HIGHER SECONDARY MATHEMATICS – XI STANDARD

1. ELEMENTARY NUMBER THEORY

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
1.1	Divisibility in integers	Illustration c/b, b/a =>c/a; c/a, c/b=>c/(a±b) GCD and Euclidean algorithm: Recognising algebraically well-ordered sets; providing simple facts on prime numbers. Euler' s function ? (n)	Approach through elementary examples Fundamental Theorem of Arithmetic to be stated and illustrated	20
1.2	Numbers bases	Expressing positive integer using different bases Manipulation of change of bases Expressing rational numbers in decimal notation (by the method of successive remainders)	Only binary, base 8 and base 16 to be used for illustration	
1.3	Number of congruence	Defining congruence relation in integers; recognizing ≡ as equivalence relation	Using the concept of congruence to explain tests of divisibility by 2,3,4,6,7 and 8	

1.4	Diphantine equations	Identifying the special nature of such equations. Applying the concept to primitive solutions of Pythagorean equation	Contribution of ancient Indian mathematicians in this field to be highlighted.	
1.5	Some famous theorems	Statement and verification of (i) Fermat' s theorem, (ii) Wilson' s theorem, and (iii) Chinese Remainder theorem	Approach through simple numeric examples no proof to be given	

1. COUNTING TECHNIQUES

S.No.	**Content**	**Expected Outcome**	**Transactional Strategy**	**No. of Periods**
2.1	Basic principles	i.Addition: If S=? Y S_i where S_i are disjoint, n(S) = ? n(S_i) ii.Product n(A) = p, n(B) = q, a?A, b?A, b?B=> n(a,b)=pq iii.Inclusion & Exclusion n(AUB) = n(A)+n(B)-n(AnB) iv.Pigeonhole principle (Satement only)	Use of Venn diagrams and tree diagrams to illustrate the principles	**20**
2.2	Permutations	Derivation and application of formulat $_nP_r$ Applying permutation of repeated objects to solve problems. Computing circular permutations	After initial derivation, factorial notation to be used for simplification	

2.3	Combinations	Derivation of value of ${}_nC_r$ Application of the formula derive above	Use of Pascal' s triangle to be encouraged for easy understanding	
2.4	Inductions	Stating and interpreting the principle of mathematical inductions. Using it to prove formulae and facts Summation using ? n, ? n^2, ? n^3	Know formula for ? n, ? n^2, ? n^3 to be used for motivation. Skill of summation when n-th term of a sequence is given to be introduced	
2.5	Binomial Theorem	Statement and proof for a natural number index Identifying the relation among binomial coefficients.	The pattern of coefficients in a binomial expansion to be elicited from students	

2. MATRICS AND DETERMINANTS

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
3.1	Matrix Algebra (with entries in R)	Defining a matrix and identifying various types of matrices; computing order of a matrix; Performing Addition, Scalar multiplication and finding the product of matrices	Illustrations and problems to be limited to 3rd order matrices only	
3.2	Determinants	Evaluating determinant of a matrix (of order not more than 3 by 3), using properties of determinants in evaluating a determinant, multiplying two determinants	Problems illustrating the properties to be chosen for examples and exercise.	15
3.3	Inverse matrix	Given a matrix (of order not more than 3 x 3) to compute its inverse, if it exists.	Question of existence to be discussed.	

3. ANALYTICAL GEOMETRY

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
4.1	Loci	Defining Loci and solving loci problems	Pure geometrical notions to be starting points	25
4.2	Equations of lines	Point-slope, slope-intercept, two points x-y intercepts, normal, parametric and general forms Computing length of perpendicular from (i) origin (ii) any point to a line	Graphical illustration to be given for better understanding of concepts	
4.3	Family of lines	Solving problems connected with (i) concurrent lines, (ii) perpendicular lines, (iii) parallel lines and (iv) bisector lines. Equation of a pair of lines and its interpretation	Illustrating how coordinatisation simplifies location of points of concurrence.	
4.4	Equation of circles	Treating circle as a locus; deriving Equation $x^2+y^2=a^2$. diameter end points form, and the general from $x^2+y^2+2gx+2fy+c=0$	Illustrating with simple problem to derive the equation, to find the center, radius etc.	
4.5	Tangents	Deriving equation of tangent to a circle, computing the length of tangent segment, obtaining condition for tangency of a line and deriving the equation of chord of contact.	Comparison with pure geometrical approach.	
4.6	Family of circles	Verifying conditions for circles to be (i) concerntric, (ii) touching and (iii) orthogonal.	Graphical illustration for making the concepts clear.	

4. ANALYTICAL GEOMETRY

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
5.1	Concept of a sequence	Defining a sequence (i) by a rule, (ii) by a recursive relation. Defining and identifying the limit of a sequences. Discriminating bounded and unbounded sequences.	Idea of limit to be introduced by geometrically representing the terms of a sequene	15
5.2	Summation of series	Statement of (i) Binomial series for a rational index (ii) Exponential series and (iii) logarithmic series	Using in summations and computing approximate values.	

5. TRIGONOMETRY

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
6.1	Trigonometric Identifies	Deriving standard identities and applying them to simple situations to arrive at interesting results	Unit circle approach to be used and diagrammatic interpretation given	25
6.2	Signs of T-ratios.	Identifying the dependence on the quadrant in which the angle terminates and fixings the sign	Treatment specific to (? -), (90±??), (180±?), (270±??)	
6.3	Compound angles	Deriving addition formulae for (A±B), (A+B+C), multiple angles 2?, 3? and sub-multiple angles like A/2. Use of transformation of sums and products	Investigation such as: Is sin(30^{o} +60^{o}) = sin30^{o} +sin60^{o} to be used for motivation.	

