

Government of Andhra Pradesh
Department of School Education
State Council of Educational Research & Training
DSC-2024
DSC – SCHOOL ASSISTANT SYLLABUS -MATHAMETICS

1. G.K & Current Affairs	-	10M
2. Perspectives in Education	-	05M
3. Classroom implications of Educational Psychology	-	05M
4. Content	-	40M
5. Methodology	-	20M
Total	-	80 M

PART - I

I. General Knowledge And Current Affairs (Marks: 10)

PART - II

II. Perspectives in Education (Marks: 05)

1. History of Education :

- The Education in Ancient India - Pre-Vedic and Post-Vedic period, Medieval Education.
- Education in Pre Independent era - Woods Despatch (1854), Hunter Commission (1882), Hartog Committee (1929), Sargent Committee (1944).
- Education in Post Independent era - Mudaliar Commission (1952-53), Kothari Commission (1964-66), Ishwarbhai Patel committee (1977), NPE-1986, POA-1992

2. Teacher Empowerment:

- Need, interventions for empowerment, Professional code of conduct for teachers, Teacher motivation, Professional development of Teachers and Teacher organizations, National / State Level Organizations for Teacher Education, Maintenance of Records and Registers in Schools.

3. Educational Concerns in Contemporary India:

- Democracy and Education, Equality, Equity, Quality in Education, Equality of Educational opportunities.
- Economics of Education, Education as Human Capital, Education and Human Resource Development, Literacy - Saakshar Bharat Mission.
- Population Education, Gender - Equality, Equity and Empowerment of Women, Urbanization and migration, Life skills.
- Adolescence Education
- Value Education – Moral Value and Professional Ethics in Education.
- Health and Physical Education
- Inclusive Education - Classroom Management in Inclusive Education

- Role of Education in view of Liberalization, Privatization and Globalization
- Programmes and Projects – APPEP, DPEP, Sarva Shiksha Abhiyan, National Programme for Education of Girls at Elementary Level (NPEGEL), Rashtriya Madhyamika Shiksha Abhiyan(RMSA), Rashtriya Avishkar Abhiyan (RAA), KGBVs, Model Schools.
- Incentives and special provisions – Mid Day Meals, Free Books, Scholarships, Awards, Welfare Hostels, Transportation.
- Current Trends in Education

4. Acts / Rights:

- Right of Children to Free and Compulsory Education Act - 2009
- Right to Information Act - 2005
- Child Rights
- Human Rights.

5. National Curriculum Framework - 2005: Perspectives, Guiding Principles, Learning and Knowledge, Teaching Learning Process, Assessments, Systemic Reforms.

6. National Education Policy-2020

PART - III

III. Classroom implications of Educational Psychology – 05Marks

1. **Individual differences:** Inter and intra individual differences, meaning, nature and theories of intelligence with special emphasis to multiple intelligence, IQ, assessment of intelligence, EQ, Creativity. Attitude, Aptitude, Interest, Habit and its Influence on Intelligence – Class room implementation.
2. **Learning:** Theories and approaches of learning, learning curves, Factors, Phases, Dimensions of learning, Types of learning, Transfer of learning. Memory, Forgetting, Learning and assessment– Class room implementation.
3. **Personality:** Nature, characteristics and theories of personality, factors of Personality, Assessment of Personality, Mental health, Adjustment, Stress – nature, Symptoms and management. Emotional intelligence, Management of emotions – Class room implementation.

PART - IV

IV. Maths –Content (Class-VI to Intermediate Present syllabus) (40 Marks)

1. Arithmetic

BODMAS rule - Ratios and Proportions (Direct, Inverse) - comparing quantities using ratios, proportion, percentage and their applications - Profit and Loss - Discount - Sales Tax/Value Added Tax/Goods and Services Tax - Simple, Compound Interest and their applications.

