121 Knec Mathematics Syllabus

FORM 1

1. NATURAL NUMBERS

1. Place values of numbers
2. Round off numbers to the nearest tens, hundreds, thousands, millions and billions
3. Odd numbers
4. Even numbers
5. Prime numbers
6. Word problems involving natural numbers

2. FACTORS

1. Factors of composite numbers
2. Prime factors
3. Factors in power form

3. DIVISIBILITY TESTS

1. Divisibility tests of numbers by 2,3,4,5,6,7,8,9,10,11

4. GREATEST COMMON DIVISOR (GCD) / HIGHEST COMMON FACTOR (HCF)

1. Greatest common divisor of a set of numbers
2. Application of GCD /HCF to real life situations

5. LEAST COMMON MULTIPLE (LCM)

1. Multiples of a number
2. LCM of a set of numbers
3. Application of LCM in real life situations

6. INTEGERS

1. Introduction to integers
2. The number line
3. Operation on integers
4. Order of operations
5. Application in real life situations

7. FRACTIONS

1. Introduction to fractions
2. Proper, improper fractions and mixed numbers
3. Conversion of improper fractions to mixed numbers and vice versa
4. Comparing fractions
5. Operations on fractions
6. Order of operations on fractions
7. Word problems involving fractions in real life situations

8. DECIMALS

1. Fractions and decimals
2. Recurring decimals
3. Recurring decimals and fractions
4. Decimal places
5. Standard form
6. Operation on decimals
7. Order of operations
8. Real life problems involving decimals

9. SQUARES AND SQUARE ROOTS

1. Squares by multiplication
2. Squares from tables
3. Square roots by factorization
4. Square roots from tables

10. ALGEBRAIC EXPRESSIONS

1. Letters for numbers
2. Algebraic expressions including algebraic fractions
3. Simplification of algebraic expressions
4. Factorisation by grouping
5. Removal of brackets
6. Substitution and evaluation
7. Problem solving in real life situations

11. RATES, RATIO, PERCENTAGES AND PROPORTION

1. Rates
2. Solving problems involving rates
3. Ratio
4. Comparing quantities using ratios
5. Increase and decrease in a given ratio
6. Comparing ratios
7. Proportion: direct and inverse
8. Solve problems involving direct and inverse proportions
9. Fractions and decimals as percentages
10. Percentage increase and decrease
11. Application of rates, ratios, percentages and proportions to real life situations

12. LENGTH

1. Units of length
2. Conversion of units of length from one form to another
3. Significant figures
4. Perimeter
5. Circumference (include length of arcs)

13. AREA

1. Units of area
2. Conversion of units of area
3. Area of regular plane figures
4. Area of irregular plane shapes
5. Surface area of cubes, cuboid and cylinder

14. VOLUME AND CAPACITY

1. Units of volume
2. Conversion of units of volume
3. Volume of cubes, cuboid and cylinders
4. Units of capacity
5. Conversion of units of capacity
6. Relationship between volume and capacity
7. Solving problems involving volume and capacity

15. MASS, DENSITY AND WEIGHT

1. Mass and units of mass
2. Density
3. Problem solving involving real life experiences on mass, volume, density and weight
4. Weight and units of weight
5. Mass and weight

16. TIME

1. Units of time
2. 12 hr and 24 hr system
3. Travel time-tables
4. Problem solving involving travel time tables

17. LINEAR EQUATIONS

1. Linear equations in one unknown
2. Simultaneous linear equations
3. Formation and solution of linear equations in one and two unknowns from given real life situations

18. COMMERCIAL ARITHMETIC

1. Currency
2. Currency exchange rates
3. Currency conversion
4. Profit and loss
5. Percentage profit and loss
6. Discounts and commissions
7. Percentage discounts and commissions

19. CO-ORDINATES AND GRAPHS

1. Cartesian plane
2. Cartesian co-ordinates
3. Points on the Cartesian plane
4. Choice of appropriate scale
5. Table of values for a given linear relation
6. Linear graphs
7. Graphical solutions of simultaneous linear equations
8. Interpretation of graphs

20. ANGLES AND PLANE FIGURES

1. Types of angles
2. Angles on a straight line
3. Angles at a point
4. Angles on a transversal
5. Corresponding angles
6. Angle properties of polygons
7. Application to real life situations

21. GEOMETRICAL CONSTRUCTIONS

1. Construction of lines and angles using a ruler and compasses only
2. Construction of perpendicular and parallel lines using a ruler and a set square only
3. Proportional division of a line
4. Construction of regular polygons (upto a hexagon)
5. Construction of irregular polygons (upto a hexagon)

