MATHEMATICS SYLLABUS: Ordinary level

Mathematics syllabus for secondary schools form I-IV in Tanzania, 2010 Edition.

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Form One

1. Numbers

1. Base Ten Numeration
    1. Identify the place value in each digit in base ten numeration
    2. Read numbers in base ten numeration
    3. Write numbers in base ten numeration up to one billion
    4. Apply numbers in daily life
2. Natural and Whole Number
    1. Distinguish between natural and whole numbers
    2. Identify even ,odd, and prime numbers
    3. Show even , odd and prime numbers on number lines
3. Operations with Whole Numbers
    1. Add whole numbers
    2. Subtract whole numbers
    3. Multiply whole numbers
    4. Divide whole numbers
    5. Use the four operations in solving word problems
4. Factors And Multiples Of Numbers
    1. Find factors of a number
    2. Find multiples of a number
    3. Use factors to find the greatest common factors(GCF) of numbers
5. Integers
    1. Identify integers
    2. Add integers
    3. Subtract integers
    4. Multiply integers
    5. Divide integers
    6. Perform mixed operations on integers

2. Fractions

1. Proper, Improper and Mixed Numbers
    1. Describe a fraction
    2. Distinguish proper, improper fractions and mixed numbers
2. Comparison of Fractions
    1. Simplify a fraction to its lowest terms

2. Identify equivalent fractions
3. Arrange fractions in order of size

3. Operations and Fractions
    1. Add fractions
    2. Subtract fractions
    3. Multiply fractions
    4. Divide fractions
    5. Perform mixed operations on fractions
    6. Solve word problems involving fractions

3. Decimal And Percentage

1. Decimals
    1. Explain the concept of decimals
    2. Convert fractions to terminating decimals and vice versa
2. Operations and Decimals
    1. Add decimals
    2. Subtract decimals
    3. Multiply decimals
    4. Perform mixed operations with decimals
    5. Solve word problems involving decimals
3. Percentages
    1. Express a quantity as a percentage
    2. Convert a fraction into percentage and vice versa
    3. Convert a decimal into percentage and vice versa
    4. Apply percentages in daily life

4. Units

1. Units of Length
    1. Convert one unit of length to another
    2. Perform computations on metric units of length
2. Unit of Mass
    1. Convert one unit of mass to another
    2. Perform computation on metric units of mass
3. Units of Time
    1. Convert one unit of time to another
    2. Read and convert unit time of 12 hour clock to 24 hour clock and vice versa
4. Units of Capacity
    1. State the standard unit of measuring capacity
    2. Use the litre in daily life

5. Approximations

1. Rounding Off Numbers
    1. Round off whole numbers to given place values
    2. Round off decimals to a given number of decimal place
2. Significant Figures
    1. Write a number to a given number of significant figures
3. Approximations in Calculations

1. Use the knowledge of rounding off of numbers in computations involving large numbers and small numbers

6. Geometry

1. Points and Lines
    1. Explain the concept of a point
    2. Extend the concept of a point to draw a line
    3. Distinguish between a line, a line segment and a ray
2. Angles and Lines
    1. Draw angles
    2. Measure angles of different size using a protractor
    3. Draw angles using a protractor
3. Constructions
    1. Construct a perpendicular bisector to a line segment
    2. Construct an angle of 60° using a pair of compasses
    3. Bisect a given angle
    4. Copy a given angle by construction
    5. Construct parallel lines
    6. Identify different types of angles formed by parallel lines and a transversal
4. Polygons And Regions
    1. Describe a polygon and a region
    2. Construct different types of triangles
    3. Construct different quadrilaterals
5. Circles
    1. Draw a circle
    2. Describe different parts of a circle

7. Algebra

1. Algebraic Operations
    1. Use symbols to form algebraic expressions
    2. Simplify algebraic expressions
2. Equations with One Unknown
    1. Solve an equation with one unknown
    2. Form and solve an equation from word problems
3. Equations with Two Unknowns
    1. Solve simultaneous equations
    2. Solve linear simultaneous equations from practical situations
4. Inequalities
    1. Solve linear inequalities in one unknown
    2. Form linear inequalities from practical situations