2. Number System

Numbers - Four fundamental operations (Addition, Subtraction, Multiplication, Division) - Knowing about Numbers - Hindu-Arabic system of numeration (Indian system of numeration) - International system of numeration (British system of numeration) - Place value and Face values of a digit in a number - Comparing and Ordering of Numbers - Whole Numbers - Factors and Multiples - Prime and Composite numbers - Even and Odd numbers - Tests for Divisibility of Numbers - Common Factors and Common Multiples - Prime factorisation - Highest Common Factor (G.C.D) - Lowest Common Multiple - Integers - properties and fundamental operations - Fractions and decimals - Types of fractions - comparison - Applications of fractions in daily life - four fundamental operations on fractions and decimals - Euclid's Division Lemma and its application - Rational Numbers - Properties of Rational Numbers - Representation of Rational Numbers on the Number line - Rational Numbers between two rational numbers - Four fundamental Operations on Rational Numbers – Rational numbers and their decimal expansions - Non-terminating, recurring decimals in rational numbers - Product of reciprocals - Squares - Square roots (Numbers and Decimals) - Properties of Square Numbers - Cubes - Cube roots of Numbers - Playing with Numbers - Games with Numbers - Letters for Digits - Irrational numbers - Real Numbers and their Decimal Expansions - Operations on Real Numbers - Laws of Exponents for Real Numbers – Properties & Laws of logarithms.

Sets and their representation (Roster form and Set builder form) – Classification of sets (Empty, Universal, subset, Finite & Infinite, disjoint sets) - difference of sets - Equal sets - Using diagrams to represent sets - Venn diagrams and cardinality of sets - Basic operations on sets (Union, Intersection).

3. Geometry

Basic geometrical concepts (Point, Line, Line segment, Ray, Curves, Polygons, Angles) - Measuring of Lines - Pairs of Lines - Intersecting Lines and Non-intersecting Lines – Lines parallel to the same line - Elements of Angles - Measuring of Angles - Types of Angles – Pairs of Angles - Naming of the given 2D figures of Triangles, Square and Rectangle - The Triangle - Types of Triangles and its Properties – Congruence and some properties of Triangles - Some more criteria for Congruence of Triangles – Criteria for similarity of triangles – Areas of similar triangles – Pythagoras theorem - Classification of Polygons - Angle sum property - Kinds of Quadrilaterals (Trapezium, Kite, Parallelogram) - Some special parallelograms (Rhombus, Rectangle, Square) - Constructing different types of Quadrilaterals - Views of 3D-Shapes - Identification of Edges, Vertices and Faces of 3D figures (Euler's Rule) - Nets for building 3D shapes – Introduction to Euclid's geometry – Euclid's definitions, axioms and postulates - Angle Subtended by a Chord at a Point - Perpendicular from the Centre to a Chord - Equal Chords and Their Distances from the Centre - Angle Subtended by an Arc of a Circle - Cyclic Quadrilaterals – Tangents of a circle – Number of Tangent to a Circle from any point – Segment of a circle formed by a Secant.

4. Mensuration

Measuring Length, Weight, Capacity, Time-Seasons, Calendar, Money, Area - Symmetry (Line and Rotational) - Perimeter of Triangle, Square, Rectangle, Rhombus, Trapezium, Parallelogram, Circle and Polygon, Properties of a Parallelogram - The Mid-point Theorem - Area of a Quadrilateral, Surface Area and Volume of Cube, Cuboid and Cylinder - Volume and capacity - Surface Area and volume of a Sphere - Volume of a Right Circular Cone - Surface area of the combination of Solids - Volume of combination of solids - Conversion of solid from one shape to another

