

नेपाल सरकार
शिक्षक सेवा आयोग
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम
२०७३

तह : निम्न माध्यमिक

विषय : गणित

Section B: Curriculum, Pedagogy and Technology in Mathematics Teaching in Lower Secondary Level

- 40 Marks

Unit I: Study the School level Mathematics Curriculum (Lower secondary/ Basic level)

- 1.1 Study of Basic/lower Secondary School Curriculum(grade 1 – 8)
 - 1.1.1 National curriculum framework, National goals of education and goals of mathematics education of basic school/lower secondary school.
- 1.2 Analysis of general objectives of education, objectives of mathematics education(level, grade wise objectives of mathematics education in basic/lower secondary school education)
- 1.3 Examine vertical and horizontal content organization in mathematics curriculum of the basic level/lower secondary level curriculum
- 1.4 Relevance of basic /lower secondary school mathematics curriculum to the changing needs and reality of society.
- 1.5 Curriculum materials and their use in planning for classroom teaching
- 1.6 Historical review of basic/lower secondary school curriculum in Nepal
- 1.7 Problem and issues in implementing basic/lower secondary Mathematics curriculum in Nepal

Unit II: Learning Theories in Mathematics Education

- 2.1 Overview of different schools of thoughts in theories of learning
- 2.2 Piaget cognitive development theory and its educational implications mathematics education
- 2.3 Bruner's theory of learning and its educational Implications in mathematics education.
- 2.4 Contrasting ideas on Piaget and Bruner's theory of learning (product vs process) and implication in classroom teaching.
- 2.5 Constructivist perspectives and approach in mathematics learning and its implication in instructional planning

Unit III: Common Teaching Strategies used in Mathematics Teaching

- 3.1 Teacher-centered vs student-centered strategies

- 3.2. Common strategies used in mathematics teaching
 - a. Lecture Methods and its use with suitable examples
 - b. Discussion Methods and its use with suitable examples
 - c. Inductive vs Deductive teaching and its use with suitable examples
 - d. Problem solving methods and its use with suitable examples
 - e. Co-operative methods and its use with suitable examples
 - f. Constructive methods and its use with suitable examples
- 3.3. Gender, culture and mathematics learning at basic/lower secondary level

Unit IV: Planning for Instruction

- 4.1 Operation Calendar and its preparation
- 4.2 Annual Plan and its preparation
- 4.3 Unit Plan and its preparation
- 4.4 Lesson Planning: Behavioral objectives and Bloom's taxonomy and related action verbs, writing behavioral objectives. lesson procedures
- 4.5. Planning lessons focusing in different strategies of instruction
- 4.6 Planning for Micro-teaching
- 4.7 Use of diagnostic test and planning for remedial teaching

Unit V: Instructional Materials and Classroom Management

- 5.1 Types of instructional Materials: hands-on manipulative and technology based materials
- 5.2 Hands-on Materials for basic/lower secondary mathematics
- 5.3 Technology based interactive and dynamic materials
- 5.4. Selection of appropriate text, web-based freely available materials and their use in classroom teaching and students' individual learning
- 5.5 Preparation/construction and Use of some instruction materials (Local, low cost/no cost materials)
- 5.6 Classroom setting for different instructional organizations and furniture management
- 5.7. Classroom questions and questioning techniques during teaching
- 5.8 Diversity management in class (cognitive, cultural and motivational)
- 5.9 Grade, multi-grade and subject teaching management

Unit VI: Assessment of Students Performance

- 6.1 Assessment vs evaluation in mathematics education (summative and formative)
- 6.2 Continuous assessment and testing: assumptions, objectives and challenges in practices
- 6.3 Liberal Promotion Policy and practice in basic/lower secondary schools and its use in assessing achievement of students in mathematics: status and challenges
- 6.4 Types of test, Quality of good test and test construction(use of specification grid)
Teacher made test(Subjective, objective), Diagnostic test
- 6.5 Scoring and grading (letter grading) system
- 6.6 Portfolio assessment systems and its use in grading students' performance
- 6.7 Reliability and validity of test
- 6.8 Standardizing test in mathematics Item analysis (P and D), and Scoring Key
- 6.9 Issues of examination in Nepal

