Revised Edition

As per Common Core Curriculum

S. CHAND'S
MATHEMATICS
FOR CLASS XI

Includes all exercises of NCERT Exemplar and textbook (with solutions)

H.K. DASS
Dr. RAMA VERMA

S. CHAND School

With value-based questions

Revised according to the new Common Core Curriculum prescribed
by the Central Board of Secondary Education (CBSE) for Class XI

S.Chand's

MATHEMATICS

FOR CLASS XI

As per Common Core Curriculum

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PREFACE TO THE FIFTH REVISED EDITION

This book **S. Chand's Mathematics for XI** is written according to Common Core Curriculum developed by the Council of Boards of School Education (COBSE) and National Council of Educational Research and Training (NCERT) for academic sessions from 2011 onwords.

From 2011 onwards 19 boards of school education such as CBSE, Haryana, Bihar, Uttarakhand, Goa, Nagaland, Jammu & Kashmir, Rajasthan, Kerala, Assam and West Bengal, etc. have followed the common syllabus as included in the textbook. Some more boards of school education are expected to agree to adopt this common core curriculum for 11th class students.

Most of the students use NCERT Textbook and they find difficulty in solving the unsolved questions that is why we have solved the unsolved questions of exercises of NCERT. In this way, the edition of this textbook has become very useful to the readers.

Pictures and realistic figures have been frequently added to make the abstruct topic lively.

Minor steps are not missed so that even weaker students can understand the subject easily.

We have made special efforts to see that this book caters to the needs of outstanding, bright, average and weak students and also for their teachers.

Clarity is our motto in writing this book, so that students would not find difficulty in grasping the subject. A lot of efforts have been made to provide ample opportunities to the students for their revision work, which is likely to boost their confidence. The language used in this book is so simple that even an average student can follow the subject without any difficulty.

Special features of this edition:

- **All the questions of each exercise of NCERT Textbook are solved in this edition.**
- **30 Solved Value-Based Questions are appended at the end of the book.**
- **Hints to the selected questions are given.**
- **Every chapter starts with the newly prescribed syllabus, important formulae and summary to help students to get a microscopic view of contents to follow.**
- **The whole syllabus is split up into small chapters in order to make the concepts clear and easy to understand.**
- **Problems are linked with learners life and experiences so that the learner will realize how and why mathematics is useful all around us.**
- **The focus is on developing the processes involved in mathematical reasoning.**

We are thankful to the management and the editorial team of S. Chand & Company Pvt. Ltd. for all help and support in publication of this book.

We will feel amply rewarded, if suggestions and constructive feedback are provided by the students and teachers, which will enable us to make the book error-free and more user-friendly.

For any clarification, we may be contacted on the following address.

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SOME UNIQUE FEATURES OF THE BOOK AT A GLANCE

- A list of symbols used in the first chapter is given.
- Comparison table of Roster and Set builder form.
- In which quadrant t-ratio lies have been explained on the basis of coordinates.
- A special trigonometrical table is given.
- Important formulae are placed in boxes in bold letters.
- Projection formula and Napiers analogy are also given.
- Inductive and deductive reasonings have been explained with the help of practical happenings.

  Iota (i) has also been defined as an operator in addition to $i = \sqrt{-1}$.
- Geometrical representations of $Z_1 \cdot Z_2$, $\frac{Z_1}{Z_2}$ are given.
- Nature of roots of a quadratic equation is explained by a diagram.
- Problems of linear inequations have been solved with the help of the number lines.
- While shading the required half planes, perpendicular lines are drawn on the dividing line.
- Permutations have explained with the help of figures based on life situation.
- Method of differences is given to find out the sum of a series.
- Formula to find area of a triangle is given in the form of determinant.
- Limits have been explained by forming tables of increasing and decreasing functions.
- Truth tables of compound statements are added.

THE BOOK IS DEDICATED TO MATHEMATICIAN

SRINIVASAN RAMANUJAN

(1887 – 1920)

Srinivasan Ramanujan Iyengar (1887 - 1920), an Indian Mathematical Wizard, occupies a unique position in the History of Mathematics. Although he had little formal education, Ramanujan has left a memorable imprint on mathematical thoughts, which fascinate and stimulate not only research mathematicians but also school students and even common people. He differed with great many mathematicians world over. Ramanujan may be next to Albert Einstein in utilising brain power with maximum efficiency.

On April 14, 1914 Ramanujan arrived in England on the invitation of renowned Prof. Hardy of Cambridge University. On February 28, 1918, he was elected the first Indian Fellow of the Royal Society.

In his fourth year abroad, he suffered by Pulmoary Tuberculosis. One day Prof. Hardy took a taxi with number 1729 to visit Ramanujan in a nursing home. During conversation, Prof. Hardy expressed that his taxi number was dull and unfavourable. Ramanujan replied immediately,

"It is very interesting number. It is the smallest number expressible as a sum of two cubes in two different ways."

$$1729 = 1^3 + 12^3 = 9^3 + 10^3.$$

He passed away on April 26, 1920 in Chetput, Madras (Chennai).

He left three notebooks containing the statements of about 3000 – 4000 theorems without proof.

CORE CURRICULUM

UNIT - I : SETS AND FUNCTIONS

1. Sets :

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

2. Relations and Functions :

Ordered pairs, Cartesian product of sets. Number of elements in the cartesian product of two finite sets. Cartesian product of the reals with it self (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 & range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum 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 & in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $\sin^2 x + \cos^2 x = 1$, for all x. Signs of trigonometric functions and sketch of their graphs. Expressing sin $(x + y)$ and cos $(x + y)$ in terms of sin x, sin y, cos x & cos y. Deducing the identities like following :

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

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

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

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

UNIT - II : ALGEBRA

1. 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 real numbers. The principle of mathematical induction and simple applications.

2. Complex Numbers and Quadratic Equations :

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

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. Solution of system of linear inequalities in two variables graphically.

4. Permutations and Combinations :

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

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.

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., Arithmetic and geometric series, infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M. Sum to *n* terms of the special series : $\Sigma n, \Sigma n^2$ and Σn^3.

UNIT - III : COORDINATE GEOMETRY

1. Straight Lines :

Brief recall of 2D from earlier classes, shifting of origin. 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, intercept form and normal form. General equation of a line. Equation of family of lines passing through the point of intersection of two lines. Distance of a point from a line.

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. 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 - IV : CALCULUS

1. Limits and Derivatives :

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. $\lim_{x \to 0} \frac{\log_e (1+x)}{x}$, $\lim_{x \to 0} \frac{e^x - 1}{x}$. 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 : MATHEMATICAL REASONING

1. Mathematical Reasoning :

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

UNIT - VI : STATISTICS AND PROBABILITY

1. Statistics :

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 (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events.

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