5. Algebra

Patterns - making rules - The idea of variables - formation of algebraic expressions - Terms, Factors and Coefficients - Linear equations in one variable - Linear equations in two variables - Solutions of Pair of Linear Equations in Two Variables - Algebraic methods of finding the solutions for a pair of linear equations - Equations reducible to a pair of linear equations in two variables - Solution of a quadratic equation by factorisation & by completing the square - Nature of roots - terms and types of algebraic expressions - finding the value of an expression - Addition, Subtraction and Multiplication of Algebraic Expressions - Multiplying a Monomial by a Monomial and polynomial - Multiplying a Polynomial by a Polynomial - Standard Identities and their applications - Applications of simple equations to practical situations - Exponents and Powers - Negative exponents - Laws of exponents - Expressing large numbers in the standard form - Factorisation - Division of Algebraic Expressions Continued (Polynomial $\div$ Polynomial) - Linear Graphs - Polynomials in one variable - Degree, Value, zeroes of a polynomial - Geometrical meaning of the Zeroes of a Polynomial - Graphical representation of linear, Quadratic and Cubic Polynomials - Factorisation of Polynomials - Algebraic Identities - Working with Polynomials - Division algorithm for polynomials - Arithmetic progressions - Parameters of Arithmetic progressions - n^{th} term of an Arithmetic progression - Sum of first n terms in Arithmetic progression - Geometric progressions - n^{th} term of a GP.

Functions :

- Ordered pair- Cartesian product of sets - Relation - Function & its types - image & pre-image - Definitions.
- Inverse functions and Theorems.
- Domain, Range, Inverse of real valued functions.

Mathematical Induction

- Principle of Mathematical Induction & Theorems.
- Applications of Mathematical Induction.
- Problems on divisibility.

Matrices:

- Types of matrices

- Scalar multiple of a matrix and multiplication of matrices
- Transpose of a matrix
- Determinants
- Adjoint and Inverse of a matrix
- Consistency and inconsistency of Equations- Rank of a matrix
- Solution of simultaneous linear equations

Complex Numbers:

- Complex number as an ordered pair of real numbers- fundamental operations
- Representation of complex numbers in the form $a+ib$.
- Modulus and amplitude of complex numbers –Illustrations.
- Geometrical and Polar Representation of complex numbers in Argand plane- Argand diagram.

De Moivre's Theorem:

- De Moivre's theorem- Integral and Rational indices.
- n^{th} roots of unity- Geometrical Interpretations – Illustrations.

Quadratic Expressions:

- Quadratic expressions, equations in one variable
- Sign of quadratic expressions – Change in signs – Maximum and minimum values
- Quadratic in-equations

Theory of Equations:

- The relation between the roots and coefficients in an equation
- Solving the equations when two or more roots of it are connected by certain relation
- Equation with real coefficients, occurrence of complex roots in conjugate pairs and its consequences
- Transformation of equations – Reciprocal Equations.

Permutations and Combinations:

- Fundamental Principle of counting – linear and circular permutations
- Permutations of 'n' dissimilar things taken 'r' at a time
- Permutations when repetitions allowed
- Circular permutations
- Permutations with constraint repetitions.
- Combinations-definitions and certain theorems

Binomial Theorem:

- Binomial theorem for positive integral index
- Binomial theorem for rational Index (without proof).
- Approximations using Binomial theorem

Partial fractions:

- Partial fractions of $f(x)/g(x)$ when $g(x)$ contains non-repeated linear factors.
- Partial fractions of $f(x)/g(x)$ when $g(x)$ contains repeated and/or non-repeated linear factors.
- Partial fractions of $f(x)/g(x)$ when $g(x)$ contains irreducible factors.

6. Statistics

DATA HANDLING -Frequency Distribution Tables and Graphs- Grouped data-ungrouped data – Measures of Central Tendency -Mean, median & mode of grouped and ungrouped data – Ogive curves.

MEASURES OF DISPERSION

- Range
- Mean deviation
- Variance and standard deviation of ungrouped/grouped data.
- Coefficient of variation and analysis of frequency distribution with equal means but different variances.

7. Probability

Probability - Linking chances to probability - Chance and probability related to real life - Probability - a theoretical approach - Mutually exclusive events - Finding probability - Complementary events and probability - Impossible and certain events - Deck of Cards and Probability – Use and Applications of probability.

- Random experiments and events
- Classical definition of probability, Axiomatic approach and addition theorem of probability.
- Independent and dependent events conditional probability- multiplication theorem and Bayes's theorem.

