



# **ORDINARY LEVEL GCE SYLLABUS**

**in**

## **570 MATHEMATICS**

**CGCE BOARD**

**PMB 10,000**

**BUEA**

**April 2011**

## 570 MATHEMATICS

### INTRODUCTION

The subject Mathematics is designed to introduce to students certain fundamental concepts and notions in Mathematics. This exemplifies all units of Mathematics emphasised through a blending of 'Traditional' and 'Modern' approaches to the subject.

It is observed that, Additional Mathematics broaden students' knowledge by treating more topics in addition to those in Mathematics. The two syllabuses, when successfully offered by students, should place him/her in a favourable position to further studies.

### Aims

The aims of the course Mathematics should enable the students to:

- i acquire knowledge and understanding of the nature, reasoning and purpose of learning Mathematics.
- ii put mathematical knowledge and skills acquired into use in other disciplines, real-life situations, employment opportunities and further studies.
- iii stimulate and sustain interests in observations, inquiry, investigations and make logical conclusions.
- iv meet up with the demands of mathematical knowledge in competitive examinations in the Republic of Cameroon and elsewhere.

### GENERAL OBJECTIVES

Complete coverage of the syllabus should provide students with the ability to:

- i. apply mathematical knowledge and skills in arts, design and projects etc.
- ii. read, write and talk about Mathematics in a variety of ways.
- iii. evaluate information in different forms and establish relationships among different physical quantities in Mathematics.
- iv. extract, select, order and present facts, ideas and opinions.
- v. demonstrate the various mathematical approach to solve problems of all types (e.g. problem solving, creative work, select an appropriate mathematical method etc).

### ASSESSMENT OBJECTIVES

Assessment items based on (2) above and (6) content below will test candidates' ability

- a. to recall, apply and interpret mathematical knowledge in context and everyday situation.
- b. to do calculation by applying a combination of mathematical skills and techniques and setting out mathematical work in a logical and clear form.
- c. to organise, interpret and present information accurately in written,

tabulated, graphical and diagrammatical forms using mathematical notations and terminology.

- d. to transform and make appropriate use of mathematical statements expressed in words or symbols.
- e. to recognise patterns and structures in a variety of situations, form generalizations and make logical deductions from mathematical data.

## FORMULAE, SYMBOLS AND NOTATIONS

Candidates should be familiar with the following formulae:

Circumference of a circle	$2\pi r$
Area of triangle	$\frac{1}{2}bc \sin A$
Area of trapezium	$\frac{1}{2}(a+b)h$
Area of circle	$\pi r^2$
Curved surface of right circular cylinder	$2\pi r h$
Curved surface of right circular cone	$\frac{1}{3}\pi r^2 h$
Surface area of sphere	$4\pi r^2$
Volume of pyramid	$\frac{1}{3}$ base area $\times$ height
Volume of right circular cone	$\frac{1}{3}\pi r^2 h$
Volume of sphere	$\frac{4}{3}\pi r^3$
Sum of interior angles of polygon	$(2n - 4)$ right angles
Solutions of $ax^2 + bx + c = 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Determinant of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$	$ad - bc$
Inverse of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$	$\frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

It is recommended that candidates have calculator with at least the following keys/functions: +, -,  $\times$ ,  $\div$ ,  $\pi$ ,  $x^2$ ,  $\sqrt{x}$ ,  $\frac{1}{x}$ ,  $x^y$ , sine, cosine and tangent and their inverses in degrees and in decimals of a degree.

The following notation will be used:

$\{ \}$	the set of
$n(A)$	the number of elements in the set $A$
$\{x : \}$	the set of all $x$ such that
$\in$	is an element of
$\notin$	is not an element of
$\cup$	union
$\cap$	intersection
$\subset$	is a subset of
$A'$	the complement of the set $A$
$PQ$	operation $Q$ followed by the operation $P$
$f: A \rightarrow B$	$f$ is a function under which each element of set $A$ has an image in set $B$
$f: x \mapsto y$	$f$ is a function under which $x$ is mapped onto $y$
$f(x)$	the image of $x$ under the function $f$
$f^{-1}$	the inverse relation of the function $f$
$fg$	the function $f$ of the function $g$
	open interval on the number line
	closed interval on the number line
<b>a</b>	the vector <b>a</b>
$\vec{AB}$	the vector represented in magnitude and direction by $\vec{AB}$
$[a,b]$	the interval $\{a \leq x \leq b\}$
$(a, b]$	the interval $\{a < x \leq b\}$
$[a, b)$	the interval $\{a \leq x < b\}$
$(a, b)$	the interval $\{a < x < b\}$
$\sim p$	not $p$
$p \Rightarrow q$	$p$ implies $q$
$p \Leftrightarrow q$	$p$ implies and is implied by $q$ ( $p$ is equivalent to $q$ )