Unit VII: Teaching of Selected Mathematical Contents at Basic/Lower secondary Level Curriculum

- 7.1 Teaching of Sets
- 7.2 Teaching of Arithmetic
- 7.3 Teaching of Algebraic
- 7.4 Teaching of Geometry
- 7.5 Teaching of Statistics
- 7.6 Teaching of Transformational geometry, symmetry, Tessellation and Scale drawing

Section B: Content knowledge of the Subject Matter**40 Marks****Unit VIII: Basics of Numbers, its extension and Logics**

- 8.1 Numbers and Numerals, Different Numeration Systems.
- 8.2. Set and set operations(including theorems' proofs)
- 8.3. Mathematical Logics (\vee , \wedge , \neg , truth table, basic laws) and writing mathematical language
- 8.4 Counting System: Combination and Permutation
- 8.5 Real Number System and Algebra of complex numbers
- 8.6 Sequence and Series
- 8.7 Sum of finite natural numbers (n , n^2 , n^3)

8.8 Principle of mathematical induction and its applications

Unit IX: Basic Algebra and Its extension

9.1. Transition from arithmetic to algebra

9.2. Relations, Equivalence relations, Binary Operation and Group Structure

9.3 Function, Graphs and Curve Tracing

9.4 Polynomials and Rational Function (Relation between roots and coefficients)

9.5 Exponential and Logarithmic Function

9.6 Matrix (its inverse) and Determinants (its Properties)

9.7 System of Linear (Cramer's rule) and Quadratic Equations

9.8 System of inequalities and LPP solutions

9.9 Binomial expansions

Unit X: Fundamental Trigonometry and Extension

10.1 Trigonometric function and Unit Circle

10.2 Radian and Degree Measure(circular measure)

10.3 Solution of trigonometric equations

10.4 Inverse Trigonometric function

10.5 Properties of Triangles

10.6 Sum, difference, multiple angles and product-sum formulae of trigonometric ratios

10.7 DeMoivre's theorem, nth roots and Euler's formula

Unit XI: Euclidean and Analytic Geometry

11.1 Fundamentals of Euclidean Geometry: History and development, fundamental properties of Euclidean geometry and axiomatic system

11.2 Selected theorems on parallel lines, triangles, quadrilaterals and circles.

11.3 Construction of triangle and quadrilateral

11.4 Area and volume of plane and solid figure

11.5 Analytic Geometry: History and development

11.6. Distance formula, Equation of st. lines, Pairs of straight lines (Perpendicular and bisectors)

11.7 Definitions and graphical representation of conic sections

11.8 Circles and related theorems and problems

11.9 General concept of Parabola, Ellipse and Hyperbola related

Unit XII: Descriptive Statistics and Probability

- 12.1 Data generation(discrete and continuous data) and display of data.
(Frequency Distribution and Graphical Representation)
- 12.2 Cumulative frequency distribution (discrete and continuous data)
- 12.3 Measure of Central tendency (AM, GM, HM)
- 12.4 Measure of Dispersion (Range, MD, SD, Skewness, Kurtosis)
- 12.5 Measure of correlation (Pearson, Spearman) and Regression Line
- 12.6 Simple probability, exclusive and independent events, tree diagram
- 12.6 Compound probabilities
- 12.7 Binomial probability distribution and its properties

Unit XIII: Differential and Integral Calculus

- 13.1 Limit and continuity of functions and related problems
- 13.2 Derivatives of functions and related problems
- 13.3 Relation between derivatives and integration
- 13.4 Integration of given function and related problems
- 13.5 Application of derivatives and integration

Unit XIV: Vector and Its Application

- 14.1 Definition and representation of Vectors and different types of vectors
- 14.2 Operation on vectors: addition, subtraction, and vector product(Scalar and Vector Product) with geometrical representations
- 14.3 Vector Geometry (Line, triangles, quadrilaterals)
- 14.4 Application of vectors (in Geometry, Trigonometry)

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