3.MATHEMATICS

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. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics which is to meet the emerging needs of all categories of students for motivating the teacher to relate the topics from real life problems and other subject areas, greater emphasis has been laid on applications of various concepts.

The curriculum at Secondary stage primarily aims at enhancing the capacity of students to employ Mathematics in solving day-to-day life problems and studying the subject as a separate discipline. It is expected that students should acquire the ability to solve problems using algebraic methods and apply the knowledge of simple trigonometry to solve problems of heights and distances Carrying out experiments with numbers and forms of geometry, framing hypothesis and verifying these with further observations form inherent part of Mathematics learning at this stage. The proposed curriculum includes the study of Arithmetical concepts, number system, algebra, geometry, trigonometry, menstruations, statistics, graphs and coordinate geometry etc.

The teaching of Mathematics should be imparted through activities which may involve the use of concrete materials, models, patterns, charts, pictures posters games, puzzles and experiments.

OBJECTIVES

The board's objectives of teaching of Mathematics at secondary stage are to help the learners to :

1. Consolidate the Mathematical Knowledge and Skills acquired at the upper primary stage.
2. Acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills.
3. Develop mastery of basic algebraic skills;
4. Develop drawing skills;
5. Feel the flow of reasons while proving a result or solving a problem.
6. Apply the Knowledge and skills acquired to solve problems and wherever possible, by more than one method
7. To develop positive ability to think analyze and articulate logically.
8. To develop awareness of the need for national integration, protection of the environment, observance of small family norms. Removal of social barriers, elimination of gender biases.
9. To develop necessary skills to work with modern technological devices fields for its beautiful structures and patterns etc.
10. To develop interest in Mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.
11. To develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.
12. To develop interest in the subject by participating in related competitions
13. To acquaint students with different aspects of mathematics used in daily life.
14. To develop an interest in students to study mathematics as discipline

One Paper **Time : 3 Hours** **Marks : 80**

UNIT		Marks
I.	Number Systems	06
II.	Algebra	17
III.	Trigonometry	12
IV.	Coordinate Geometry	06
V.	Geometry	16
VI.	Mensuration	13
VII.	Statistics And Probability	10
	TOTAL	**80**

UNIT I : NUMBER SYSTEMS

1. REAL NUMBERS (6 Marks)

Euclid's division lemma, Fundamental Theorem of Arithmetic-statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of results-irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, decimal expansions of rational numbers in terms of terminating non-terminating recurring decimals.

UNIT II : ALGEBRA

1. Polynomials (3 Marks)

Zeros of a polynomial, Relationship between zeros and coefficients of a polynomial with particular reference to quadratic polynomials. Statement and simple problems on division algorithm for polynomials with real coefficients.

2. Pair of Linear Equations in Two Variables. (6 Marks)

Pair of linear equations in two variables. Geometric representation of different possibilities of solutions inconsistency.

Algebraic conditions for number of solutions. Solution of pair of linear equations in two variables algebraically by substitution, by elimination and by cross multiplication. Simple situational problems must be included. Simple problems on equations reducible to linear equations may be included.

3. Quadratic Equations (3 Marks)

Standard form of a quadratic equation $ax^2+bx+c = 0$, $(a\neq0)$. Solution of the quadratic equations (only real roots) by factorization and by completing the square, i.e. by using quadratic formula. Relationship between discriminant and nature of roots.

Problems related to day to day activities to be incorporated.

4. **Arithmetic Progression** **(5 Marks)**

Motivation for studying AP. Derivation of standard results of finding the n^{th} term and sum of first n terms

UNIT III : TRIGONOMETRY :

1. **Trigonometric Ratios** **(7 Marks)**

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios, whichever are defined at 0^0 & 90^0. Values (with proofs) of the trigonometric ratios of 30^0, 45^0, & 60^0. Relationships between the ratios.

2. **Trigonometric Identities**

Proof and applications of the identity $\sin^2A + \cos^2A = 1$. Only simple identities to be given. Trigonometric ratios of complementary angles.

3. **Heights and Distances** **(5 Marks)**

Simple and believable problems on heights and distances. Problems should not involve more than two right triangle. Angles of elevation/ depression should be only 30^0, 45^0, 60^0.

UNIT IV: COORDINATE GEOMETRY

1. **Lines (In two-dimensions)** **(6 Marks)**

Review the concepts of coordinate geometry done earlier including graphs of linear equations. Awareness of geometrical representation of quadratic polynomials. Distance between two points and section formula (internal). Area of a triangle.

UNIT V : GEOMETRY

1. **TRIANGLES** **(9 Marks)**

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect to other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio. The line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.

5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
7. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
8. (Prove) In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right triangle.

2. CIRCLES **(4 Marks)**

Tangents to a circle motivated by chords, drawn from points coming closer and closer and closer to the point.

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to circle are equal.

3. CONSTRUCTIONS **(3 Marks)**

1. Division of line segment in a given ratio (internally)
2. Tangent to circle from a point outside it.
3. Construction of a triangle similar to a given triangle.

UNIT VI MENSURATION

1. AREAS OF PLANE FIGURES (6 Marks)

The area of circle; area of sectors and segments of a circle. Problems bases on areas and perimeter/ circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60^0, 90^0, & 120^0 only. Plane figures involving triangles, simple quadrilaterals and circle should be taken).

2. SURFACE AREAS AND VOLUMES (7 Marks)

I. Problems on finding surface areas and volumes of combinations of any two of the following cubes, cuboids, spheres, hemispheres and right circular cylinders/cones. Frustum of a cone.
II. Problems involving concerting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids be taken)

UNIT VII : STATISTICS AND PROBABILITY

1. **Statistics** **(5 Marks)**

   Mean, median and mode of grouped data (bimodal situation to be avoided). Cumulative frequency graph.

2. **PROBABILITY** **(5 Marks)**

   Classical definition of probability. Connection with probability as given in class IX. Simple problems on single events, not using set notation.

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SR. No.	Types of Question	Marks	No. of Questions	NO. of Question to be attempt	Total
1	MCQs	1	18	16	16
2	Short Answer with reasoning	2	8	5	10
3	Short Answer	3	10	7	21
4	Long Answer	4	4	2	08
5	Long Answer	5	8	5	25
	Total				80

Prescribed Book :

1. Ganit Published by H.P. Board of School Education.