

### 3. Syllabus of Advanced Mathematics (E)

#### Subject Code : 19

Class : IX

Total Marks : 100

#### Unit-I. System of Numeration :

History of Numeration and numerals, Different systems of Numerals: Roman and Indo-Arabian. Different Scales of Numeration with bases 2,8, 10 and 16. Change of base. Arithmetic of Binary numbers.

#### Unit-II. Basic Set Theory :

- (A) Fundamentals of Statement Algebra
- (B) Operations of Sets, Algebra of Sets, Proofs of Laws of Algebra of Sets.

#### Unit-III. Logarithm and properties

#### Unit-IV. Special product and Factorization of :

- (i)  $a^3+b^3+c^3+3(b+c)(c+a)(a+b)$
- (ii)  $x^3+(a+b+c)x^2+(ab+bc+ca)x+abc$
- (iii)  $(a+b+c)(bc+ca+ab)-abc$
- (iv)  $a^3+b^3+c^3-3abc$
- (v)  $a^2(b+c)+b^2(c+a)+c^2(a+b)+2abc$
- (vi)  $bc(b+c)+ca(c+a)+ab(a+b)+2abc$
- (vii)  $a(b^2+c^2)+b(c^2+a^2)+c(a^2+b^2)+2abc$
- (viii)  $a^2(b+c)+b^2(c+a)+c^2(a+b)+3abc$
- (ix)  $bc(b+c)+ca(c+a)+ab(a+b)+3abc$
- (x)  $a(b^2+c^2)+b(c^2+a^2)+c(a^2+b^2)+3abc$
- (xi)  $a^2(b-c)+b^2(c-a)+c^2(a-b)$
- (xii)  $bc(b-c)+ca(c-a)+ab(a-b)$

$$(xiii) a^3(b-c) + b^3(c-a) + c^3(a-b)$$

$$(xiv) a^3(b^2-c^2) + b^3(c^2-a^2) + c^3(a^2-b^2)$$

**Unit V : Concept of inequalities, Tricotomy property (Order relation in R) Elementary properties of inequalities, Simple applications) Inequations and solutions of inequations in two variables, Graphs of inequations (simple cases).**

**Unit VI : Sequence and series :**

(A) Idea of a sequence of numbers -

(B) Arithmetic Progression (AP)-

AP as a special kind of a sequence, General term of an AP, to find an AP having given any two terms of it. If each term of an AP is increased or decreased or multiplied or divided by the same number then the resulting sequence is also an AP, Arithmetic mean (A.M.), insertion of any number of AM between two given positive numbers, Arithmetic series and its sum to n terms and related problems.

(C) Geometric Progression (GP)-

GP as a special kind of sequence and its general terms; to find a GP having given any two terms of it. If each term of GP is multiplied or divided by the same number the resulting sequence is also a GP. Geometric mean (G.M), insert any number of GM between any two given positive numbers. To prove the relation  $AM > GM$  in case of any positive real numbers. Geometric series and its sum to n terms and related problems.

(D) Sum of the three series

i)  $1 + 2 + 3 + \dots + n$

ii)  $1^2+2^2+3^2+ \dots + n^2$

iii)  $1^3+2^3+3^3+ \dots + n^3$

**Unit VII : Plane Geometry**

Proofs of the following theorems and exercises on the theorems.

1. The Perpendicular bisectors of the sides of a triangle are concurrent.
2. The internal bisectors of the angles of a triangle are concurrent
3. The perpendiculars drawn from the vertices of a triangle to the opposite sides are concurrent.
4. The medians of a triangle are concurrent.

**Unit VIII : Some special Geometrical Constructions :**

- (1) Construction of a triangle given its two sides and a median corresponding to these sides.
- (2) (i) Construct a triangle with given Perimeter and the two suitable base angles.  
(ii) Construct a triangle with given (unequal) medians.  
(iv) Draw a square equal in area to a given rectangle.  
(v) Draw a rectangle having given one side and a diagonal.  
(vi) Draw a regular polygon in a given circle.
- 3) Construction of figures (Triangles, quadrilaterals) similar to the given figure as per the given scale factor.
- 4) Construction of circumcircle and incircle.



**LIST OF PRACTICALS**  
**ADVANCED MATHEMATICS (E)**

**Subject Code : 19**

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1. Project: Different systems of numerations.
2. If P and Q are any two statements then form any five tautology (or formula).
3. Using Venn diagram, verify the following properties of sets.
  - i) Associative laws.
  - ii) Distributive laws.
  - iii) De-Morgan's laws.
  - iv) Difference laws.
4. Using log tables find the value.

i) 
$$\sqrt[7]{\frac{(4.56)^4 \times (32.4)^{15}}{(11.529)^4 \times (6.9642)^3}}$$
 ii) 10th root of 0.0004296

Teachers are requested **not** to provide the same problem (question) to all the students. They are, requested to create similar questions, at least 15-20 so that each student gets different question.

5. Pascal triangle and its application to find the coefficients in the expansion of  $(a+b)^n$ ,  $n=4, 5, 6, 7, 8, 9, 10$
6. Solve graphically the following system of linear inequations.  
 $2x-3y+6>0$  ;  $3x+5y < 15$  ;  $y> 1$  ;  $x>0$

Note: Teachers are requested **not** provide the same pair of linear inequations to the all students.

7. Verification of the following formulae
  - i) Sum of first n terms of an AP
  - ii)  $1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$

- iii)  $1+3+5+\dots+(2n-1)=n^2$
- iv)  $2+4+6+8+\dots+2n=n(n+1)$
8. (a) To verify that the perpendicular bisector of the sides of any triangle are concurrent
- (b) To verify that the angle bisectors of a triangle are concurrent.
- (c) To verify that the altitudes of a triangle are concurrent.
- (d) To verify that the medians of a triangle are concurrent.
9. Find the positions of Circumcentre, Incentre, Orthocentre and Centroid of a given triangle.
10. Construct a triangle when the medians are given and hence verify that the centroid divides a median in the ratio 2: 1.
- N.B. :** Students have to do atleast 8 practicals.

# ADVANCED MATHEMATICS (E)

Subject Code : 19

Class - IX

Time : 3 hours

Full Marks : 100

Pass Marks : 30

Internal Assessment : 10

Pass marks in written examination : 27

Sl. No.	LESSONS	Course	
		Half Yearly	Annual
1.	System of Numeration	✓	✓
2.	Sets	✓	✓
3.	Logarithm	✓	✓
4.	Special products and Factorisation	✓	✓
5.	Inequalities		✓
6.	Sequence and Series		✓
7.	Plane Geometry		✓
8.	Some Special Geometrical Constructions		✓
	<b>Total</b>	<b>90</b>	<b>90</b>
9.	Internal Assessment	10	10
	<b>Grand Total</b>	<b>100</b>	<b>100</b>

**Textbook: Ucca Ganit**

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\* Questions from each Unit/Lesson will carry marks 2-15.