Mathematics Syllabus – High School

Class IX

Number System (20 periods)

- Real numbers
  Review of representation of natural numbers, integers, and 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.
- Finding $\sqrt{2}, \sqrt{3}, \sqrt{5}$ correct to 6-decimal places by division method
- Examples of nonrecurring / non terminating decimals such as
  1.010110111011111____
  1012112111211112____
  and $\sqrt{2}, \sqrt{3}, \sqrt{5}$ etc.
- Existence of non-rational numbers (irrational numbers) such as $\sqrt{2}, \sqrt{3}$, and their representation on the number line.
- Existence of each real number on a number line by using Pythogorian result.
- Square root of a surd of the form $a + \sqrt{b}$ (simple problems)
- Concept of a Surd.
- Rationalisation of a monomial, binomial surds of second order.

Algebra

(i) Polynomials (25 periods)

- Definition of a polynomial in one variable, its coefficients, with examples and counter examples, its terms, zero polynomial.
- Constant, linear, quadratic, cubic polynomials; monomials, binomials, trinomials. Zero / roots of a polynomial / equation.
- Division of polynomials
- State and motivate the Remainder Theorem with examples and analogy to integers (motivate).
- Statement and verification of the Factor Theorem.
- Recall of algebraic expressions and identities.
- Further identities of the type:
  $(x+y+z)^2 = x^2+y^2+x^2+2xy+2yz+2zx$
  $(x \pm y)^3 = x^3 \pm y^3 \pm 3xy\,(x \pm y)$
  $x^3+y^3+z^3-3xyz = (x+y+z)$

$(x^2+y^2+z^2-xy-yz-zx)$

$x^3+y^3 =(x+y)(x^2-xy+y^2)$

$x^3-y^3 =(x-y)(x^2+xy+y^2)$

and their use in factorization of polynomials. Simple expressions reducible to these polynomials.

(ii) Linear Equations in Two Variables (12 periods)

- Recall of linear equations in one variable.
- Introduction to the equation in two variables.
- Solution of a linear equation in two variables substitution and graphical methods
- Graph of a linear equation in two variables
- Equations of lines parallel to x axis and y-axis.
- Simple word problems related to linear equations

Coordinate geometry (9 periods)

- Introduction
- Cartesian system
- Representation of a point in a plane by its location.
- Plotting a point in a plane if its co-ordinates are given.

Geometry

(i) Introduction to Euclid's Geometry (6 periods)

- History - Euclid and geometry in India. Euclid' s method of formalizing observe phenomenon onto rigorous mathematics with definitions, common / obvious notions, axioms / postulates, and theorems.
  The five postulates of Euclid.
  Equivalent varies of the fifth postulate. Showing the relationship between axiom and theorem.
- Given two distinct points, there exists one and only one line through them.
- (Prove) Two distinct lines cannot have more than one point in common.

(ii) Lines and Angles (10 periods)

- Pair of angles.
- (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 1800 and it's converse.
- (Prove) If two lines intersect, the vertically opposite angles are equal.
- (Motivate) Relation between corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
- Concurrent lines concurrent point.

- (Motivate) Lines, which are parallel to given line, are parallel.
- (Prove) The sum of the angles of interior triangle is 1800.
- (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.

(iii) Triangles (20 periods)

- (Motivate) 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 (SAS Congruence).
- (Prove) Two triangles 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 (ASA Congruence).
- (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
- (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal to the hypotenuse and a side of the other triangle.
- (Prove) The angles opposite to equal sides of a triangle are equal.
- (Motivate) The sides opposite to equal angles of a triangle are equal.
- (Motivate) Triangle inequalities and relation between 'angle and facing side'; inequalities in a triangle.

(iv) Quadrilaterals (10 periods)

- (Prove) The diagonal divides a parallelogram into two congruent triangles.
- (Motivate) In a parallelogram opposite sides are equal and its converse.
- (Motivate) In a parallelogram opposite angles are equal and its converse.
- (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
- (Motivate) In a parallelogram, the diagonals bisect each other and its converse.
- (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and its converse.

(v) Area (4 periods)

- Review concept of area, recall area of a rectangle.
- (Prove) Parallelograms on the same base and between the same parallels have the same area.
- (Motivate) Triangles on the same base and between the same parallels are equal in area and its converse.
- If A parallelogram and a triangle are on the same base and between the same parallels. The area of the triangle is equal to half the area of the parallelogram.

(vi) Circles (15 periods)

- Definitions of circle related concepts of circle; radius, circumference, diameter, chord, arc, subtended angle. The points within, on outside the circle.
- (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse.
- (Motivate) The perpendicular from the centre of a circle to a chord bisects the chord and its converse
- (Motivate) There is one and only one circle passing through three non-collinear points.
- (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre (s) and its converse.
- (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.
- (Motivate) Angles in the same segment of a circle are equal.
- (Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of the line segment, the four points lie on a circle.
- (Motivate) The sum of the either pairs of the opposite angles of a cyclic quadrilateral is 1800 and its converse.

(vii) Constructions (10 periods)

- Construction of a triangle given its base, sum / difference of the other two sides and one base angles.
- Construction of a triangle when its perimeter and base angles are given.
- Construct of segment of a circle containing given chord and angle.

Mensuration (15 hrs)

Surface Areas and Volumes (14 periods)

Areas of Plane figures (4 periods)

- Revision of surface area and volume of cube, cuboid Surface areas of right circular cylinder, cone, sphere, hemi sphere.
- Volume of right circular cylinder, cone, sphere and hemi sphere
- Word problems on cylinder, cone, sphere, hemi sphere.
- Relationship between surface areas of any two comparable solids.
- Relationship in between volumes two comparable solids.

Data handling (15 hrs)

Statistics (13 periods)

- Frequency distribution for ungrouped and grouped data
- Mean, Median and Mode of ungrouped frequency distributions (weighted scores).

Probability (12 periods)

- Feel of probability using data through experiments. Notion of chance in events like tossing coins, dice etc.
- Tabulating and counting occurrences of 1 to 6 in a number of throws.
- Comparing the observation with that for a coin. Observing strings of throws, notion of randomness.
- Consolidating and generalizing the notion of chance in events like tossing coins / dice.
- Relating probability to chances in life-events.
- Visual representation of frequency outcomes of repeated throws of the same kind of coins or dice.
- Throwing a large number of identical dice/coins together and aggregating the result of the throws to get large number of individual events.
- Observing and aggregating number over a large number of repeated events. Observing strings of throws, notion of randomness

Proofs in Mathematics

- Mathematical Statement, Verification of statement
- Mathematical Reasoning, Deductive reasoning
- Theorems, Conjectures and Axioms
- What is a Mathematical proof? Steps of Mathematical proofs.