8. Numbers (II)

1. Rational Numbers
    1. Define a rational number
    2. Perform the basic operations on rational numbers
2. Irrational Numbers
    1. Define irrational numbers
3. Real Numbers

1. Define real numbers
2. Find absolute value of real numbers
3. Solve related practical problems

9. Ratio, Profit And Loss

1. Ratio
    1. Express a ratio in its simplest form
    2. Divide a given quantity into proportional parts
2. Profits and Loss
    1. Find profit or loss
    2. Calculate percentage profit and percentage profit and percentage loss
3. Simple Interest
    1. Calculate simple interest
    2. Solve real life problems related to simple interest

10. Coordinate Geometry

1. Coordinates of a Point
    1. Read the coordinates of a point
    2. Plot a point given its coordinates
    3. Locate a point on the coordinates
2. Gradient (Slope) of a Line
    1. Calculate the gradient of a line given two points
3. Equation of a Line
    1. Find the equations of a line given the coordinates of two points on a line
4. Graphs of Linear Equations
    1. Form the table of value
    2. Draw the graph of a linear equation
5. Simultaneous Equations
    1. Solve linear simultaneous equations graphically

11. Perimeters And Areas

1. Perimeters of Triangles and Quadrilaterals
    1. Find the perimeters of triangles and quadrilaterals
2. Circumference of a Circle
    1. Estimate the value of Pi (Π)
    2. Calculate the circumference of a circle
3. Areas of Rectangles and Triangles
    1. Calculate the area of a rectangle
4. Areas of Trapezium and Parallelogram
    1. Calculate area of a parallelogram
    2. Calculate the area of a trapezium
5. Area of a Circle
    1. Calculate areas of circle

Form Two

1. Exponents And Radicals

1. Exponents
    1. List the laws of exponents
    2. Verify the laws of exponents
    3. Apply laws of exponents in computations
2. Radicals
    1. Simplify radicals
    2. Perform basic operations on radicals
    3. Rationalize the denominator
    4. Read square roots and cube roots of numbers from mathematical tables
3. Transposition of Formula
    1. Re-arrange letters so that one letter is the subject of the formula
    2. Transpose a formulae with square roots and square

2. Algebra

1. Binary Operations
    1. Describe the binary operations
    2. Perform binary operations
2. Brackets in Computation
    1. Perform basic operations involving brackets
    2. Simplify algebraic expressions involving the basic operations and brackets
3. Quadratic Expressions
    1. Form a quadratic expression from two linear factors
    2. Write the general form of quadratic expression
4. Factorization
    1. Factorize linear expressions
    2. Factorize quadratic expressions

3. Quadratic Equations

1. Solving Equations
    1. Determine the solution of a quadratic equation by factorization
    2. Find the solution of a quadratic equation by completing the square
2. General Solution of Quadratic Equations
    1. Derive the quadratic formula
    2. Solve quadratic equations using quadratic formula

4. Logarithms

1. Standard Form
    1. Write numbers in standard form
    2. Perform computations which involved multiplication and division of numbers expressed in standard form
2. Laws Of Logarithms
    1. State the laws of logarithms

2. Verify the laws of logarithms using the knowledge of exponents
3. Use the laws of Logarithms to simplify logarithmic expressions
4. Solve logarithmic equation
5. Apply laws of logarithms to find products, quotients, roots and powers of numbers
6. Apply logarithmic tables to find products and quotients of numbers computation
7. Apply logarithmic tables to find roots and power of numbers

5. Congruence

1. Congruence of Triangles
    1. Determine the conditions for congruence of triangles
    2. Prove congruence of triangle
    3. Apply theorems on congruence of triangles to solve related problems

6. Similarity

1. Similar Figures
    1. Identify similar polygons
    2. Prove similarity theorems of triangles

7. Geometric And Transformations

1. Reflection
    1. Describe the characteristics of reflection in a plane
    2. Represent different reflections by drawings
2. Rotations
    1. Describe characteristics of a rotation on a plane
    2. Represent different rotation on a plane by drawings
3. Translation
    1. State properties of translations
    2. Represent translations drawings
4. Enlargement
    1. Develop a scale of enlargement
    2. Construct enlargement of a given figures
    3. Draw figures to scale
    4. Find actual distances represented by a scale drawings
5. Combined Transformations
    1. Draw combined transformations
    2. Solve simple problems on combined transformations

