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FOR UTTARAKHAND CLASS 9 PREPARATION

Uttarakhand Board Class 9 Syllabus 2027 Mathematics

EXAM	YEAR	TYPE	SUBJECT
Uttarakhand Class 9	2027	Syllabus	Maths

2026-27

MATHEMATICS (031)

Class – IX

TOTAL MARKS- 100 {80 (Theory) + 20 (Internal Assessment)}

THEORY: 80 Marks **Time: 3:00 Hrs.**

Units	Unit Name	Marks
I	NUMBER SYSTEMS	10
II	ALGEBRA	20
III	COORDINATE GEOMETRY	04
IV	GEOMETRY	27
V	MENSURATION	13
VI	STATISTICS	06
	Total	**80**

UNIT I: NUMBER SYSTEMS

REAL NUMBERS

1- 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.

2- 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.

3- Definition of nth root of a real number.

4- 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.

5- 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.)

Competencies	• *Develops a deeper understanding of numbers, including the set of real numbers and its properties.* • *Recognizes and appropriately uses powers and exponents.* • *Computes powers and roots and applies them to solve problems.*
Explanation	• *Differentiates rational and irrational numbers based on decimal representation.* • *Represents rational and irrational numbers on the number line.* • *Rationalizes real number expressions such as 1/ $a+b\sqrt{x}$ and 1/ $\sqrt{x}+\sqrt{y}$, where x, y are natural numbers and a, b are integers.* • *Applies laws of exponents.*

UNIT II: ALGEBRA

1- POLYNOMIALS

Definition of a polynomial in one variable, with examples and counter examples. Coefficients of a polynomial, terms of a polynomial and zero polynomial.

Degree of a polynomial.

Constant, linear, quadratic and cubic polynomials. Monomials, binomials, trinomials. Factors and multiples.

Zeros 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.

Competencies	*Learns the art of factoring polynomials*
Explanation	• *Defines polynomials in one variable.* • *Identifies different terms and different types of polynomials.* • *Finds zeros of a polynomial* • *Proves factor theorem and applies the theorem to factorize polynomials.* • *Proves and applies algebraic identities up to degree three.*

2- 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 realnumbers, plotting them and showing that they lie on a line.

Competencies	*Visualizes solutions of a linear equation in two variables as ordered pair of real numbers on its graph.*
Explanation	*Describes and plot a linear equation in two variables.*

UNIT III: COORDINATE GEOMETRY

COORDINATE GEOMETRY

The Cartesian plane, coordinates of a point

Names and terms associated with thecoordinate plane, notations.

Competencies	*Specifies locations and describes spatial relationships using coordinate geometry.*
Explanation	*Describes cartesian plane and its associated terms and notations.*

UNIT IV: GEOMETRY

1- 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:

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

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

Competencies	*Proves theorems using Euclid's axioms and postulates– for triangles, quadrilaterals, and circles and applies them to solve geometric problems.*
Explanation	• *Understands historical relevance of Indian and Euclidean Geometry.* • *Defines axioms, postulates, theorems with reference to Euclidean Geometry.*

2- LINES AND ANGLES

(State without proof) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180° and the converse.

(Prove) If two lines intersect, vertically opposite angles are equal.

(State without proof) Lines which are parallel to a given line are parallel.

Competencies	*Derives proofs of mathematical statements particularly related to geometrical concepts, like parallel lines by applying axiomatic approach and solves problems using them.*
Explanation	• *Visualizes, explains and applies relations between different pairs of angles on a set of parallel lines and intersecting transversal.* • *Solves problems based on parallel lines and intersecting transversal.*

3- TRIANGLES

(State without proof) Two triangles are congruent if any two sides and the included angle of one triangle is equal (respectively) 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 is equal (respectively) to any two angles and the included side of the other triangle (ASA Congruence).

(State without proof) Two triangles are congruent if the three sides of one triangle are equal (respectively) to three sides of the other triangle (SSS Congruence).

(State without proof) 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).

(Prove) The angles opposite to equal sides of a triangle are equal.

(State without proof) The sides opposite to equal angles of a triangle are equal.

Competencies	• *Describe relationships including congruency of two dimensional geometrical shapes (lines, angle, triangles) to make and test conjectures and solve problems.* • *Derives proofs of mathematical statements particularly related to geometrical concepts triangles by applying axiomatic approach and solves problems using them.*
Explanation	• *Visualizes and explains congruence properties of two triangles.* • *Applies congruency criteria to solve problems.*

4- QUADRILATERALS

((Prove) The diagonal divides a parallelogram into two congruent triangles.

(State without proof) In a parallelogram opposite sides are equal, and conversely.

(State without proof) In a parallelogram opposite angles are equal, and conversely.

(State without proof) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.

(State without proof) In a parallelogram, the diagonals bisect each other and conversely.

(State without proof) 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 (State without proof) its converse.