Random Variables and Probability Distributions:

- Random Variables
- Theoretical discrete distributions – Binomial and Poisson Distributions

8. Coordinate Geometry

Cartesian System – Distance between two points – distance between two points on a line parallel to the co-ordinate axis – Distance between any two points on a line in the x-y plane – Section formula – centroid of a triangle – Tri-sectional points of a line – Area of the triangle – Heron's formula- Collinearity – Straight lines – Slope of the straight line – slope of a line joining two points.

Locus :

- Definition of locus – Illustrations.
- To find equations of locus - Problems connected to it.

Transformation of Axes :

- Transformation of axes - Rules, Derivations and Illustrations.
- Rotation of axes - Derivations – Illustrations.

The Straight Line :

- Revision of fundamental results.
- Straight line - Normal form – Illustrations.
- Straight line - Symmetric form.
- Straight line - Reduction into various forms.
- Intersection of two Straight Lines.
- Family of straight lines - Concurrent lines.
- Condition for Concurrent lines.
- Angle between two lines.
- Length of perpendicular from a point to a Line.
- Distance between two parallel lines.
- Concurrent lines - properties related to a triangle.

Pair of Straight lines:

- Equations of pair of lines passing through origin, angle between a pair of lines.
- Condition for perpendicular and coincident lines, bisectors of angles.
- Pair of bisectors of angles.
- Pair of lines - second degree general equation.
- Conditions for parallel lines - distance between them, Point of intersection of pair of lines.
- Homogenizing a second degree equation with a first degree equation in X and Y.

Circle :

- Equation of circle -standard form-centre and radius of a circle with a given line segment as diameter & equation of circle through three non collinear points - parametric equations of a circle.
- Position of a point in the plane of a circle – power of a point-definition of tangent-length of tangent
- Position of a straight line in the plane of circle-conditions for a line to be tangent – chord joining two points on a circle – equation of the tangent at a point on the circle-point of contact-equation of normal.
- Chord of contact - pole and polar-conjugate points and conjugate lines - equation of chord with given middle point.
- Relative position of two circles- circles touching each other externally, internally common tangents-centres of similitude- equation of pair of tangents from an external point.

System of circles:

- Angle between two intersecting circles.
- Radical axis of two circles- properties- Common chord and common tangent of two circles – radical centre.
- Intersection of a line and a Circle.

Parabola:

- Conic sections –Parabola- equation of parabola in standard form-different forms of parabola- parametric equations.
- Equations of tangent and normal at a point on the parabola (Cartesian and parametric) - conditions for straight line to be a tangent.

Ellipse:

- Equation of ellipse in standard form- Parametric equations.
- Equation of tangent and normal at a point on the ellipse (Cartesian and parametric) - condition for a straight line to be a tangent.

Hyperbola:

- Equation of hyperbola in standard form- Parametric equations.
- Equations of tangent and normal at a point on the hyperbola (Cartesian and parametric) - conditions for a straight line to be a tangent- Asymptotes.

Three Dimensional Coordinates :

- Coordinates.
- Section formulas - Centroid of a triangle and tetrahedron.

Direction Cosines and Direction Ratios :

- Direction Cosines.
- Direction Ratios.

Plane :

- Cartesian equation of Plane - Simple Illustrations.

9. Trigonometry

Trigonometry – Naming the sides in a Right triangle – Trigonometric Ratios – Defining Trigonometric Ratios – Trigonometric ratios of some specific and complementary angles – Trigonometric identities – Applications of Trigonometry – Drawing figures to solve problems – solutions for two triangles.

Trigonometric Ratios up to Transformations:

- Graphs and Periodicity of Trigonometric functions.
- Trigonometric ratios and Compound angles.
- Trigonometric ratios of multiple and sub- multiple angles.
- Transformations - Sum and Product rules.

Trigonometric Equations:

- General Solution of Trigonometric Equations.
- Simple Trigonometric Equations – Solutions.

Inverse Trigonometric Functions:

- To reduce a Trigonometric Function into a bijection.
- Graphs of Inverse Trigonometric Functions.
- Properties of Inverse Trigonometric Functions.

Hyperbolic Functions:

- Definition of Hyperbolic Function – Graphs.
- Definition of Inverse Hyperbolic Functions – Graphs.
- Addition formulas of Hyperbolic Functions.