## STRUCTURE OF THE EXAMINATION

The expected weighting of each assessment objective is shown in the following table:

Assessment Objective	Weighting of Assessment Objective
Knowledge (AO1)	30 %
Understanding (AO2)	40 %
Application of knowledge and Understanding (AO3)	20%
Higher level abilities (, analysis & synthesis) (AO4)	10%

The examination will comprise of two papers, time allocation and weighting for each component of the examination is shown in the following table:

Paper	Section	Type of questions	Duration	Marks	Weighting	Remarks
I	—	MCQ	1½ hours	50	30%	50 questions, to answer all
II	A	Structural	2½ hours	40	70%	15 questions to answer all
	B	Essay		60		4 questions to answer all

The use of electronic calculators will be allowed.

## The SYLLABUS

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
<b>1 NUMBERS</b>		
1.1 Ordinary Processes of Number Manipulation	<p>The four rules (addition, subtraction, multiplication and division) and their combinations.</p> <p>Identity and inverse elements of addition and multiplication.</p> <p>Commutativity, associativity, distributivity, use of brackets.</p>	<p>(i) Add, subtract, divide and multiply numbers.</p> <p>(ii) Identify and find inverse elements under the operations: addition and multiplication.</p> <p>(iii) Understand and to say with certainty which of the four rules satisfy the commutative and associative laws.</p> <p>(iv) Carry out operation involving the use of brackets.</p>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
1.2 Natural Numbers	<p>Natural numbers defined to include zero.</p> <p>Basic operations with natural numbers.</p> <p>Odd, even and prime numbers. Note that 1 is not a prime number.</p> <p>Divisibility, factors, common factors, prime factors, multiples HCF and LCM.</p> <p>Squares, square roots, cubes, cube roots, powers and roots. (introduction to indices)</p> <p>Number representation (number bases).</p>	<p>(i) Identify, read and manipulate natural numbers.</p> <p>(ii) State the value represented by a given digit in a numeral (place value).</p>
1.3 Integers	<p>Operations with integers.</p> <p>Ordering and the use of the symbols =, &lt;, ≥, ≤.</p>	<p>Carry out operations with integers and ordering of integers.</p>
1.4 Directed numbers	<p>Directed numbers:</p> <p>Positive and negative numbers, and absolute values.</p> <p>Operations with negative numbers.</p> <p>Use of directed numbers in practical situations.</p>	<p>(i) Add, subtract, divide and multiply directed numbers</p> <p>(ii) Represent directed numbers on a number line.</p> <p>(iii) Find the absolute value of a number</p> <p>(iv) Use directed numbers in practical situations, e.g. temperature.</p>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
1.5 Rational numbers	Rational numbers (proof of irrationality is not required at this level).	(i) Recall and use rational and Irrational numbers. (ii) Define the set of rational numbers
1.6 Fractions and Decimals	Operations with fractions Inter-conversion between fractions and decimals. Operations with decimals.	(i) Manipulate fractions and decimals with and without a calculator. (ii) Convert fractions to decimals (iii) and vice versa (iv) Solve real-life problems using fractions and decimals.
1.7 Real numbers	Relationship between number sets.  Operations in the different sets of numbers.  Properties of operations in these sets.	(i) Recognise elements of the various sets of numbers. (ii) Carry out operations in the different sets of numbers. (iii) State and use the properties of operations in these sets.
1.8 Estimation and Approximation.	Estimating numbers and quantities. Approximating to specified numbers of significant figures and decimal places. Rounding off (up and down) to the nearest whole number. Approximating numbers to the nearest ten, hundred, thousand, etc.	(i) Give a realistic estimate of the magnitude of real-life quantities (e.g. distance, time, etc.). (ii) Approximate numbers to a given number of decimal places or significant figures.
1.9 Standard Form	Standard form: use of $A \times 10^n$ where $n$ is an integer and $1 \leq A < 10$  <i>Note that standard form is not an approximation and when numbers are converted to standard form they should retain the accuracy of the original number.</i>	Convert numbers in floating decimal point form into standard form.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
1.10 Numbers in Real Life	Weights and measures. Inter-relationships between units of measurement. Decimal currency (money). Conversions (currency exchange). Units of time and their relationships. The 12h and 24h clock. Reading clocks and other dials.	(i) Recognise and use appropriately metric units of length, area, volume and capacity. (ii) Carry out calculations involving different currencies. (iii) State and interpret readings shown on circular meters.