22. SCALE DRAWING

1. Types of scales
2. Choice of scales
3. Sketches from given information and scale drawing
4. Bearings
5. Bearing, distance and locating points
6. Angles of elevation and depression
7. Solving problems involving bearings, scale drawing, angles of elevation and depression
8. Simple surveying techniques

23. COMMON SOLIDS

1. Common solids, e.g cubes, cuboids, pyramids, prisms, cones, spheres and cylinders e.t.c
2. Sketches of solids
3. Nets of solids
4. Models of solids from nets
5. Surface area of solids from nets (include cubes,
cuboids, cones, pyramids, prisms)
6. Distance between two points on the surface of a solid

*** FORM 2**

1. CUBES AND CUBE ROOTS

1. Cubes of numbers by multiplication
2. Cubes from tables
3. Cube roots of numbers by factor method
4. Evaluation of cube and cube root expressions
5. Application of cubes and cube roots to real life situations

2. RECIPROCALS

1. Reciprocals of numbers by division
2. Reciprocals of numbers from tables
3. Computation using reciprocals

3. INDICES AND LOGARITHMS

1. Indices (powers) and base
2. Laws of indices (including positive integers, negative integers and fractional indices)
3. Powers of 10 and common logarithms
4. Common logarithms
    1. Characteristics
    2. Mantissa
5. Logarithm tables
6. Application of common logarithms in multiplication, division and finding roots

4. EQUATIONS OF STRAIGHT LINES

1. Gradient of straight line
2. Equation of a straight line
3. The equation of a straight line of the form y=mx+c
4. The x and y intercepts of a line
5. The graph of a straight line
6. Perpendicular lines and their gradients
7. Parallel lines and their gradients
8. Equations of parallel and perpendicular lines

5. REFLECTION AND CONGRUENCE

1. Lines and planes of symmetry
2. Mirror lines and construction of objects and images
3. Reflection as a transformation
4. Reflection in a Cartesian plane
5. Direct and opposite congruency
6. Congruency tests (SSS,SAS,AAS,ASA and RHS)

6. ROTATION

1. Properties of rotation
2. Centre and angle of rotation
3. Rotation in the Cartesian plane
4. Rotation symmetry of plane figures and solids point axis and order)
5. Congruence and rotation

7. SIMILARITY AND ENLARGEMENT

1. Similar figures and their properties
2. Construction of similar figures
3. Properties of enlargement
4. Construction of objects and images under enlargement
5. Enlargement in the cartesian plane
6. Linear, volume, area and scale factors
7. Real life situations

8. PYTHAGORAS THEOREM

1. Pythagoras theorem
2. Solutions of problems using Pythagoras theorem
3. Application to real life situations

9. TRIGONOMETRY

1. Tangent, cosine and sine of angles
2. Trigonometric tables
3. Angles and sides of a right angled triangle
4. Sine and cosine of complimentary angles
5. Relationship between tangent, sine and cosine
6. Trigonometric ratios of special angles 30, 45,60 and 90
7. Logarithm of a sine, a cosine and a tangent
8. Application of trigonometry to real life situations

10. AREA OF A TRIANGLE

1. Area of a triangle
1. A=1/2 ab sin c

2. Application to real life situations

11. AREA OF QUADRILATERALS AND OTHER POLYGONS

1. Area of quadrilaterals
2. Area of other polygons (Regular and irregular)

12. AREA OF A PART OF A CIRCLE

1. Area of a sector
2. Area of a segment
3. Area of a common regions between two circles

13. SURFACE AREA OF SOLIDS

1. Surface area of prisms, pyramids, cones, frustrums and spheres

14. VOLUME OF SOLIDS

1. Volume of a prism, a pyramid, a cone, a frustrum and a sphere

15. QUADRATIC EXPRESSIONS AND EQUATIONS

1. Expansion of algebraic expressions
2. The three quadratic identities
3. Using the three quadratic identities
4. Factorisation of quadratic expressions
5. Solutions of quadratic equations by factor method
6. Formation and solution of quadratic equations

16. LINEAR INEQUALITIES

1. Inequalities on a number line
2. Simple and compound inequality statements
3. Linear inequality in one unknown
4. Graphical representation of linear inequalities
5. Graphical solutions of simultaneous linear inequalities
6. Simple linear inequalities from inequality graphs
7. Inequalities from inequality graphs

