नेपाल सरकार

शिक्षक सेवा आयोग

माध्यमिक तहको खुला प्रतियोगितात्मक विषयगत परीक्षाको पाठ्यक्रम -२०७६

विषय: गणित   पुर्णाङ्क: १००

समय: ३ घण्टा

Section A

Unit 1: Teaching Arithmetic

1.1. **Set theory**: Set and notations, Relation between sets, Operations on sets, Algebra of sets, Venn-Diagrams and related problems

1.2. **Percentage and Application**: Money Exchange, Discount and VAT, Profit and loss, Home arithmetic

1.3. **Sequence and Series**: Arithmetic, Geometric and Harmonic sequence and series, nth term and sum, A.M, G.M, H.M and their relations

1.4. **Investment and Growth**: Compound interest, Compound depreciation, Population growth

1.5. **Mensuration**: Area of triangle, Area and volume of prism, Area and volume of cylinder and sphere, Area and volume of pyramid and cone, Cost and estimation

Unit 2: Teaching Algebra and Geometry

2.1. **School Algebra**: Algebraic Expressions, Radical and surds, Polynomials and rationales, Indices, Linear and quadratic equation

2.2. **Geometry**: Triangle, Quadrilateral, Circle, Tangent to Circle, Construction

2.3. **Analytic Geometry**: Straight line, Homogeneous equation, Pair of lines, Angle between two lines.

2.4. **Transformation Geometry**: Reflection, Rotation, Translation and Enlargement

2.5. **Vector and Scalar**: Definitions, Scalar product, Vector product, Application vector in geometry

Unit 3: Teaching Pre-Calculus

3.1. **Matrices and Determinants**: Definition of matrix, Transpose and inverse, Determinants of 2×2 and 3×3 matrix, Properties of determinants and problems, Solution of system of linear equation (Cramer's rule)

3.2. **Linear Programming, Function and Graph:** Graphical, Simplex Method, Odd and even functions, Symmetry (about origin, X-axis and Y-axis), Sketching graphs of quadratic function

3.3. **Trigonometry**: Unit, circle, algebric, Trigonometric, exponential and their graph, composite and inverse function.Trigonometric identities, general values, solution of triangles and inverse functions

3.4. **Complex Number**: Definition, Absolute value, Conjugate, Algebra of complex number, De- Moivre's theorem

3.5. **Conic Section**: Definition, Ellipse, Parabola and Hyperbola (standard equation and example)

Unit 4: Teaching Statistics

4.1. **Counting Principles and Induction**: Counting principle, permutation, combination, mathematical induction

4.2. **Probability**: Mathematical expectation, conditional probability, Bayes' theorem.

4.3. **Measures of Central Tendency**: Mean, Median, Mode, Relations among them

4.4. **Measure of Dispersion**: Range and Quartile deviation, Mean deviation, Standard deviation, Coefficient of variation.

4.5. **Correlation and Regression**: Correlation coefficient and its properties, Pearson's correlation, Spearman's correlation, Regression equations of two variables

Unit 5: Overview of Mathematics Curriculum of Secondary Level

5.1. **Curriculum and Textbook**: Comparative study of mathematics curriculum, Textbooks and Teachers guide of grade 9 -12

5.2. **Teaching Materials**: Development and use of of teaching and supplementary materials in mathematics teaching

5.3. **Evaluation and Testing:** Testing and and evaluation in mathematics teaching, specification grid

5.4. **Assessment**: Continuous assessment system, grading system in student assessment,

5.5. **Error analysis:** Correction of error and error analysis

Section B

Unit 6: Calculus and Mechanics

6.1. **Limit and Continuity**: Meaning of $x \rightarrow a$, Limit of a function, Left hand and right-hand limit, Continuities and discontinuities of a function.

6.2. **Derivative**: Derivative and its geometrical meaning (slope of tangent), Techniques of differentiation, Application of derivative (Maxima/Minima, increasing/decreasing, concavity), Rolle's and Mean value theorem.

