

## MATHEMATICS (IX-X)

(CODE NO. 041)

Session 2021-22

### Term-wise Syllabus

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 the 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 to 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 height 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 number system, algebra, geometry, trigonometry, mensuration, 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 broad objectives of teaching of Mathematics at secondary stage are to help the learners to

- consolidate the Mathematical knowledge and skills acquired at the upper primary stage;
- acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills;
- develop mastery of basic algebraic skills;
- develop drawing skills;
- feel the flow of reason while proving a result or solving a problem;
- apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method;
- to develop ability to think, analyze and articulate logically;
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases;
- to develop necessary skills to work with modern technological devices and mathematical software's.
- to develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.

- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics;
- 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.

## COURSE STRUCTURE

### CLASS –IX (2021-22)

#### FIRST TERM

**One Paper**

**90 Minutes**

| NO. | UNIT NAME                  | MARKS     |
|-----|----------------------------|-----------|
| I   | NUMBER SYSTEMS             | 8         |
| II  | ALGEBRA                    | 5         |
| III | COORDINATE GEOMETRY        | 4         |
| IV  | GEOMETRY                   | 13        |
| V   | MENSURATION                | 4         |
| VI  | STATISTICS & PROBABILITY   | 6         |
|     | <b>Total</b>               | <b>40</b> |
|     | <b>INTERNAL ASSESSMENT</b> | <b>10</b> |
|     | <b>TOTAL</b>               | <b>50</b> |

### UNIT- NUMBER SYSTEMS

#### 1. NUMBER SYSTEM

Review of representation of natural numbers, integers, rational numbers on the number line. Rational numbers as recurring/ terminating decimals. Operations on real numbers.

1. Examples of non-recurring/non-terminating decimals. Existence of non-rational numbers (irrational numbers) such as  $\sqrt{2}, \sqrt{3}$  and their representation on the number line.
2. Rationalization (with precise meaning) of real numbers of the type  $\frac{1}{a+b\sqrt{x}}$  and  $\frac{1}{\sqrt{x}+\sqrt{y}}$  (and their combinations) where x and y are natural number and a and b are integers.
3. Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particular cases, allowing learner to arrive at the general laws.)

### UNIT-ALGEBRA

#### 2. LINEAR EQUATIONS IN TWO VARIABLES

Recall of linear equations in one variable. Introduction to the equation in two variables. Focus on linear equations of the type  $ax+by+c=0$ . Explain that a linear equation in two variables has infinitely many solutions and justify their being written as ordered pairs of real numbers, plotting them and showing that they lie on a line. Graph of linear equations in two variables. Examples, problems from real life with algebraic and graphical solutions being done simultaneously

## **UNIT-COORDINATE GEOMETRY**

### **3. COORDINATE GEOMETRY**

The Cartesian plane, coordinates of a point, names and terms associated with the coordinate plane, notations, plotting points in the plane.

## **UNIT-GEOMETRY**

### **4. LINES AND ANGLES**

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is  $180^\circ$  and the converse.
2. (Prove) If two lines intersect, vertically opposite angles are equal.
3. (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
4. (Motivate) Lines which are parallel to a given line are parallel.
5. (Prove) The sum of the angles of a triangle is  $180^\circ$ .
6. (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

### **5. TRIANGLES**

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
2. (Motivate) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)
5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) The sides opposite to equal angles of a triangle are equal.

## **UNIT-MENSURATION**

### **6. HERON'S FORMULA**

Area of a triangle using Heron's formula (without proof)

## UNIT-STATISTICS & PROBABILITY

### 7. STATISTICS

Introduction to Statistics: Collection of data, presentation of data — tabular form, ungrouped / grouped, bar graphs, histograms

| INTERNAL ASSESSMENT                          | MARKS | TOTAL MARKS |
|----------------------------------------------|-------|-------------|
| Periodic Tests                               | 3     | 10          |
| Multiple Assessments                         | 2     |             |
| Portfolio                                    | 2     |             |
| Student Enrichment Activities-practical work | 3     |             |

## SECOND TERM

| No. | UNIT NAME                      | MARKS |
|-----|--------------------------------|-------|
| I   | ALGEBRA(Cont.)                 | 12    |
| II  | GEOMETRY(Cont.)                | 15    |
| III | MENSURATION(Cont.)             | 9     |
| IV  | STATISTICS & PROBABILITY(Cont) | 4     |
|     | Total                          | 40    |
|     | INTERNAL ASSESSMENT            | 10    |
|     | TOTAL                          | 50    |

## UNIT-ALGEBRA

### 1. POLYNOMIALS

Definition of a polynomial in one variable, with examples and counter examples. Coefficients of a polynomial, terms of a polynomial and zero polynomial. Degree of a polynomial. Constant, linear, quadratic and cubic polynomials. Monomials, binomials, trinomials. Factors and multiples. Zeros of a polynomial. Factorization of  $ax^2 + bx + c$ ,  $a \neq 0$  where  $a$ ,  $b$  and  $c$  are real numbers, and of cubic polynomials using the Factor Theorem.

Recall of algebraic expressions and identities. Verification of identities

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$$
$$(x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x \pm y)$$
$$x^3 \pm y^3 = (x \pm y)(x^2 \mp xy + y^2)$$

and their use in factorization of polynomials.

## **UNIT-GEOMETRY**

### **2. QUADRILATERALS**

1. (Prove) The diagonal divides a parallelogram into two congruent triangles.
2. (Motivate) In a parallelogram opposite sides are equal, and conversely.
3. (Motivate) In a parallelogram opposite angles are equal, and conversely.
4. (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
5. (Motivate) In a parallelogram, the diagonals bisect each other and conversely.
6. (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and in half of it and (motivate) its converse.

### **3. CIRCLES**

Through examples, arrive at definition of circle and related concepts-radius, circumference, diameter, chord, arc, secant, sector, segment, subtended angle.

1. (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
2. (Motivate) The perpendicular from the centre of a circle to a chord bisects the chord and conversely, the line drawn through the centre of a circle to bisect a chord is perpendicular to the chord.
3. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre (or their respective centres) and conversely.
4. (Motivate) The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.
5. (Motivate) Angles in the same segment of a circle are equal.
6. (Motivate) The sum of either of the pair of the opposite angles of a cyclic quadrilateral is  $180^\circ$  and its converse.

### **4. CONSTRUCTIONS**

1. Construction of bisectors of line segments and angles of measure  $60^\circ$ ,  $90^\circ$ ,  $45^\circ$  etc., equilateral triangles.
2. Construction of a triangle given its base, sum/difference of the other two sides and one base angle.

## **UNIT-MENSURATION**

### **5. SURFACE AREAS AND VOLUMES**

Surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.

## **UNIT-STATISTICS & PROBABILITY**

## 6. PROBABILITY

History, Repeated experiments and observed frequency approach to probability. Focus is on empirical probability. (A large amount of time to be devoted to group and to individual activities to motivate the concept; the experiments to be drawn from real - life situations, and from examples used in the chapter on statistics).

| INTERNAL ASSESSMENT                          | MARKS | TOTAL MARKS           |
|----------------------------------------------|-------|-----------------------|
| Periodic Tests                               | 3     | 10 marks for the term |
| Multiple Assessments                         | 2     |                       |
| Portfolio                                    | 2     |                       |
| Student Enrichment Activities-practical work | 3     |                       |