8. Pythagoras Theorem

1. Proof of Pythagoras Theorem
    1. Prove the pythagoras theorem
2. Application of Pythagoras Theorem
    1. Apply the pythagoras theorem to solve daily life problems

9. Trignometry

1. Trigonometric Rations
    1. Define sine, cosine and tangent of an angle using a right angled triangle
2. Trigonometric Ratios of Special Angles

1. Determine the sine, cosine and tangent of 30°, 45° and 60° without using mathematical tables
2. Solve simple trigonometric problems related to special angles

3. Trigonometric Tables
    1. Read the trigonometric ratios from tables
    2. Solve problems involving trigonometric ratios from tables
4. Angles of Elevation and Depression
    1. Demonstrate angles of elevation and angles of depression
    2. Solve Problems involving angles of elevation and angles of depression

10. Sets

1. Description of a Set
    1. Define a set
    2. List the members of a set
    3. Name a set
    4. Distinguish sets by listing and by stating the members
2. Types of Sets
    1. Define a universal set and an empty set
    2. Distinguish between finite and infinite sets
    3. Distinguish between equivalent and equal sets
3. Subsets
    1. Define a subset
    2. List subsets of a given set
    3. Distinguish between proper and improper subsets
    4. Calculate the number of subsets in a set
4. Operations With Sets
    1. Find union of two sets
    2. Find the compliment of a set
    3. Find the number of elements in the union and intersection of two sets
5. Venn Diagrams
    1. Represent a sets by using venn diagrams
    2. Interpret information from venn diagrams

11. Statistics

1. Pictograms
    1. Display Information by pictograms
    2. Interpret pictograms
2. Bar Charts
    1. Draw horizontal and vertical bar charts
    2. Interpret bar chart
3. Line Graphs
    1. Represent data using line graphs
    2. Interpret line graphs
4. Pie Chart
    1. Display data using pie charts
    2. Interpret pie charts
5. Frequency Distribution Tables
    1. Make frequency distribution tables from raw data

    2. Interpret frequency distribution table form raw data
    3. Interpret frequency distribution tables
6. Frequency Polygons
    1. Draw frequency polygons from frequency distribution tables
    2. Interpret frequency polygons
7. Histograms
    1. Draw histograms from frequency distribution table
    2. Interpret histograms
8. Cumulative Frequency Curves
    1. Draw cumulative frequency curves from a cumulative frequency distribution table
    2. Interpret a cumulative frequency curve

Form Three

1. Relations

1. Relations
    1. Find relations between two sets
    2. Find relations between members in a set
    3. Demonstrate relations pictorially
2. Graph of a Relation
    1. Draw a graph of a relation represented by a linear inequality
3. Domain and Range of a Relation
    1. State the domain of relation
    2. State the range of a relation
4. Inverse of a Relation
    1. Explain the Inverse of a relation pictorially
    2. Find inverse of a relation
    3. Draw a graph of the inverse of a relation

2. Functions

1. Representation of a Function
    1. Explain the concept of a functions pictorially
    2. Identify functions
2. Domain and Range of a Function
    1. State the domain of a function
    2. State the range of function
3. Graphic Function
    1. Draw graphs of functions
4. Inverse of a Function
    1. Explain the inverse of a function
    2. Show the inverse of a function pictorially
    3. Find the inverse of a function
    4. Draw a graph of the inverse of a function
    5. State the domain and range of inverse of functions

3. Statistics

1. Mean
    1. Calculate the mean from a set of data, frequency distribution tables and histogram
    2. Interpret the mean obtained from a set data, frequency distribution tables and histogram
2. Medium
    1. Explain the concept of median
    2. Calculate the medium from a set of data
    3. Find the median using frequency distribution tables and cumulative curve
    4. Interpret the median obtained from the data
3. Mode