6.3. **Integration**: Definition, Techniques of integrations (substitutions, by parts), Fundamental theorem of calculus, Application of integration (area, volume)

6.4. **Numerical Interpolation**: Interpolation, numerical differentiation numerical integration

6.5. **Dynamics and Statics**: Introduction, Mechanics, Law of forces, Resultant forces and equilibrium forces.

Unit 7: Geometry and Differential Equation

7.1. **Euclidean Geometry and its Elements**: Introduction to Euclidian Geometry, Fifth postulates, Foundations, Congruence, Similarity

7.2. **Non-Euclidean Geometry**: Shortcomings of Euclidean Geometry, Discovery of Non-Euclidean Geometry, Elliptic Geometry, Hyperbolic Geometry, Comparison among three geometries

7.3. **Three-Dimensional Geometry**: Coordinate System, Direction cosines/ratios, Equation of straight line

7.4. **Surface Topology**: Polyhedron, Euler's Formula, Euler's characteristics for surface, Orientability of surface and four color problems

7.5. **Differential Equation**: Order and degree, First order first degree equation, Method of variable separable, Homogenous equation

Unit 8: History of Mathematics and Geometric Transformation

8.1. **Numeration System**: Egyptian, Babylonian, Roman, Hindu-Arabic and Devanagari, Characteristics of the numeration system

8.2. **History of Mathematics**: The problems of Antiquity, Medieval mathematics, Modern mathematics

8.3. **Isometric Transformation**: Reflection, rotation, half turn and glide reflection and derivation

8.4. **Non-Isometric Transformation**: Enlargement and reduction and derivation

Unit 9: Probability

9.1. **Joint Probabilty Dostribution:** Marginal and conditional distribution, moment and moment generating function.

9.2. **Discrete Probability Distribution:** Binomial, poison, hypergeometric distribution (Derivation of mean, variance, moment generating function)

9.3. **Continous Probability Distribution:** Normal distribution, beta and gamma distribution.

9.4. **Hypothesis Testig:** Introduction, types of error, critical value and significance level. T-test and Z-test.

9.5. **Non-Parametric Test:** Introduction and application, sign test, rank test, H- test and test of randomness.

Unit 10: Recent Trends in Mathematics Education

10.1. **Philosophy of Mathematics Education**: Introduction and its components, Foundations of mathematics education, components and shift in philosphy.

10.2. **Learning Theories of Mathematics Education**: Three major schools of thoughts (Behaviorist, Cognitivist & Constructivist), Major contributions of major theorists (Piaget and Bruner)

10.3. **Trends in Mathematics Education**: Objectives and contents, Methods and materials, Students' and Teachers' role, Assessments, Research in mathematics

10.4. **Issues of Mathematics Education**: Introduction, Teaching and learning, Assessment of mathematics, Culture of mathematics teaching

10.5. **ICT in Mathematics Education**: Introduction, Use of ICT tools to explore mathematical knowledge, Models on Teaching mathematics using ICTs

<p style="text-align:center">Specification Grid</p>

Subject: Mathematics   **Level: Secondary**

Units	Contet area	Questions and weight	Full Marks	Time
	Section A			
1	Teaching Arithmetic	1×10	10	3 Hours
2	Teaching Algebra and Geometry	1×10	10	
3	Teaching Pre-calculus	1×10	10	
4	Teaching Statistics	1×10	10	
5	Overview of Mathematics Curriculum of Secondary Level	1×10	10	
	Section B			
6	Calculus and Mechanics	1×10	10	
7	**Geometry and Differential Equation**	1×10	10	
8	Probability and History of Mathematics	1×10	10	
9	Higher Mathematics	1×10	10	
10	Recent Trends in Mathematics Education	1×10	10	
Total		10×10	100	

Notes:

1. This curriculum is divided into sections A & Section B.

2. Generally from section A, questions will be asked related to pedagogy.

3. From section B questions will be asked covering cognitive level.

4. Separate answer sheets will be used for each section.

5. The medium of the language in written test will be either Nepali or English or both.

5. This curriculum will be affected from 2076/11 / 20.