17. LINEAR MOTION

1. Displacement, velocity, speed and acceleration
2. Determining velocity and acceleration
3. Solve problems involving relative speed
4. Distance-time graph
5. Velocity time graph
6. Interpretation of graphs of linear motion
7. Relative speed

18. STATISTICS

1. Definition of statistics
2. Collection and organisation of data
3. Frequency distribution tables (for grouped and ungrouped data)
4. Grouping data
5. Mean, mode and median
6. Representation of data
1. Line graph
2. Bar graph
3. Pie chart
4. Pictogram
5. Histogram
6. Frequency polygon
7. Interpretation of data

19. ANGLE PROPERTIES OF A CIRCLE

1. Arc, chord and segment
2. Angles subtended by the same arc at the circumference
3. Relationship between angles subtended at the centre and angle subtended on the circumference by the same arc
4. Angle in a semi circle
5. Angles properties of a cyclic quadrilaterals
6. Finding angles of a cyclic quadrilateral

20. VECTORS

1. Vector and scalar quantities
2. Vector notation
3. Representation of vectors
4. Equivalent vectors
5. Addition of vectors
6. Multiplication of a vector by a scalar
7. Column vectors
8. Position vectors
9. Magnitude of a vector
10. Midpoint of a vector
11. Translation vector

* FORM 3

1. QUADRATIC EXPRESSIONS AND EQUATIONS(2)

1. Factorisation of quadratic expressions
2. Perfect squares
3. Completion of the square
4. Solution of quadratic equation by completing square method
5. Quadratic formulae
6. Solutions of quadratic equations using the formulae
7. Formation of quadratic equations and solving them
8. Tables of values for a given quadratic relation
9. Graphs of quadratic equations
10. Simultaneous equations-one linear and one quadratic
11. Application to real life situations

2. APPROXIMATIONS AND ERRORS

1. Computing using calculators
2. Estimations and approximations
3. Significant figures
4. Absolute, relative, percentage, round-off and truncation errors
5. Propagation of errors from simple calculations
6. Maximum and minimum errors

3. TRIGONOMETRY (2)

1. The unit circle
2. Trigonometric ratios from the unit circle
3. Trigonometric ratios of angles greater than 360 and negative angles
4. Using trigonometric tables

5. Radian measure
6. Simple trigonometric graphs
7. Derivation of sine and cosine rule
8. Solution of triangles
9. Application of sine and cosine rule to real situation

4. SURDS

1. Rational and irrational numbers
2. Simplification of surds
3. Rationalisation of denominators

5. FURTHER LOGARITHMS

1. Logarithmic notation
2. The laws of logarithms
3. Simplification of logarithmic equations
4. Further computations using logarithmic laws.

6. COMMERCIAL ARITHMETIC

1. Principal rate and time
2. Simple interest
3. Compound interest using step by step method
4. Derivation of compound interest formulae
5. Calculations using the compound interest formula
6. Appreciation and depreciation
7. Calculation of appreciation and depreciation using the compound interest formula
8. Hire purchase
9. Income tax

7. CIRCLES CHORDS AND TANGENTS

1. Arcs, chords and tangents
2. Lengths of tangents and intersecting chords
3. Properties of chords
4. Construction of tangents to a circle
5. Direct and transverse common tangents to two circles
6. Angles in alternate segment
7. Circumscribed, inscribed and described circles
8. Centroid and orthocentre
9. Apply knowledge of tangents and chords to real life situations

8. MATRICES

1. Matrix
2. Order of a matrix
3. Square matrix
4. Compatibility in addition and multiplication of matrices
5. Multiplication of a matrix by a scalar
6. Matrix multiplication
7. Identity matrix
8. Determinant of a 2x2 matrix
9. Inverse of a 2x2 matrix and singular matrix
10. Solutions of simultaneous linear equations in two unknowns

9. FORMULA AND VARIATIONS

1. Change of the subject
2. Direct, inverse, partial and joint variations
3. Constant of proportionality
4. Graphs of direct and inverse proportion
5. Formation of equation on variation from real life situations

10. SEQUENCES AND SERIES

1. Simple number patterns
2. Sequences
3. Arithmetic sequence
4. Geometric sequence
5. Determining a term in the sequence
6. Arithmetic progression (A.P)
7. Geometric Progression (G.P)
8. Sum of an A.P
9. Sum of a G.P
10. Application of A.P and G.P to real life situations

11. VECTORS (2)

1. Co-ordinates in two and three dimensions
2. Column and position vectors in three dimensions
3. Column vectors in terms of unit vectors and
4. Magnitude of a vector
5. Parallel vectors
6. Collinearity
7. Proportional division of a line
8. Ratio theorem
9. Vector methods in geometry