1.11 Percentages	Fractions as percentages. Simple and compound interest (simple cases). Profit and loss. Discount and loans.	(i) Carry out calculations concerning percentages. (ii) Calculate interest, principal, time, rate for loans and bank deposits (iii) Do calculations based on real life situations.
1.12 Ratio and Proportion, Rates and Scales	Division of a quantity in a given ratio. Practical use e.g. use of proportion to identify 'best buys'. Common measures of rates e.g. km/h. Calculations involving speed, distance and time. Maps and scales.	(i) Compare quantities using ratios increase and decrease in a given ratio comparing ratios. (ii) Make practical use of these concepts in real life situations. (iii) Interpret scales
<b>2. SETS AND LOGIC</b>		
2.1 Set Language and Notation	Define sets in various forms. Special symbols related to sets (an element of, subsets, universal sets, intersection, union and complement). Types of sets: finite, infinite, universal, null, singleton.	(i) Use set language and symbols correctly. (ii) Identify the types of sets.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
2.2 Relationship between Sets	Subsets, complement of a set, the power set. Intersection and union of sets, cardinality. Representation of sets: Venn diagrams. Practical application of set language.	(i) Identify the elements of the intersection, union and complement of sets. (ii) Recognize proper subsets use in Venn diagram to illustrate the relationship between specific sets. (iii) Solve real-life problems using set theory.
2.3 Logic	Deductive reasoning (conjunction, disjunction and negations). Truth tables and their conditional (ideas of: converse; inverse, contra positive). Operators and laws of logic (bi-conditionals, implications and logical equivalence, laws of logic). De Morgan’s laws. Understanding of concepts and correct use of symbols should be emphasized. <i>Note: Only basic concepts and laws should be treated. No proofs are required</i>	(i) Understand and use logical concepts and reasoning to draw up truth tables and apply these to logical problems. (ii) Use correctly the symbols and notations of logic.
<b>3 FUNCTIONS</b>		
3.1 Mathematical Relations	Relation of a set into a set Cartesian product of two sets. Graphical representation – arrow diagrams, Pappy graphs, Cartesian diagrams. Relations in a set. Properties of relations in a set	(i) Represent the relationship between two sets in diagram form. (ii) Identify one-to-one, many-to-one, one-to- many and many-to- many relations.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
3.2 Functions	Mapping. Idea of a function. Representation and Notation. Function of a variable. Notation used e.g. $f(x) = 3x + 5$ ; $f: x \rightarrow 3x + 5$ . Domain and range of a function. Composite functions. Inverse functions. Use of flow diagrams to illustrate functions.	(i) Recognise and define functions. (ii) Understand and express the difference between a function, a variable and an expression. (iii) Find the composite function of given functions. (iv) Compute the inverse of functions. (v) Use different methods of defining functions in an appropriate manner. Determine the domain of composite and inverse functions. (vi) Use flow diagrams to illustrate functions.
<b>4. EUCLIDEAN GEOMETRY</b>		
4.1 Geometrical terms and relationships	Use and interpretation of the terms: point, line, plane, parallel, perpendicular, right angle, acute angle, obtuse and reflex angles, interior and exterior angles.  Points, lines, line segment, length of line segment and their notations  Parallel lines. Perpendicular lines	(i) Recognise and correctly name geometrical features and their relationships. (ii) Use the knowledge of the properties of parallel and perpendicular lines to solve problems involving them.
4.2 Simple Plane Figures	Vocabulary and diagrams of triangles, circles, special quadrilaterals (square, parallelogram, rectangle, rhombus, trapezium, kite). Types of triangles: (right, isosceles, equilateral). Angle properties of a triangle. Quadrilaterals: parallelograms, rectangles, squares, rhombus, trapezium, kite. Identification and description of the properties of each. Regular and irregular polygons (pentagon, hexagon, etc.) Properties of polygons, sum of interior and exterior angles.	i. Identify and describe plane figures. ii. Draw or sketch plane figures. iii. State the properties of the angles and sides of plane figures. iv. Deduce the interior angles of a regular polygon based on the number of sides. v. Reduce the number and sides of a polygon based on its interior angles. vi. Calculate the interior and exterior angles of polygons

