

Mathematics Syllabus – High School**Class IX****Number System**

(i) Real numbers(15 periods):

- Euclid division lemma
 - Introduction, HCF
 - Some number generalisations
- More about rational and irrational numbers.
- Fundamental Theorem of Arithmetic – statements.
- LCM, HCF
- Properties of real numbers in terms of rationality and irrationality
- Proofs of results irrationality of $\sqrt{2}, \sqrt{3}$ etc. and decimal expansions of rational numbers in terms of terminating, non terminating, recurring of decimals and vice versa.
- Introduction of logarithms
- Conversion of a number in exponential form to a logarithmic form
- Properties of logarithms $\log_a a = 1; \log_a 1 = 0$
- Laws of logarithms
 - $\log xy = \log x + \log y;$
 - $\log x / y = \log x - \log y$
 - $\log x^n = n \log x.$
 - $a^{\log_a N} = N$
- Standard base of logarithms and usage

(ii) **Sets (8 periods):**

- Sets and their representations : Empty set, Finite and infinite sets. Equal sets. Subsets, subsets of the set of real numbers (especially intervals with notations). Universal set and cardinality of sets.
- Venn diagrams
 - Sets, subsets
 - Disjoint sets.
- Basic operations on sets
 - Union, intersection, difference of sets

Algebra

(i) Polynomials (8 periods)

- Zeroes of a polynomial (Linear, Quadratic cubic polynomials).
- Geometrical meaning of Zeroes of quadratic and cubic polynomials using graphs.
- Relationship between Zeroes and coefficients of a polynomial with particular reference to quadratic polynomials.
- Statement and simple problems on division algorithm for polynomials with integral coefficients.
- Zeroes of a biquadratic polynomial.

(ii) Pair of Linear Equations in Two Variables (15 periods)

- Pair of linear equations in two variables. Geometric representation of different possibilities of solutions / inconsistency.
- Algebraic conditions for number of solutions (Consistent, inconsistent).
- Solution of pair of linear equations in two variables algebraically – by substitution, by elimination methods – Simple situational problems.
- Simple problems on equations reducible to linear equations in two variables.

(iii) Quadratic Equations (12 periods)

- Standard form of a quadratic equation $ax^2+bx+c=0$, ($a \neq 0$).
- Solutions of quadratic equations (only real roots) by factorization and by completing the square, i.e., by using formula to find roots of quadratic equation.
- Relationship between discriminant and nature of roots.
- Problems related to day-to-day life situations

(iv) Progressions (11 periods)

- Sequence and series
- Progressions –introduction
- Motivation for studying AP. Derivation of standard results of finding the n^{th} term and sum of first n terms of A.P.
- Motivation for studying G.P
- N^{th} term of G.P.

Trigonometry

(i) Introduction (15 periods)

- Trigonometric ratios of an acute angle by using right angled triangle i.e. sine, cosine, tangent, cosecant and cotangent.
- Values (with proofs) of the trigonometric ratios of 30° , 45° and 60° .
- Motivate the ratios, whichever are defined at 0° and 90° .
- Relationship between the ratios.
- Trigonometric Identities:
Proof and applications of the identities

$$\sin^2 A + \cos^2 A = 1.$$

$$1 + \tan^2 A = \sec^2 A$$

$$\cot^2 A + 1 = \operatorname{cosec}^2 A$$

- Simple problems on identities
- Trigonometric ratios of complementary angles.

(ii) **Applications of trigonometry (8 periods)**

- Angle of elevation, angle of depression
- Simple and daily life problems on heights and distances. Problems should not involve more than two right triangles and angles elevation/depression should be only 30° , 45° , 60° .

Coordinate geometry Lines (In two-dimensions) (15 periods)

- Review the concepts of coordinate geometry done by the graphs of linear equations.
- Distance between two points i.e. P (x_1 , y_1) and Q (x_2 , y_2)
- Section formula (internal division of a line segment in the ratio $m:n$).
- Area of a triangle on coordinate plane.
- Slope of a line joining two points.

Geometry

(i) **Similar triangles (18 periods)**

Meaning, examples, properties of similar triangles.

- Difference between congruency and similarity of triangles.
- (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.
- (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
- (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar (AAA).
- (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar (SSS).
- (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.
- (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
- (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.³

- (Prove) In a right triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.
- (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.
- Problems based on above theorems.
- **Construction:**
- Division of a line segment using basic proportionality theorem.
- A triangle similar to given triangle as per the given scale factor.

(ii) Tangents and secants to a circle (15 periods)

- Tangents to a circle motivated by chords drawn from points coming closer and closer to the point.
- (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
- (Prove) The lengths of tangents drawn from an external point to a circle are equal.
- Segment of a circle made by the secant.
- Finding the area of the minor/ major segment of a circle.
- Constructions
A tangent to a circle through point given on it.
- Pair of tangents to a circle drawn from an external point.

Mensuration

I. Surface Areas and Volumes (10 periods)

- Problems on finding surface areas and volumes of combinations of any of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders / cones.
- 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.)

Data handling (15 hrs)

(i) Statistics (15 periods)

- Revision of Mean, median and mode of ungrouped (frequency distribution) data.
- Understanding, the concept of Arithmetic Mean, Median and Mode for grouped (classified) data.
- The meaning and purpose of arithmetic Mean, Median and Mode
- Simple problems on finding Mean, Median and Mode for grouped/ungrouped data.
- Usage and different values and central tendencies through Ogives.

(ii) Probability (10 periods)

- Concept and definition of Probability.
- Simple problems (day to day life situation) on single events simple using set notation.
- Concept of complimentary events.

Mathematical modeling (8 periods)

- Concept of Mathematical modeling
- Discussing the broad stages of modeling – real life, situations (Simple Interest, probability, fare installments, payments etc.)