12. BINOMIAL EXPANSION

1. Binomial expansion up to power four
2. Pascal's triangle
3. Coefficient of terms in binomial expansion
4. Computation using binomial expansion
5. Evaluation of numerical cases using binomial expansion

13. PROBABILITY

1. Probability
2. Experimental probability
3. Range of probability measure 0Range of probability measure 0<p(x)Range of probability measure 0<p(x)<1 </p(x)
4. Probability space
5. Theoretical probability
6. Discrete and continuous probability (simple cases only)
7. Combined events (mutually exclusive and independent events)

8. Laws of probability
9. The tree diagrams

14. COMPOUND PROPORTIONS AND RATES OF WORK

1. Proportional parts
2. Compound proportions
3. Ratios and rates of work
4. Proportions applied to mixtures

15. GRAPHICAL METHODS

1. Tables and graphs of given relations
2. Graphs of cubic equations
3. Graphical solutions of cubic equations
4. Average rate of change
5. Instantaneous rate of change
6. Empirical data and their graphs
7. The line of best fit
8. Equation of a circle
9. Finding of the equation of a circle
10. Determining of the centre and radius of a circle

* FORM 4

1. MATRICES AND TRANSFORMATIONS

1. Transformation on the cartesian plane
2. Identification of transformation matrix
3. Successive transformations
4. Single matrix of transformation for successive transformations
5. Identity matrix and transformation
6. Inverse of a transformation
7. Area scale factor and determinant of a matrix
8. Shear and stretch (include their matrices)
9. Isometric and non-isometric transformation
10. Application of transformation to real life situations

2. STATISTICS

1. Mean from assumed mean
2. Cumulative frequency table
3. Ogive
4. Median
5. Quartiles
6. Range
7. Interquartile range
8. Quartile deviation
9. Variance
10. Standard deviation

3. LOCI

1. Common types of loci
2. Perpendicular bisector loci
3. Loci of a point at a given distance from a fixed point and a fixed line
4. Angle bisector loci
5. Constant angle loci
6. Other loci under given condition including intersecting loci
7. loci of inequalities
8. Loci involving chords

4. TRIGONOMETRY (3)

1. Trigonometric ratios
2. Deriving the relation
1. `(sin^{2}(x))+(cos^{2}(x))=1`
3. Graphs of trigonometric functions
1. y=sinx
2. y=cosx
3. y=tanx
4. y=a sinx
5. y=a cosx
6. y=a sinbx
7. y=a cosbx
8. y=a tanbx
9. `y=a sin(bx +- theta )`
10. `y=a cos(bx +- theta )`
11. `y=a tan(bx +- theta )`
4. Simple trigonometric equations amplitude, period,
wavelength and phase angle of trigonometric functions

5. THREE DIMENSIONAL GEOMETRY

1. Geometrical properties of common solids
2. Skew lines and projection of a line onto a plane
3. Length of a line in 3-dimensional geometry
4. The angle between
1. a line and a line
2. A line and a plane
3. A plane and a plane
5. Angles between skew lines

6. LONGITUDES AND LATITUDES

1. Latitude and longitudes (great and small circles)
2. The equator and Greenwich Meridian
3. Radii of small and great circles
4. Position of a place on the surface of the earth
5. Distance between two points along the small and great circles in nautical miles and kilometres
6. Distance in nautical miles and kilometres along a circle of latitude
7. Time and longitude
8. Speed in knots and kilometres per hour

7. LINEAR PROGRAMMING

1. Formation of linear inequalities
2. Analytical solutions of linear inequalities
3. Solutions of linear inequalities by graphs
4. Optimization (include objective function)
5. Application to real life situations

8. DIFFERENTIATION

1. Average and instantaneous rates of change
2. Gradient of a curve at a point
3. Gradient of `y=x^{n} (where n is a positive integer)
4. Delta notation `( Delta )`
5. Derivative of a polynomial
6. Equations of tangents and normals to the curve
7. Stationary points
8. Curve sketching
9. Application of differentiation in calculation of distance, velocity and acceleration
10. Maxima and minima

9. AREA APPROXIMATION

1. Area by counting techniques
2. Trapezium rule
3. Area using trapezium rule
4. Mid-ordinate rule
5. Area by the mid-ordinate rule

10. INTEGRATION

1. Differentiation
2. Reverse differentiation
3. Integration notation and sum of areas of trapezia
4. Indefinite and definite integrals
5. Area under a curve by integration
6. Application in kinematics