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
4.3 Simple solid figures	Vocabulary (faces, edges, vertices) recognition, description, drawing and identification of cube, cuboid, prism, cylinder, pyramid, cone, sphere. Representation of simple solids. Nets of cube, cuboid, prism, cone, cylinder, pyramid.	(i) Recognise solid figures and make simple drawings of solid figures. (ii) Draw the net of a given solid figure. (iii) Deduce the surface area of a solid figure from its net.
4.4 Similarity	Properties of similar figures. Similarity in nature, similarity of plane shapes. Constant proportionality. Congruency of triangles (SSS, SAS, RHS). Areas and volumes of similar figures.	(i) Recognise similar figures. (ii) Identify congruent triangles and state the reason for this conclusion. (iii) Carry out calculations on similar plane figures and similar solids. (iv) Carry out calculations of lengths and areas on maps and on the ground, based on similarity. (v) Carry out calculations on area and volume of models in real life.
4.5 Symmetry	Symmetry about a point, line or plane. Recognition of line and rotational symmetry in two dimensions. Drawing symmetrical figures. Properties of triangles, quadrilaterals and circles directly related to their symmetries. Symmetrical properties of certain solids (prism, cylinder, pyramid, cone).	(i) Recognise the various forms of symmetry (ii) Indicate points and/or axes of symmetry for a given figure. (iii) Distinguish between rotational symmetry and line symmetry.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
4.6 Angles	<p>Angle measurement in degrees and radians, and their orientation.</p> <p>Types of angles (right angle, acute, straight, obtuse and reflex).</p> <p>Angles in a straight line. Angles at a point (adjacent angles, vertically opposite angles, supplementary angles, complementary angles).</p> <p>Angles formed by intersecting lines (transversals). Vertically opposite, corresponding, alternate angles.</p> <p>Angle properties of triangles, quadrilaterals, polygons.</p> <p>Sum of interior and exterior angles.</p>	<p>(i) Name and identify types of angles.</p> <p>(ii) Measure angles using a protractor.</p> <p>(iii) Recognise equal angles formed by intersecting lines.</p> <p>(iv) State the angle properties of plane figures.</p> <p>(v) Solve problems involving angles in a straight line and angles at a point, angles at transversal and corresponding angles.</p>
4.7 Circles	<p>Vocabulary associated with circles or related figures (centre, radius, chord, circumference, diameter, tangent, arc, sector, segment).</p> <p>Angle in a semi-circle.</p> <p>Angles at the centre and circumference.</p> <p>Angles in the same segment (subtended by the same arc).</p> <p>Angle between radius and tangent of a circle at the point of contact.</p> <p>Alternate segment theorem.</p> <p>Properties of cyclic quadrilaterals.</p> <p>Symmetric properties of a circle (equal chords, perpendicular bisector of a chord, tangents from an external point).</p> <p>The intersecting chord theorem.</p>	<p>(i) Identify and correctly name features of circles.</p> <p>(ii) Identify relationships between angles in circles.</p> <p>(iii) Name special angles in circles.</p> <p>(iv) Apply the intersecting chord theorem when the point of intersection is either inside or outside the circle.</p> <p>(v) Use the intersecting chord theorem to calculate distances between points on chords.</p>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
5.8 Geometrical Constructions	<p>Use of drawing instruments: copying lengths and angles.</p> <p>Construction of the following:</p> <ul style="list-style-type: none"> <li>-line segment.</li> <li>-Triangle where lengths of sides are given.</li> <li>-Special angles: <math>60^\circ</math> and <math>90^\circ</math></li> <li>-angle bisectors.</li> <li>-Perpendicular bisector of a line segment.</li> <li>-Perpendicular from a given point to a given line.</li> <li>-Division of a line segment into a given number of congruent segments.</li> <li>-A tangent to a circle from a given point outside the circle.</li> <li>-The circumscribed circle about a triangle.</li> <li>-The inscribed circle of a triangle</li> <li>-A line parallel to a given line, passing through a given point.</li> <li>-A square equal to an area and to a given rectangle.