MATHEMATICS
CLASS – IX

DISTRIBUTION OF MARKS

1.	Number System	08 marks
2.	Algebra	20 marks
3.	Co-ordinate Geometry	06 marks
4.	Geometry and Construction	20 marks
5.	Mensuration	16 marks
6.	Statistics and Probability	10 marks
	Total	**80 marks**

WEIGHTAGE OF MARKS FOR INTERNAL ASSESSMENT

The Internal Assessment of 20 marks is to be awarded on the basis of the performance of a student in the activity work, project work and continuous assessment as per the following scheme.

- Assessment through test – 10 marks
- Assessment of Project Work – 5 marks
- Assessment of 2 skills – 5 marks.

For its effective implementation, the following aspects of the scheme should be kept in view:

a. Internal examination is to be conducted at the school level to assess the activity work and project work done by every student during the year.

b. Each student must perform at least two activities for assessment of any two skills like numerical ability, observation, ability to see patterns, analytical thinking, understanding logic, skills of comparing, interpreting, problem solving, decision making and skills of games.

c. The assessment may be carried out by a team of two Mathematics teachers including the teacher teaching the particular class

The break-up of 5 marks for assessment of **activity/skills** could be as:-

- Statement of the objective of activity - 01 mark
- Design of approach to activity - 01 mark
- Actual conduct of activity - 01 mark
- Procedure explanation - 01 mark
- Result and conclusion - 01 mark

The marks for assessment of two activities (5 + 5) may be added and the average should be calculated out of 5.

The breakup of 5 marks for assessment of **project** could be as:-

-	Identification and statement of the project	-	01 mark
-	Design of the project	-	01 mark
-	Procedure adopted	-	01 mark
-	Write-up of the project	-	01 mark
-	Interpretation of the result	-	01 mark

UNIT I : NUMBER SYSTEMS

1. Real Numbers

Review of representation of natural numbers, integers, rational numbers on the number line. Representation of terminating/non-terminating recurring decimals, on the number line through successive magnification. Rational numbers as recurring/terminating decimals. Operations on real numbers. 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, and conversely, viz. every point on the number line represents a unique real number.

Existence of $\sqrt{x}$ for a given positive real number x and its representation on the number line with geometric proof. Definition of n^{th} root of a real number. 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). 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 numbers and a, b are integers.

UNIT II : ALGEBRA

1. Polynomials

Definition of a polynomial in one variable, its coefficients, with examples and counter examples, its terms, zero polynomial. Degree of a polynomial; constant, linear, quadratic, cubic polynomials; monomials, binomials, trinomials. Factors and multiples. Zeros of a polynomial/equation. State and motivate the Remainder Theorem with examples and analogy to integers. Statement and proof of the Factor Theorem. Factorization of $ax^2 + bx + c$, $a \neq 0$ where a, b, c are real numbers and of cubic polynomials using the Factor Theorem.

Recall of algebraic expressions and identities. Further identities of the type $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$; $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy\,(x \pm y)$, $x^3 + y^3 + z^3 - 3xyz = (x + y + z)\,(x^2 + y^2 + z^2 - xy - yz - zx)$ and their use in factorization of polynomials.

2. Linear Equations In Two Variables

Recall of linear equations in one variable. Introduction to equations in two variables. Focus on linear equations of the type $ax + by + c = 0$. Prove 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 seem to lie on a line. Graph of

linear equations in two vairables. Examples, problems from real life, including, problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

UNIT III : COORDINATE GEOMETRY

Coordinate Geometry

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

UNIT IV : GEOMETRY

1. Lines And Angles

i) (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180^o and the converse.
ii) (Prove) If two lines intersect, the vertically opposite angles are equal.
iii) (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
iv) (Motivate) Lines, which are parallel to a given line, are parallel.
v) (Prove) The sum of the angles of a triangle is 180^o.
vi) (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interiors opposite angles.

2. Triangles

i) (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).
ii) (Prove) 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).
iii) (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
iv) (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).
v) (Prove) The angles opposite to equal sides of a triangle are equal.
vi) (Motivate) The sides opposite to equal angles of a triangle are equal.
vii) (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

3. Quadrilaterals

i) (Prove) The diagonal divides a parallelogram into two congruent triangles.
ii) (Motivate) In a parallelogram, opposite sides are equal and conversely.
iii) (Motivate) In a parallelogram, opposite angles are equal and conversely.
iv) (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.

v) (Motivate) In a parallelogram, the diagonals bisect each other and conversely.
vi) (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and (motivate) its converse.

4. Area

Review concepts of area. Recall area of a triangle.

i) (Prove) Parallelograms on the same base and between the same parallels have the same area.
ii) (Motivate) Triangles on the same base and between the same parallels are equal in area.

5. Circles

Through examples, arrive at definitions of circle related concepts, radius, circumference, diameter, chord, arc, subtended angle.

i) (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
ii) (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.
iii) (Motivate) There is one and only one circle passing through three given non-collinear points.
iv) (Motivate) Equal chords of a circle (or of congruent circles) are equivalent from the centre and conversely.
v) (Prove) 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.
vi) (Motivate) Angles in the same segment of a circle are equal.
vii) (Motivate) If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
viii) (Motivate) The sum of either pair of opposite angles of a cyclic quadrilateral is 180° and its converse.

6. Constructions

i) Construction of bisectors of line segments. Construction of angles of 60°, 90°, 45° angles etc, equilateral triangles.
ii) Construction of a triangle given its base, sum/difference of the other two sides and one base angle.
iii) Construction of a triangle with a given perimeter and base angles.

UNIT V : MENSURATION

1. Areas

Area of a triangle using Heron's formula (without proof) and its application in finding the area of a quadrilateral.

2. Surface Areas And Volumes

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

UNIT VI : STATISTICS & PROBABILITY

1. Statistics

Introduction to Statistics: Collection of Data, presentation of tabular form, Ungrouped/grouped data, bar graphs, histograms (with varying base lengths), frequency polygons, qualitative analysis of data to choose the correct form of presentation of the collected data. Mean, median, mode of ungrouped data.

2. 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).

PRESCRIBED TEXTBOOK:

- **Modern abc of Mathematics – IX**
  M/S Modern Publishers Chancellor Commercial, H. B. Road,
  Panbazar, Guwahati – 781001.

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