Competencies	*Derives proofs of mathematical statements particularly related to geometrical concepts of quadrilaterals by applying axiomatic approach and solves problems using them.*
Explanation	• *Visualizes and explains properties of quadrilaterals.* • *Solves problems based on properties of quadrilaterals.*

5- CIRCLES

(Prove) Equal chords of a circle subtend equal angles at the center and (State without proof) its converse.

(State without proof) The perpendicular from the center of a circle to a chord bisects the chord and conversely, the line drawn through the center of a circle to bisect a chord is perpendicular to the chord.

(State without proof) Equal chords of a circle (or of congruent circles) are equidistant from the center (or their respective centers) and conversely.

(Prove) The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle.

(State without proof) Angles in the same segment of a circle are equal.

(State without proof) 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.

(State without proof) The sum of either of the pair of the opposite angles of a cyclic quadrilateral is 180° and its converse

Competencies	*Proves theorems about the geometry of a circle, including its chords and subtended angles.*
Explanation	• *Visualizes and explains properties of circles.* • *Solves problems based on properties of circle.*

UNIT V: MENSURATION

1. AREAS

Area of a triangle using Heron's formula (without proof)

Competencies	*Visualizes, represents, and calculates the area of a triangle using Heron's formula.*
Explanation	*States and applies Heron's Formula to find area of a triangle.*

2. SURFACE AREAS AND VOLUMES

Surface areas and volumes of spheres (including hemispheres) and right circular cones.

Competencies	*Visualizes and uses mathematical thinking to discover formulas to calculate surface areas and volumes of solid objects (spheres, hemispheres and right circular cones)*
Explanation	*Solves problems based on surface areas and volumes of three dimensional shapes (spheres/hemisphere, right circular cones).*

UNIT VI: STATISTICS

STATISTICS

Bar graphs, histograms (with varying base lengths), and frequency polygons.

Competencies	*Draws and interprets bar graph, histogram and frequency polygon.*
Explanation	*Represents data using Bar Graph, Histogram and frequency polygon.*

NOTE- The following additional topics are also included in the syllabus, but will not be assessed in the examinations. Subject teachers can integrate these with existing chapters as they align well.

Unit-II : ALGEBRA *LINEAR EQUATIONS IN TWO VARIABLES*

1. *Graph of linear equations in two variables.*
2. *Examples, problems from real life, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.*

Unit-III : *COORDINATE GEOMETRY: Plotting points in the plane.*

Unit-IV : *LINES AND ANGLES*

1. *(State without proof) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.*
2. *(Prove) The sum of the angles of a triangle is 180°.*
3. *(State without proof) 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 (State without proof) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

AREAS OF PARALLELOGRAMS AND TRIANGLES

Review concept of area, recall area of a rectangle.

1. *(Prove) Parallelograms on the same base and between the same parallels have equal area.*
2. *(State without proof) Triangles on the same base (or equal bases) and between the same parallels are equal in area.*

CIRCLES

1. *Through examples, arrive at definition of circle and related concepts-radius, circumference, diameter, chord, arc, secant, sector, segment, subtended angle.*
2. *(State without proof) There is one and only one circle passing through three given non-collinear points.*

CONSTRUCTIONS

1. *Construction of bisectors of line segments and angles of measure 60° , 9 0° , 45 ° etc., equilateral triangles.*
2. *Construction of a triangle given its base, sum/difference of the other two sides and one base angle.*

UnitVI : *AREAS- Application of heron's formula in finding the area of a quadrilateral.*

SURFACE AREAS AND VOLUMES- Surface areas and volumes of cubes, cuboids and right circular cylinders.

Unit-VI : *STATISTICS*

1. *Introduction to Statistics: Collection of data, presentation of data-tabular form, ungrouped / grouped data.*
2. *Mean, median and mode of ungrouped data.*

PROBABILITY

1. *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);*
2. *The experiments to be drawn from real - life situations, and from examples used in the chapter on statistics).*

INTERNAL ASSESSMENT — Max. Marks: 20

(i) Activities (02)- 2X5 **10 Marks**

(ii) Project Work (01) **05 Marks**

(iii) Continuous Assessment (Unit Test) **05 Marks**

(There will be total 4 Unit Tests to be conducted throughout the year (two Unit Tests before half yearly examination and two after half yearly examination). At the time of half yearly result preparation best of two Unit Tests (I & II) marks will be taken and converted to the weightage of 05 marks. Likewise, best of two Unit Tests (III & IV) marks will be taken and converted to the weightage of 05 marks for the annual result preparation.)

PRESCRIBED BOOKS:

1. गणित (Mathematics) - Textbook for class IX - NCERT Publication

2. गणित (Mathematics) - Textbook for class X - NCERT Publication

3. Laboratory Manual - Mathematics, secondary stage - NCERT Publication

4. Mathematics exemplar problems for class IX, NCERT publication.

5. Mathematics exemplar problems for class X, NCERT publication.

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