</li> </ul> <p>Given three segments</p> <ul style="list-style-type: none"> <li>-construction of a fourth segment such that the lengths of the four segments are in proportion.</li> </ul> <p>Given two segments,</p> <ul style="list-style-type: none"> <li>-construction of a segment whose length is the geometric mean between the lengths of the given segments.</li> <li>-Construction of simple geometric figures from a given data.</li> </ul>	<p><b>Candidates will be assessed on their ability to:</b></p> <ul style="list-style-type: none"> <li>(i) Correctly use drawing instruments (pencil, ruler, compasses) to construct figures.</li> <li>(ii) Follow instructions.</li> <li>(iii) Accurately measure lengths.</li> </ul>
4.8 Loci	<p>Idea of a locus in two dimensions (plane)</p> <p>NB: Geometric proofs are not necessary.</p>	Interpret and sketch a given loci.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
<b>5. MENSURATION</b>		
5.1 Perimeters, Areas, Volumes	Units of measurement of lengths, areas and volume. Perimeter and area of rectangle and triangle Area of parallelogram, trapezium and kite.	(i) Select and use the appropriate formula to calculate area and perimeter of a plane figure. (ii) State the area and perimeter in appropriate units.
5.2 Circles	Note: the value of $\pi$ may either be taken as $22/7$ , or the accurate value obtained from a calculator, or the answer may be left in terms of $\pi$ , depending on the individual question. Circumference and area of circle. Length of arc and chord (exclude radian measure). Area of sector and segment.	(i) Select and use the appropriate formula to calculate length of chords, area and circumference of circular figures. (ii) State the area and perimeter in appropriate units.
5.3 Solid figures	Surface area and volume of cuboid, cylinder, right prism, sphere, cone, pyramid Volume and area of composite plane or solid figures by either addition or subtraction. Volume of flow.	(i) Select and correctly use appropriate formulae for areas and volumes of solid figures. (ii) Express the results in appropriate units.
<b>6. RECTANGULAR COORDINATE GEOMETRY, GRAPHS</b>		
6.1 Cartesian Coordinates	Representing points with Cartesian coordinates in two dimensions.	(i) Construct Cartesian diagrams. (ii) Correctly use vocabulary such as $x$ -axis, $y$ -axis and origin. (iii) Identify and annotate $x$ - and $y$ -axes with an appropriate scale. Plot points on the $x, y$ -plane. (iv) State the coordinates of points on the $x, y$ -plane.
6.2 The Straight Line Segment	Midpoint. Length of a line segment Gradient. Conditions for two lines to be parallel or perpendicular.	(i) Select and correctly use the method for finding midpoint, length and gradient. (ii) Determine whether lines are parallel or perpendicular.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
6.3 Graphs	<p>Finding and interpreting equations in the form <math>y = mx + c</math>.</p> <p>Other forms of equations of the straight line.</p> <p>Interpretation and use of graphs in practical situations (travel, temperature, conversion graphs, etc.).</p> <p>Linear inequalities on the Cartesian plane</p> <p>Drawing of graphs from given or generated data (linear, quadratic, others).</p> <p>Interpreting graphs of the form <math>y = ax^n</math>, where <math>n = -2, -1, 0, 1, 2</math>.</p> <p>Gradient at a point on a curve by construction.</p> <p>Interpretation of gradient as rate of change – velocity, acceleration, maximum and minimum.</p>	<ul style="list-style-type: none"> <li>(i) Express equations of linear graphs in other forms.</li> <li>(ii) Draw up tables showing relations between variables from which graphs may be drawn. Correctly draw and label axes on graph paper to a given scale.</li> <li>(iii) Draw graphs from given or generated data (linear, quadratic, others).</li> <li>(iv) Plot points and join them with a smooth curve where necessary.</li> <li>(v) Determine gradient by constructing a line on a graph.</li> </ul>
6.4 Graphical Solution of Equations	<p>Intersection with the <math>x</math>-axis.</p> <p>Intersection of two graphs (both linear i.e. simultaneous equations, or one linear and one quadratic).</p> <p>Area under a graph (by counting squares). Distance travelled as area under speed-time graph.</p>	<ul style="list-style-type: none"> <li>(i) Solve equations using graphs.</li> <li>(ii) Deduce the value of a variable shown on graph paper accurately as possible.</li> <li>(iii) Deduce additional graphs to be drawn in order for equations to be solved.</li> <li>(iv) Interpret speed-time and distance-time graphs.</li> </ul>
