

**Term – Wise Syllabus**  
**Session – 2019-20**  
**Class-IX**  
**Subject: Mathematics (Code: 041)**

**Course Structure**

Units	Unit Name	Marks
I	Number Systems	08
II	Algebra	17
III	Coordinate Geometry	04
IV	Geometry	28
V	Mensuration	13
VI	Statistics & Probability	10
Total		80
Internal Assessment		20
Grand Total		100

**Term-I (April 2019 to September 2019)**

**Chapter 1 : 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. 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. Explaining that every real number is represented by a unique point on the number line and conversely, viz. every point on the number line represents a unique real number.

Definition of  $n^{\text{th}}$  root of a real number.

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.

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.)

**Chapter 2 : Polynomials**

Definition of a polynomial in one variable with examples and counter examples. Coefficients of a polynomial, terms of a polynomial and zeroes of polynomial. Degree of a polynomial. Constant, linear, quadratic and cubic polynomials. Monomials, binomials, trinomials. Factors and multiples. Zeroes of a polynomial. Motivate and State the Remainder Theorem with examples. Statement and proof of the Factor Theorem. 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:

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

$$(x \pm y)^3 = x^3 \pm y^3 \pm 3xy(x \pm y)$$

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

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$$

and their use in factorization of polynomials.

**Chapter 3: Coordinate Geometry**

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

### **Chapter 4: 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, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

### **Chapter 5\*: Introduction to Euclid's Geometry**

History - Geometry in India and Euclid's geometry. Euclid's method of formalizing observed phenomenon into rigorous Mathematics with definitions, common/obvious notions, axioms/postulates and theorems. The five postulates of Euclid. Equivalent versions of the fifth postulate. Showing the relationship between axiom and theorem, for example:

(Axiom) 1. Given two distinct points, there exists one and only one line through them.

(Theorem) 2. (Prove) Two distinct lines cannot have more than one point in common.

### **Chapter 6: 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.

### **Chapter 7: 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. (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).
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) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

### **Chapter 12: Heron's Formula**

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

### **Chapter 14: 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 and mode of ungrouped data.

### **Chapter 15: 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)

### **Suggested Maths Lab Activities**

- To construct a square-root spiral.
- To represent some irrational numbers on the number line.
- To verify the algebraic identity :  $(a + b)^2 = a^2 + 2ab + b^2$

- To verify the algebraic identity :  $(a - b)^2 = a^2 - 2ab + b^2$
  - To verify the algebraic identity :  $a^2 - b^2 = (a + b)(a - b)$
  - To verify the algebraic identity :  $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
  - To verify the algebraic identity :  $(a+b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$
  - To verify the algebraic identity :  $(a - b)^3 = a^3 - b^3 - 3(a - b)ab$
  - To verify the algebraic identity :  $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
  - To verify the algebraic identity :  $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
  - To find the values of abscissa and ordinates of various points given in a Cartesian plane.
  - To find a hidden picture by plotting and joining the various points with given coordinates in a plane.
  - To verify experimentally that if two lines intersect, then
    - (i) The vertically opposite angles are equal.
    - (ii) The sum of two adjacent angles is  $180^\circ$ .
    - (iii) The sum of all the four angles is  $360^\circ$ .
  - To verify experimentally the different criteria for congruency of triangles using triangle cut-outs.
  - To verify that the sum of the angles of a triangle is  $180^\circ$ .
  - To verify exterior angle property of a triangle.
  - To verify experimentally that in a triangle, the longer side has the greater angle opposite to it.
  - To find the formula for the area of a trapezium experimentally.
  - To draw histograms for classes of equal widths and varying widths.
  - To find experimental probability of unit's digits of telephone numbers listed on a page selected at random of a telephone directory.
  - To find experimental probability of each outcome of a die when it is thrown a large number of times.
- Mental Maths & YUVA sessions
- Revision of syllabus for Mid Term Examination.

**Note:-**

1. **Chapter 5\* will not be used for assessment as per CBSE curriculum 2019-20.**
2. **Topic “Existence of  $\sqrt{x}$  for a given positive real number x and its representation on the number line with geometric proof.” of chapter 1 will be deleted as per CBSE curriculum 2019-20.**

### Term II (October 2019 to March 2020)

#### Chapter 8: 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 is half of it and (motivate) its converse.

#### Chapter 9: Area of Parallelogram and Triangles

Review concept of Area, Recall area of a rectangle.

1. (Prove) Parallelograms on the same base and between the same parallels have the equal area.
2. (Motivate) Triangles on the same base (or equal base) and between the same parallels are equal in area.

### Chapter 10: 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) There is one and only one circle passing through three given non-collinear points.
4. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre (or their respective centre) and conversely.
5. (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.
6. (Motivate) Angles in the same segment of a circle are equal.
7. (Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
8. (Motivate) The sum of either of the pair of the opposite angles of a cyclic quadrilateral is  $180^\circ$  and its converse.

### Chapter 11: Constructions

Construction of bisectors of line segments and angles of measure  $60^\circ$ ,  $90^\circ$ ,  $45^\circ$  etc., equilateral triangles.

Construction of a triangle given its base, sum/difference of the other two sides and one base angle.

Construction of a triangle of given perimeter and base angles.

### Chapter 13: Surface Areas and Volumes

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

#### Suggested Maths Lab Activities

- To verify experimentally that the sum of the angles of a quadrilateral is  $360^\circ$ .
- To verify experimentally that the parallelograms on the same base and between same parallels are equal in area.
- To verify that the triangles on the same base and between the same parallels are equal in area.
- To verify that the ratio of the areas of a parallelogram and a triangle on the same base and between the same parallels is 2:1.
- To verify that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.
- To verify that the angles in the same segment of a circle are equal.
- To verify that the opposite angles of a cyclic quadrilateral are supplementary.
- To form a cube and find the formula for its surface area experimentally.
- To form a cuboid and find the formula for its surface area experimentally.
- To form a cone from a sector of a circle and to find the formula for its curved surface area.
- To find the relationship among the volumes of a right circular cone, a hemisphere and a right circular cylinder of equal radii and equal heights.
- To obtain the formula for the surface area of a sphere.

- Mental Maths & YUVA sessions
- Revision from Support Material
- Revision for Common Annual School Examination - 2020

**Note:-**

- ❖ **Complete the syllabus by December, 2019.**

**Mathematics**  
**Code (041)**  
**Question Paper Design**  
**Class – IX (2019-20)**

**Time: 3 Hrs.**

**Max. Marks: 80**

S. No.	Typology of Questions	VSA-Objective type (1 Mark)	SA-I (2 Marks)	SA-II (3 Marks)	LA (4 Marks)	Total Marks	% Weightage (approx.)
1	<b>Remembering:</b> Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	6	2	2	1	20	25
2	<b>Understanding:</b> Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas	6	1	1	3	23	29
3	<b>Applying:</b> Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	5	2	2	1	19	24
4	<b>Analysing :</b> Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations <b>Evaluating:</b> Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. <b>Creating:</b> Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	3	1	3	1	18	22
<b>Total</b>		20x1 =20	6x2 =12	8x3=24	6x4=24	80	100

<b>Internal Assessment</b>	<b>20 Marks</b>
Pen Paper Test and Multiple Assessment (5+5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks