

UNITS

1. Units and Functions

1.1 Sets

Sets and their representations Empty set. Finite and Infinite sets [taloa] sets. Subsets of the set of real numbers especially intervals (with notations). Power set. Universal set. Venn diagrams. Union and Intersection of sets Difference of sets Complement of a set.

1.2 Relations and Functions

Ordered pairs, the Cartesian product of sets. A number of elements in the cartesian product of Rio finite sets. Cartesian product of the teals with itself (up to $R \times R \times R$). Definition of relation, pictorial diagrams. domain, co-domain and range of a relation. [function as a special kind of relation from one set to another Pictorial representation of a function, domain, co-domain and range of a function. The real-valued function of the real variable. domain and range of these functions, constant, identity, polynomial, rational, module% Sign= and greatest integer functions with their graphs. Sum, difference., product and quotients of functions.

1.3 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 the unit circle. The truth of the identity.

$\sin^2 x + \cos^2 x = 1$, for all x signs of the trigonometric functions and sketch of their graphs. Expressing

$\sin(x+y)$ and $\cos(x+y)$ in terms of $\sin x$, $\sin y$, $\cos x$ and $\cos y$. Deducing the identities like the

following:

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \cot y \mp 1}{\cot y \pm \cot x}$$

$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}, \cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2},$$

$$\sin x - \sin y = 2 \cos \frac{x+y}{2} \sin \frac{x-y}{2}, \cos x - \cos y = -2 \sin \frac{x+y}{2} \sin \frac{x-y}{2}.$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$: General solution of trigonometric equations of the type $\sin \theta = \sin \alpha$, $\cos \theta = \cos \alpha$ and $\tan \theta = \tan \alpha$. Proofs and simple applications of sine and cosine formulae.

2. Algebra

2.1. The principle of Mathematical Induction

Processes of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of the real numbers. The principle of mathematical induction and simple applications.

2.2 Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by an inability to solve every quadratic equation. A brief description of the algebraic properties of complex numbers. Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, a solution of quadratic equations in the complex number system.

2.3. Linear Inequalities

Linear Inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. The solution of a system of linear inequalities in two variables - graphically.

2.4. Permutations and Combinations

The fundamental principle of counting. Factorial n Permutations and combinations, derivation of formulae and their connections, simple applications.

2.5. Binomial Theorem

History, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, general and middle term in binomial expansion, simple applications.

2.6. 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., geometric mean (G.M.), relation between A.M. and G.M. Sum to n terms of the special series: $\sum n$, $\sum n^2$ and $\sum n^3$.

Unit 3: Coordinate Geometry

3.1. Straight Lines

A brief recall of 2D from earlier classes. The slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope intercept form, two-point form, intercepts form and normal form. General equation of a line. Distance of a point from a line.

3. 2. Conic Sections

Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and 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.

3.3 Introduction to Three-dimensional Geometry

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

Unit 4: Calculus

Limits and Derivatives

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

Unit 5: Mathematical Reasoning

Mathematically acceptable statements. Connecting words/phrases — consolidating that understanding of "if and only if (necessary and sufficient) condition", "implies", "and/or", "implied by", "and", "or", "there exists" and their use through a variety of examples related to real life and Mathematics Validating the statements involving the connecting words — difference between contradiction, converse and contrapositive.

Unit 6: Statistics and Probability

1. Statistics

A measure of dispersion; mean deviation, variance and standard deviation of ungrouped grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability

Random experiments: Outcomes, sample spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (sec theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

Appendix

1. infinite Series

Binomial theorem for am' index, infinite geometric series, exponential and logarithmic series.

2. Mathematical Modelling

Consolidating the understanding, developed up to Class X. Focus on modelling problems related to real-life

(like environment crave?, etc.) and connecting with other subjects of study where many constraints may really need to be ignored, formulating the model, looking for solutions, interpreting them in the problem situation and evaluating the model.

