sequence and Series

Sequence and series, arithmetic progression (A. P.), arithmetic mean (A.M.), geometric progression (G.P.), general term of a G.P., sum of n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M.

Unit-III: Coordinate Geometry

1. Straight Lines

Brief recall of two-dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point-slope form, slope-intercept form, two-point form, intercept form and normal form. General equation of a line. Distance of a point from a line.

2. Conic Sections

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. Introduction to Three-Dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

Unit-IV: Calculus

1. Limits and Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit, limits of polynomials and rational functions trigonometric, exponential and logarithmic functions, definition of derivative relate it to the slope of the tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit-V: Statistics and Probability

1. Statistics

Measures of Dispersion: Range, mean deviation, variance and standard deviation of ungrouped/grouped data.

2. Probability

Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.