

MATHEMATICS

CLASS - IX

UNIT-I: NUMBER SYSTEM

Real numbers:

- Irrational number as non-terminating and non-repeating decimals (irrational numbers may be introduced by recalling rational numbers as terminating or non-terminating recurring decimals).
- Real numbers and the real number line. Surds and Rationalization of surds. Problems of proving a number to be irrational number should be avoided. Representing an irrational number on the number line should be avoided for numbers other than $\sqrt{2}$, $\sqrt{3}$ and $\sqrt{5}$.

Sets :

- Revision.
- Representation of sets, equal sets, subsets, power set, universal set.

UNIT – II: COMMERCIAL MATHEMATICS

Compound Interest :

- Compound interest when the interest is compounded yearly and half-yearly.
- Rate of growth and depreciation. Conversion period not more than four (Rate should be 4%, 5% or 10%).

Ratio and Proportion :

- Ratio and proportion.
- Direct variation – simple and direct word problem.

Cost of Living Index :

- Cost of Living Index and its computation (weighted aggregate method only).

Sales tax :

- Computation of Sales Tax including inverse problems.

UNIT -III: ALGEBRA

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 / roots of a polynomial / equation. State and motivate the Remainder Theorem with examples and analogy to integers.
- Statement and proof of the Factor Theorem.
- Factorisation 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:
 $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$; $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x \pm y)$;
 $x^3 \pm y^3 = (x \pm y)(x^2 \mp xy + y^2)$;
 $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - xz - yz)$ and their use in factorization of polynomials. Simple expressions reducible to these polynomials.

G.C.D. and L.C.M.

- G.C.D. and L.C.M. of polynomials by factorisation.

Linear Equations in Two Variables :

- Recall of linear equations in one variable.
- Introduction to the equation in two variables.
- 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.
- System of linear equation in two variables.
- Solution of the system of linear equations by substitution method.
- Simple word problems.

UNIT-IV : GEOMETRY

Lines and Angles:

- 1. If two parallel lines are intersected by a transversal, then the pair of corresponding angles are equal.**
- 2. If two parallel lines are intersected by a transversal, then the pair of alternate angles are equal.**
- 3. Vertically opposite angles are equal.**
4. If a transversal intersects two lines in such a way that a pair of alternate angles is equal, then the two lines are parallel.
5. If a transversal intersects two parallel lines, then the interior angles on the same side of the transversal are supplementary.
6. If a transversal intersects two lines in such a way that a pair of interior angles on the same side of the transversal are supplementary, then the two lines are parallel.
7. Lines which are parallel to a given line are parallel to each other.
8. If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

Triangles :

1. Two triangles are congruent if any two sides and the included angle of one triangle are equal to any two sides and the included angle of the other triangle.
2. Two triangle are congruent if any two angles and the included side of one triangle are equal to any two angles and the included side of the other triangle.
3. Two triangles are congruent if the three sides of one triangle are equal to the three sides of the other triangle.
4. Two right triangles are congruent if the hypotenuse and a side of one triangle are respectively equal to the hypotenuse and a side of the other triangle.
5. The angles opposite to equal sides of a triangle are equal.
6. The sides opposite to equal angles of a triangle are equal.

Concurrent Lines in a Triangle :

1. The angle bisectors of a triangle pass through the same point.
2. The perpendicular bisectors of the sides of a triangle pass through the same point.
3. Medians of a triangle pass through the same point which divided each of the medians in the ratio 2:1.
4. In a triangle, the three altitudes pass through the same point.

Quadrilaterals and Parallelograms :

1. A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and of equal length.
2. Diagonals of a rectangle are equal and bisect each other.
3. Diagonals of a rhombus bisect each other at right angles.
4. Diagonals of a square are equal and bisect each other at right angles.
5. In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and is half of it.
6. The line drawn through the mid point of one side of a triangle parallel to another side bisects the third side.
7. Triangle inequalities and relation between 'angle and facing side'; inequalities in a triangle.

Area :

1. Parallelograms on the same base and between the same parallels are equal in area.
2. Triangles on the same base and between the same parallels are equal in area.
3. If two triangles have equal areas and one side of the one triangle is equal to one side of the other then their corresponding altitudes are equal.

Constructions :

1. Construction of a triangle given its base, sum of the other two sides and one base angle.
2. Construction of a triangle given its base, difference of the other two sides and one base angle.
3. Construction of a triangle of given perimeter and base angles.
4. Construction of a triangle given its two sides and a median corresponding to one of these sides.
5. Construction of a triangle equal in area to a given quadrilateral.
 - (i) Proofs of constructions not required.
 - (ii) Constructions using ruler and compasses only.

Circles :

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

1. Two circles are congruent if and only if they have equal radii.
2. Equal chords of a circle subtend equal angles at the centre.
3. If the angles subtended by the chords at the centre (of a circle) are equal, then the chords are equal.
4. The perpendicular from the centre of a circle to a chord bisect the chord and its converse.
5. There is one and only one circle passing through three given non-collinear points.
6. Equal chords of a circle are equidistant from the centre.
7. The chords of a circle which are equidistant from the centre are equal.

UNIT-V : COORDINATE GEOMETRY

- The Cartesian plane.
- Co-ordinates of a point, names and terms associated with the coordinate plane, notations, plotting points in the plane, graph of linear equations as examples.

- Focus on linear equations of the type $ax+by+c=0$ by writing it as $y=mx+c$ and linking with the chapter on linear equations in two variables.

UNIT - VI: TRIGONOMETRY

Trigonometric ratios :

- Formation of angles through rotation of a ray.
- Idea of positive and negative angles.
- Trigonometric ratios of an acute angle of a right angled triangle. Trigonometric ratio of 0,30,45,60,90.
- Given a trigonometric ratio, to find all other trigonometric ratios.
- Given a side and an angle of a right triangle, to find other sides and angles.

Trigonometric Identities :

- Very simple identity proof of trigonometric ratios.

UNIT - VII: MENSURATION

Areas :

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

Surface Areas and Volumes :

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

UNIT-VIII: STATISTICS AND PROBABILITY

Statistics :

- Introduction to statistics.
- Collection of data, presentation of data – tabular form, ungrouped/ grouped, bar graphs, histograms (with varying base lengths), frequency polygons.
- Mean, median, mode of ungrouped data.

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 example used in the chapter on statistics).