Properties of Triangles:

- Relation between sides and angles of a Triangle
- Sine, Cosine, Tangent and Projection rules.
- Half angle formulae and areas of a triangle
- In-circle and Ex-circle of a Triangle.

10. Vector Algebra

Addition of Vectors:

- Vectors as a triad of real numbers.
- Classification of vectors.
- Addition of vectors.
- Scalar multiplication.
- Angle between two non-zero vectors.
- Linear combination of vectors.
- Component of a vector in three dimensions.
- Vector equations of line and plane including their Cartesian equivalent forms.

Product of Vectors:

- Scalar Product - Geometrical Interpretations - orthogonal projections.
- Properties of dot product.
- Expression of dot product in i, j, k system – Angle between two vectors.
- Geometrical Vector methods.
- Vector equations of plane in normal form.
- Angle between two planes.
- Vector product of two vectors and properties.
- Vector product in i, j, k system.
- Vector Areas.
- Scalar Triple Product.
- Vector equations of plane in different forms, skew lines, shortest distance and their Cartesian equivalents. Plane through the line of intersection of two planes, condition for coplanarity of two lines, perpendicular distance of a point from a plane, Angle between line and a plane. Cartesian equivalents of all these results
- Vector Triple Product – Results

11. Calculus

Limits and Continuity:

- Intervals and neighbourhoods.
- Limits.
- Standard Limits.
- Continuity.

Differentiation:

- Derivative of a function.
- Elementary Properties.
- Trigonometric, Inverse Trigonometric, Hyperbolic, Inverse Hyperbolic Function - Derivatives.
- Methods of Differentiation.
- Second Order Derivatives.

Applications of Derivatives:

- Errors and approximations.
- Geometrical Interpretation of a derivative.
- Equations of tangents and normal's.
- Lengths of tangent, normal, sub tangent and sub normal.
- Angles between two curves and condition for orthogonality of curves.
- Derivative as Rate of change.
- Rolle's Theorem and Lagrange's Mean value theorem without proofs and their geometrical interpretation.
- Increasing and decreasing functions.
- Maxima and Minima.

Integration:

- Integration as the inverse process of differentiation- Standard forms –properties of integrals.
- Method of substitution- integration of Algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions. Integration by parts.
- Integration- Partial fractions method.
- Reduction formulae.

Definite Integrals:

- Definite Integral as the limit of sum
- Interpretation of Definite Integral as an area.
- Fundamental theorem of Integral Calculus.
- Properties.
- Reduction formulae.
- Application of Definite integral to areas.

Differential equations:

- Formation of differential equation-Degree and order of an ordinary differential equation.
- Solving differential equation by
 - a) Variables separable method.
 - b) Homogeneous differential equation.
 - c) Non - Homogeneous differential equation.
 - d) Linear differential equations.

V. Methodology (20 Marks)

1. Meaning and Nature of Mathematics, History of Mathematics.
2. Contributions of Great Mathematicians - Aryabhatta, Bhaskaracharya, Srinivasa Ramanujan, Euclid, Pythagoras, George cantor.
3. Aims and Values of teaching Mathematics, Instructional objectives (Blooms taxonomy)
4. Mathematics curriculum: Principles, approaches of curriculum construction, - Logical and Psychological, Topical and Concentric, Spiral approaches. Qualities of a good Mathematics text book.
5. Methods of teaching mathematics- Heuristic method, Laboratory method, Inductive and Deductive methods, Analytic and Synthetic methods, Project method and Problem Solving method.
6. Unit Plan, Year Plan, Lesson Planning in Mathematics.
7. Instructional materials, Edgar Dale's Cone of Experience.
8. Evolving strategies for the gifted students and slow learners,
9. Techniques of teaching mathematics like Oral work, written work, Drilling, Assignment, Project, Speed and Accuracy.
10. Mathematics club, Mathematics structure, Mathematics order and pattern sequence.
11. Evaluation - Types, Tools and Techniques of Evaluation, Preparation of Standard Assessment Tools Analysis, Characteristics of a good test.