

Unit I: Sets and Functions

1. Sets

20 Periods

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, 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. Properties of Complement.

2. Relations and Functions

20 Periods

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

20 Periods

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 $\sin 2x + \cos 2x = 1$, for all x . 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. Deducing identities like the following:

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

$$\sin \alpha \pm \sin \beta = 2 \sin \frac{1}{2}(\alpha \pm \beta) \cos \frac{1}{2}(\alpha \mp \beta)$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha - \cos \beta = -2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$.

Unit II: Algebra

1. Complex Numbers and Quadratic Equations

10 Periods

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

2. Linear Inequalities

10 Periods

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the

number line.

3. Permutations and Combinations

10 Periods

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

10 Periods

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

5. Sequence and Series

10 Periods

Sequence and Series. 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

15 Periods

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, Distance of a point from a line.

2. Conic Sections

25 Periods

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

10 Periods

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

Unit IV: Calculus

1. Limits and Derivatives

40 Periods

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 slope of 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

20 Periods

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

2. Probability

20 Periods

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.

Disclaimer
Dropped Topics/ Chapter

Chapter 1 - Sets

1.7 Power Set, Exercise 1.3 Ques. 5

1.12 Practical Problems on Union and Intersection of Two Sets

Exercise 1.6

Examples 31–34 and Ques. 6–7 (Miscellaneous Exercise)

Ques. 13–16 (Miscellaneous Exercise), Last Point in the Summary on the Page

Last Point in the Summary

Chapter 3 - Trigonometric Functions

3.5 Trigonometric Equations (up to Exercise 3.4)

Last five points in the Summary

3.6 Proofs and Simple Applications of Sine and Cosine Formulae

Chapter 4 - Principle of Mathematical Induction

Full Chapter

Chapter 5 - Complex Numbers

5.5.1 Polar Representation of a Complex Number

5.6 Quadratic Equation

Example 11 and Exercise 5.3

Examples 13, 15, 16

Ques. 5–8, 9 and 13 (Miscellaneous Exercise)

Last three points in the Summary

5.7 Square-root of a Complex Number

Chapter 6 - Linear Inequalities

6.4 Graphical Solution of Linear Inequalities in Two Variables

6.5 Solution of System of Linear Inequalities in Two Variables

Last three points in the Summary

Chapter 8 - Binomial Theorem

8.3 General Middle Terms

Example 17 and Ques. 1–3, and 8 (Miscellaneous Exercise)

Last two points in the Summary

Chapter 9 - Sequences and Series

9.4 Arithmetic Progression (A.P.) (up to Exercise 9.2)

9.7 Sum to n terms of Special Series

Examples 21, 22 and 24

Ques. 1–6, 12, 15, 16, 20, 23–26 (Miscellaneous Exercise)

Point 3 and 4 in the Summary

Chapter 10 - Straight Lines

10.2.4 Collinearity of Three Points (Examples 4–5 and Ques. 8, 13–14 in Exercise 10.1)

10.3.6 Normal Forms

Ques. 8 in Exercise 10.2

10.4 General Equation of a Line

Ques. 3 in Exercise 10.3

Ques. 2 (Miscellaneous Exercise)

Fourth Last Point in the Summary

10.6 Equation of Family of Lines Passing Through the Points of Intersection of Two Lines

10.7 Shifting of Origin

Chapter 11 - Conic Sections

11.5.2 Special Cases of an Ellipse

Chapter 12 - Introduction to Three Dimensional Geometry

12.5 Section Formula

Exercise 12.3

Ques. 4 and 5 (Miscellaneous Exercise)

Last Three Points in the Summary

Chapter 14 - Mathematical Reasoning

Full Chapter

Chapter 15 - Statistics

15.6 Analysis of Frequency Distribution

Ques. 6 (Miscellaneous Exercise) and last point in the Summary

Chapter 16 - Probability

16.1 Introduction

16.2 Random Experiment

First Two Points in the Summary