1. Explain the concept of mode
2. Calculate the mode
3. Find the mode using frequency distribution and a histogram
4. Interpret the mode obtained from the data

4. Rates And Variations

1. Rates
    1. Relate rates of quantities of different kinds
    2. Relate quantities of the same kind
    3. Convert Tanzanian currency into other currencies
2. Variations
    1. Explain the concept of direct variation
    2. Solve problems on direct variations
    3. Draw graphs of direct variation
    4. Explain the concept of inverse variation
    5. Solve problems on inverse variations
    6. Draw graphs relating inverse variations
    7. Use joint variation in solving problems

5. Sequence And Series

1. Sequences
    1. Explain the concept of sequence
    2. Identify an arithmetic progression (AP) and geometric progression (GP)
    3. Find the general term of an AP
    4. Find the general term of GP
2. Series
    1. Derive the formula for a sum of an arithmetic progression
    2. Calculate the arithmetic mean
    3. Derive the formula for the sum of a geometric progression
    4. Calculate the geometric mean
3. Compound Interest
    1. Calculate compound interest using formula

6. Circles

1. Definition of Terms
    1. Define circle, chord, radius, diameter, circumference, arc, sector, centre and segment of a circle
2. Central Angle
    1. Derive the formula for the length of an arc
    2. Calculate the central angle
    3. Explain the concept of radian measure
    4. Convert radians to degree and vice versa
3. Angles Properties
    1. Prove circle theorems of inscribed angles
    2. Apply the circle theorems in solving related problems
4. Chord Properties of a Circle
    1. Identify chord properties of a circle
    2. Prove the theorem on the perpendicular bisector to a chord.

3. Prove the theorem on parallel chords
4. Apply the theorems on chords in solving related problems

5. Tangent Properties
    1. Describe a tangent to a circle
    2. Identify tangent properties of a circle
    3. Prove tangent theorems
    4. Apply theorems relating to tangent to a circle in solving problems

7. The Earth As A Sphere

1. Features and Location of Places
    1. Describe the equator, great circle, small circles, meridian, latitudes and longitudes
    2. Locate a place on the Earth's surface
2. Distances along Great Circles
    1. Calculate distances along great circles
    2. Solve navigation related problems
3. Distances along Small Circles
    1. Calculate distance along small circles

8. Accounts

1. Double Entry
    1. Explain the meaning of double entry
    2. Explain different types of ledger
    3. Construct a ledger
    4. Post entries in the ledger
    5. Close the simple accounts
2. Trial Balance
    1. Explain the concept of trial balance
    2. Construct trial balance
    3. Post debit balances and credit balances
    4. Check the balances
3. Trading Profit and Loss
    1. Ascertain gross profit/loss using trading account
    2. Ascertain net profit/loss account
4. Balance Sheet
    1. Construct a balance sheet
    2. Post entries in balance sheets
    3. Interpret information from the balance sheet

Form Four

1. Coordinate Geometry

1. Equation of a Line
    1. Derive the general equation of a straight line
2. Midpoint of a Line Segment
    1. Determine the coordinates of the midpoint of a line segment
3. Distance Between Two Points on a Plane
    1. Calculate the distance between two points on a plane
4. Parallel and Perpendicular Lines
    1. Compute gradients in order to determine the conditions for any two lines to be parallel
    2. Compute gradients in order to determine the conditions for any two lines to be perpendicular
    3. Solve problems on parallel and perpendicular lines

2. Area And Perimeter

1. Area of any Triangle
    1. Derive the formula for the area of any triangle
    2. Apply the formula to find the area of any triangle
2. Area of a Rhombus
    1. Derive the formula for finding the area of rhombi in terms of the diagonals.
    2. Apply the formula to find the areas of quadrilaterals
3. Perimeter of a Regular Polygon
    1. Derive the formula for finding the length of a side of a regular polygon
    2. The formula to determine the perimeter of a regular polygon
4. Area of a Regular Polygon
    1. Derive the formula for finding the area of a regular polygon
    2. Apply the formula to calculate the area of a regular polygon
5. Area of Similar Polygons
    1. Find the ratio of areas of similar polygons
    2. Solve problems related to ratio for areas of similar polygons