6.4	Trigonometric Equations	Solving equations of types: sin? = sin? ? Cos? =cos? , Tan=Tan, acos? +bsin? =c	Restrictions for the solution set to be clearly brought out with examples.	
6.5	Inverse trigonometric functions	Defining the functions and deriving simple relations between them	Need for clear specification of domain to be illustrated	
6.6	Properties of triangles	Deriving conditional identities (if(A+B+C=?)l deriving Sine, Cosine, Napier, Area, Projection formulae	Applying these formulae to derive standard results regarding triangles	
6.7	Solution of triangles	Solving SSS, SAS, SAA, SSA types. (Ambiguous case excluded)	Problems to be very simple just to illustrate the concept.	

6. FUNCTIONS AND THEIR GRAPHS

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
7.1	Function of a Real variable	Discriminating constants and variables; classifying intervals as open and closed: defining a ‘ neighbourhood’ Defining a function in several ways. Representation of a function in tabular. Graphical and formula forms.	Approach through numerical illustrations. Function as (i) a rule and as (ii) a set of ordered pairs. Identifying the domain, codomain, range and image through several examples. Vertical line tests for a function	25
7.2	Constant function and linear function	Graphing a constant function Computing the slope of a linear function	Entire concepts to be approached through several examples of graphical illustrations.	

7.3	Quadratic and cubic functions	Explaining real and imaginary roots of a quadratic equation through graph of the quadratic function with simulatanceous use of discriminant' Graphing a cubic function with special emphasis on its shape.	Manipulations like moving a graph up or down, left or right, stretching /contracting vertically or horizontally. Reflecting in x axis y axis / origin explained through quadratic graph	
7.4	Polynomial functions	Illustration with cubic polynomials: computing approximate roots (zeros) of a non-linear, non-quadratic function.	Adoption of ' trial and improvement' method (method of averages) to find approximate roots.	
7.5	Rational functions	Identifying the domain of definition. Determining the positioning of the asymptotes Splitting into partial fractions	Intuitive approach to be adopted in explaining the concept of asymptotes	
7.6	Power function	Interpreting the graph of 2^x study of graph of e^x	Identifying the graph of log x by the principle of symmetry	
7.7	Circular and hyperbolic functions	Unit circle definition of trigonometric functions and their graphs, Identifying the periodicity of functions	Defining hyperbolic functions using circular functions.	
7.8	Arithmetic of functions	Computing sum. Difference. Product, quotient and composition of functions	Appropriate constraints on domain/range to be illustrated	
7.9	Some special functions	Graphing Absolute value, Square bracket, Fractional part and step functions. Sequences as functions	Use of more than one equation to define a function to be illustrated.	

7.10	Inverse of a function	Defining 1-1 onto functions and the inverse of a functon *f*	Relating inverse to symmetry of the graph of *f*	
7.11	Miscellaneous functions	Concepts of explicit & implicit functions, parametric functions and even & odd functions.	To be illustrated through examples both analytic and graphical.	

7. DIFFERENTIAL CALCULAS

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
8.1	Limits of a functions	Defining the limit of a function, stating fundamental results on limits, and recognizing important limits such as lim $\underline{x^n - a^n}$ lim $\underline{\sin?}$ lim $\underline{e^x - 1}$ x-0 x – a x-0 ? x-0 x lim $\underline{\log(1+x)}$ lim $\underline{a^x - 1}$ lim $(1+\underline{1})^x$ x-0 x x-0 x x-0 x lim (1 + x) x-0	Graphical approach and intuitive ideas to be exploited to explain the notion of limits. Simple applications of stated resulted to be illustrated.	
8.2	Contimuity of a functin.	Defining continuity; Interpreting continuity graphically, identifying discontinous functins	Illustrating testing of continuity in the case of all important functions discussed in the beginning chapter.	30
8.3	Concept of differentiation	Defining and interpreting geometrically, Recognising the relation between continuity and differentiability	Graphical and analytical examples to be discussed.	
8.4	Differentiation techniques	Differentiatin from 1^{st} principlesl establishing rules for differentiation and deriving standard formula; Applying method of substitution Discussing logarithmic, implicit and parametric cases; differentiating successively (unto 3^{rd} order)	Multiple approaches to the same problem to be illustrated rule of Leibnitz not to be stated or used	

8. DIFFERENTIAL CALCULAS

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
9.1	Concept of integration	Defining and identifying integral as anti-derivative	Geometrical interpretation for reverse of differentiation to be given	20
9.2	Integration techniques	Recognizing rules of integration; statement of standard types, integrating using method of substitution, integrating by parts, deriving and applying Reduction formulae.	Integration of special types to be dealt with are: Scanning	

9. HANDLING DATA

S.No.	Content	Expected Outcome	Transactional Strategy	No. of Periods
10.1	Measures of central tendency	Given a frequent distribution, to compute Mean, Median, Mode, GM and HM	Recall of computing some of these measures in the case of raw data to be done first	15
10.2	Measures of dispersion	Computing Range, Standard Deviation and Coefficient or variation	Explanation through geometrical interpretation wherever possible	
10.3	Interpolation	Discriminating Interpolation and Extrapolation Forming difference table for equal intervals, Newton' s forward and backward interpolation	Through simple examples, guessing formulae by polynomial method.	
10.4	Concepts of Probability	Approaching Probability axiomatically identifying mutually exclusive events, independent events etc. statement and verification of addtion theorem and multiplication theorem; Baye' s Theorem; applying conditional probability.	Only simple problems to illustrate the concepts to be used.	
			Total	210