

# MATHEMATICS

Total Marks 100

Time: 3 Hours

## Units

Unit :- I	Number Systems	05 Marks
Unit : II	Algebra	29 Marks
Unit : III	Trigonometry	14 Marks
Unit :IV	Coordinate Geometry	08 Marks
Unit :V	Geometry	22 Marks
Unit :VI	Mensuration	11 Marks
Unit :VII	Statistics and Probability	11 Marks

## UNIT 1:- NUMBER SYSTEMS

### Real Numbers

(05 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, decimal expansions of rational numbers in terms of terminating / non terminating recurring decimals,  $\sqrt{2}, \sqrt{3}, \sqrt{5}$ .

## UNIT II: - ALGEBRA

### 1. Polynomials

(05 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

( 07 Marks )

Pair of Linear equations in two variables. Geometric representations of different possibilities of solutions/ inconsistency.

Algebraic conditions for number of solutions. Solutions 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.

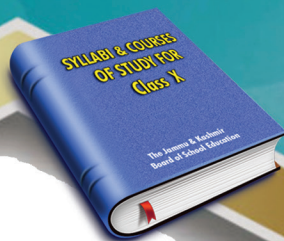
### 3. Quadratic Equations

( 10 Marks)

Standard form of a quadratic equations  $ax^2 + bx + c = 0$  (  $a \neq 0$  ). Solutions of 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 Progressions (AP)

(07 Marks)

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

### UNIT III:- TRIGONOMETRY

#### 1. Introduction to Trigonometry

(07 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  $0^\circ$  and  $90^\circ$ . Value ( with proofs ) of the trigonometric ratios of  $30^\circ$ ,  $45^\circ$  and  $60^\circ$ . Relationships between the ratios.

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

#### 2. Heights and Distances

( 07 Marks)

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

### UNIT IV:- COORDINATE GEOMETRY

#### Lines ( in two- dimensions)

( 08 Marks )

Review the concepts of coordinate geometry done earlier including graphs of linear equations.

Awareness of geometrical representations of quadratic polynomials. Distance between two points and section formula ( internal ). Area of a triangle.

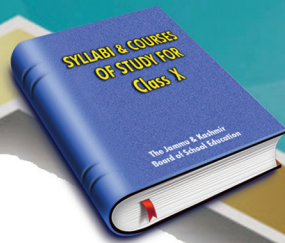
### UNIT V:- GEOMETRY

#### 1. Triangles

(09 Marks)

Definitions, examples, counterexamples of similar triangles.

1. ( Prove) If a line is drawn parallel to one side of a triangle to intersect the 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. ( Motivate ) If a perpendicular is drawn from the vertex of the right angle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
7. ( Prove ) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
8. ( Prove ) in a right triangle, the square on the hypotenuse is equal to the sum of the squares on 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 side is right triangle.

## 2. Circles

( 06 Marks )

Tangents to a circle motivated by chords drawn from points coming 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 a circle are equal.

## 3. Constructions

( 07 Marks )

1. Division of a 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 Related to Circles

( 04 Marks )

Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter/ circumference of the above said plane figures.

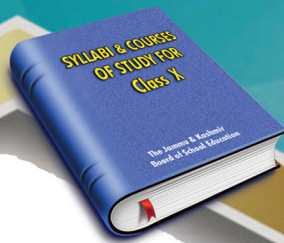
(In calculating area of segment of a circle, problems should be restricted to central angle of  $60^\circ$ ,  $90^\circ$  and  $120^\circ$  only. Plane figures involving triangles, simple quadrilaterals and circle should be taken)

## 2. Surface Areas and Volumes

( 07 Marks )

1. 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 cone.
2. Problems involving converting 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

(07 Marks)

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

### 2. Probability

(04 Marks)

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