3. Three Dimensional Figures

1. Three Dimensional Figures
    1. Classify three dimensional figures
    2. List the characteristics of each class
2. Construction of Three Dimensional Figures
    1. Construct three dimensional figures
3. Sketching Three Dimensional Figures
    1. Sketch three dimensional figures
    2. Identify properties of three dimensional figures
    3. Find the angle between a line and a plane
    4. Calculate the angle between two planes

4. Surface Area of Three Dimensional Objects
    1. Derive the formulae for calculating the surface area of prisms, cylinder and pyramids and cone
    2. Apply the formulae to calculate the surface area of spheres
5. Volume of Three Dimensional Objects
    1. Derive the formulae for calculating volume of prisms, cylinders and pyramids
    2. Apply the formulae to calculate the volume of cylinders, pyramids and cones

4. Probability

1. Probability of an Events
    1. Determine the probability of an event through experiments
    2. Interpret experimental results in relation to real life occurrences
    3. Write the formula for finding the probability of an event
    4. Apply the formula to calculate the probability of an event
2. Combined Events
    1. Perform experiments of two combined events
    2. Draw a tree diagram of combined events
    3. Find the probability of two combined events using the formula
    4. Apply the knowledge of probability to determine the occurrence of events in real life situation

5. Trignometry

1. Trigonometric Ratios
    1. Determine the sine, cosine and tangent of an angle measured in the clockwise and anticlockwise directions
    2. Apply trigonometric ratios to solve problems in daily life
2. Sine and Cosine Functions
    1. Find sines and cosines of angles 0 such that $-720° \leq \theta \geq 720°$
    2. Draw the graphs of sine and cosine
    3. Interpret the graphs of sine and cosine functions
3. Sine and Cosine Rules
    1. Derive the sine and cosine rules
    2. Apply the sine and cosine rules in solving problems on triangles
4. Compound Angles
    1. Apply the compound of angle formulae or sine, cosine and tangent in solving trigonometric problems

6. Vectors

1. Displacement and Positions of Vectors
    1. Explain the concept of a vector quantity
    2. Distinguish between displacement and position vectors
    3. Resolving any vector into I and J components
2. Magnitude and Direction of a Vector
    1. Calculate the magnitude and direction of a vector
3. Sum and Difference of Vectors
    1. Find the sum of two or more vectors

2. Find the difference of vectors

4. Multiplication of a Vector by a Scalar
    1. Multiply a vector by a scalar
5. Application of Vectors
    1. Apply vectors in solving simple problems on velocities, displacements and forces

7. Matrices And Transformations

1. Operations on Matrices
    1. Explain the concept of a matrix
    2. Add matrices of order up to 2 X 2
    3. Subtract matrices of order up to 2 X 2
    4. Multiply a matrix of order 2 X 2 by a scalar
    5. Multiply two matrices of order up to 2 X 2
2. Inverse of a Matrix
    1. Calculate the determinant of a 2 X 2 matrix
    2. Find the inverse of a 2 X 2 matrix
    3. Apply 2 X 2 matrix to solve simultaneous equations
3. Matrices and Transformations
    1. Transform any point P(X, Y) into $P^1(X^1,Y^1)$ by pre-multiplying (χ_γ) with a transformation matrix T
    2. Apply the matrix to reflect a point P(X, Y) in the x-axis
    3. Apply the matrix to reflect a point P(X, Y) in the Y-Axis
    4. Use a matrix operator to rotate any point P(X, Y) through 90° 180°, 270° and 360° about the Origin
    5. Use the enlargement matrix E in enlarging figures

8. Linear Programming

1. Simultaneous Equations
    1. Form simultaneous equation from word problems
    2. Solve simultaneous equations graphically
2. Inequalities
    1. Form linear inequalities in two unknowns from word problems
    2. Find the solution set of simultaneous linear inequalities graphically
3. The Objective Function
    1. Form an objective function from word problems
4. Maximum and Minimum Values
    1. Locate corner points on the feasible region
    2. Find the minimum and maximum values using the objective function