CBSE CLASS XI
MATHEMATICS (Code No. 041)

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage fromwhere the students go either for higher academic education in Mathematics or for professional courses likeEngineering, Physical and Bioscience, Commerce or Computer Applications. The present revised syllabus hasbeen designed in accordance with National Curriculum Framework 2005 and as per guidelines given in FocusGroup on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students.Motivating the topics from real life situations and other subject areas, greater emphasis has been laid onapplication of various concepts.

Objectives

The broad objectives of teaching Mathematics at senior school stage intend to help the students:

- to acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- to feel the flow of reasons while proving a result or solving a problem.
- to apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- to develop positive attitude to think, analyze and articulate logically.
- to develop interest in the subject by participating in related competitions.
- to acquaint students with different aspects of Mathematics used in daily life.
- to develop an interest in students to study Mathematics as a discipline.
- to develop awareness of the need for national integration, protection of environment, observance ofsmall family norms, removal of social barriers, elimination of gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

COURSE STRUCTURE
CLASS XI (2017-18)

One Paper (Total Periods 240 of 35 Minutes each)

Three Hours (Max Marks. 100)

No.	Units	No. of Periods	Marks
I.	Sets and Functions	60	29
II.	Algebra	70	37
III.	Coordinate Geometry	40	13
IV.	Calculus	30	06
V.	Mathematical Reasoning	10	03
VI.	Statistics and Probability	30	12
	TOTAL	**240**	**100**

*No chapter/unit wise weightage. Care to be taken to cover all the chapters.

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). Power set. Universal set. Venn diagrams. Union and Intersection of sets.Difference of sets. Complement of a set. Properties of Complement Sets.

2. Relations & 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 R x R x 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 quotient 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

$$sin^2 x + cos^2 x = 1$$

for all x. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing sin (x±y) and cos (x±y) in terms of sinx, siny, cosx & cosy and their simple applications. Deducing the identities like the following:

$$tan\left(x \pm y\right) = \frac{tanx \pm tany}{1 \pm tanx tany}$$

$$cot\left(x \pm y\right) = \frac{cotx coty}{1 \pm cotx coty}$$

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

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

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

Identities related to sin 2x, cos2x, tan 2x, sin3x, cos3x and tan3x. General solution of trigonometric equations of the type sin *y* = sin *a, cos y* = *cos a* and tan *y* = tan *a.*

Unit-II: Algebra

1. Principle of Mathematical Induction: (10 Periods)

Process 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 (15 Periods)

Need for complex numbers, especially

$\sqrt{-1}$, to be motivated by inability to solve some of the quardratic equations. Algebraic properties of complex numbers.Argand plane and polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system. Square root of a complex number.

3. Linear Inequalities (15 Periods)

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line.Graphical representation of linear inequalities in two variables.Graphical method of finding a solution of system of linear inequalities in two variables.

4. 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.

5. Binomial Theorem (10 Periods)

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 (10 Periods)

Sequence and Series. Arithmetic Progression (A. P.). Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of first n terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M. Formulae for the following special sums

$$\sum_{k=1}^{n} k, \sum_{k=1}^{n} k^2 \, and \, \sum_{k=1}^{n} k^3$$

Unit-III:Coordinate Geometry

1. Straight Lines (10 Periods)

Brief recall of two dimensional geometry from earlier classes. Shifting of origin. 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.Equation of family of lines passing through the point of intersection of two lines.Distance of a point from a line.

2. Conic Sections (20 Periods)

Sections of a cone: circle, 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 and section formula.

Unit-IV: Calculus

1. Limits and Derivatives (30 Periods)

Derivative introduced as rate of change both as that of distance function and geometrically.

Intutive idea of limit.Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to scope 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 (10 Periods)

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", "there 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 contrapositive.

Unit-VI: Statistics and Probability

1. Statistics (15 Periods)

Measures of dispersion: Range, mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.

2. Probability (15 Periods)

Random experiments; outcomes, sample spaces (set representation). Events; occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories studied in earlier classes. Probability of an event, probability of 'not', 'and' and 'or' events.

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MATHEMATICS (CODE - 041)
QUESTION PAPER DESIGN
CLASS - XI (2017-18)

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Time 3 Hours (Max. Marks: 100)

Typology of Questions:

1. **Remembering-** (Knowledge based Simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define, or recite, information)

Very Short Answer (1 marks): 2
Short Answer (2 marks): 2
Long Answer I (4 marks): 2
Long Answer II (6 marks): 1
Total Marks: 20
% Weightage: 20%

2. **Understanding-** (Comprehension –to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)

Very Short Answer (1 marks): 1

Short Answer (2 marks): 3
Long Answer I (4 marks): 4
Long Answer II (6 marks): 2
Total Marks: 35
% Weightage: 35%

3. **Application-** (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)

Very Short Answer (1 marks): 1
Short Answer (2 marks): 0
Long Answer I (4 marks): 3
Long Answer II (6 marks): 2
Total Marks: 25
% Weightage: 25%

4. **High Order Thinking Skills-** (Analysis & Synthesis- Classify, compare, contrast, or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of sources)

Very Short Answer (1 marks): 0
Short Answer (2 marks): 3
Long Answer I (4 marks): 1
Long Answer II (6 marks): 0
Total Marks: 10
% Weightage: 10%

5. **Evaluation-** (Appraise, judge, and/ or justify the value or worth of a decision or outcome, or to predict outcomes based on values)

Very Short Answer (1 marks): 0
Short Answer (2 marks): 0
Long Answer I (4 marks): 1
Long Answer II (6 marks): 1

Total Marks: 10
% Weightage: 10%

TOTAL
Very Short Answer (1 marks): 1x4=4
Short Answer (2 marks): 2x8=16
Long Answer I (4 marks): 4x11=44
Long Answer II (6 marks): 6x6=36
Total Marks: 100
% Weightage: 100%

VBQ: One of the LA-I type question should be to assess the values inherent in the texts.

QUESTION WISE BREAK UP

Type of Question	Mark per Question	Total no. of Question	Total Marks
VSA	1	4	04
SA	2	8	16
LA-I	4	11	44
LA-II	6	6	**36**
Total		**29**	**100**

1. No chapter wise weightage. Care to be taken to cover all the chapters.

2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

Choice(s):

There will be no overall choice in the question paper.

However, 30% internal choices will be given in 4 marks and 6 marks questions.