<b>7. ALGEBRA AND NETWORKS</b>		
7.1. Basic Processes of Algebra	<p>Use of letters to represent numbers (meaning of algebraic symbols like <math>3a, a(x+y), 3a^2</math>).</p> <p>Basic arithmetic processes in algebra.</p>	<ul style="list-style-type: none"> <li>(i) Understand and use correctly the vocabulary of algebra.</li> <li>(ii) Carry out addition, subtraction, multiplication and division of algebraic expression.</li> </ul>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
7.2 Expansion and Factorization of Expressions	<p>Manipulation of algebraic expressions.</p> <p>Extraction of common factors, collection of like terms.</p> <p>Expansion of products.</p> <p>Simple factorization, factorization by grouping, factorization of trinomials.</p> <p>Recognition of special expressions: perfect square, difference of two squares.</p> <p>Algebraic fractions with numerical or linear expressions as denominators (simple cases involving sum, difference, product, quotient).</p>	<ul style="list-style-type: none"> <li>(i) Understand algebraic expressions.</li> <li>(ii) Distinguish between like and unlike terms.</li> <li>(iii) Collect like terms; arrange a given expression in a specified form.</li> <li>(iv) Expand and simplify products.</li> <li>(v) Factorize algebraic expressions.</li> <li>(vi) Simplify algebraic fractions.</li> </ul>
7.3 Construction, Interpretation and use of Formulae	<p>Substitution of numbers for letters and words.</p> <p>Change of subject.</p> <p>Constructing equations from a given situations.</p>	<ul style="list-style-type: none"> <li>(i) Construct a formula based on verbal information.</li> <li>(ii) Substitute values in a formula.</li> <li>(iii) Rearrange a formula to make a given variable its subject.</li> </ul>
7.4 Linear and Quadratic Equations	<p>Linear equations and their solutions</p> <p>Simultaneous linear equations in two variables and solutions using different methods.</p> <p>Quadratic equations in one unknown, by factorizing quadratic expressions including difference of two squares, completing the square. Use of quadratic formula.</p>	<ul style="list-style-type: none"> <li>(i) Solve simultaneous equations by an appropriate method (elimination, substitution, graphical method, matrix method).</li> <li>(ii) Solve quadratic equations by an appropriate method. Note that use of formula is only appropriate if factorization has failed.</li> <li>(iii) Conform to specifications for approximation of answers.</li> </ul>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
7.5 Factor and Remainder Theorems	Factor and remainder theorems: use of factor theorem to find linear factors of a polynomial; use of factor and remainder theorems to evaluate unknown coefficients.	<ul style="list-style-type: none"> <li>(i) Divide a polynomial by a given linear factor and write down the quotient and remainder.</li> <li>(ii) Use the remainder theorem to find the remainder after division by a given linear expression.</li> <li>(iii) Use the factor theorem to identify linear factors of a polynomial.</li> <li>(iv) Find the factors of a given polynomial <math>f(x)</math> and solve the equation <math>f(x) = 0</math>.</li> </ul>
7.5 Linear and Quadratic Inequalities	Intervals ( $[ ]$ , $] [$ , $] ]$ , $[ [$ , etc. ) Solution of linear inequalities. Representation on the number line and using intervals. Solution of quadratic inequalities. Representation of solutions in a two dimensional plane.	Define, identify and use the intervals $[ ]$ , $] [$ , $] ]$ , $[ [$ . <ul style="list-style-type: none"> <li>(i) Represent a range of values on the real number line.</li> <li>(ii) Identification of the critical values for a quadratic inequality.</li> </ul>
7.6 Indices	Index notation for simple integer powers. Use and interpretation of positive, negative, zero and fractional indices. Laws of indices.	Use, interpret and evaluate numbers in index form.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
7.7 Sequences	<p>Recognizing and continuing number patterns.</p> <p>Terms of a sequence, generating the terms of a sequence.</p> <p>Use of linear expressions to describe the <math>n</math>th term of a sequence.</p> <p>Generalizing number patterns (use of <math>U_1, U_n</math>).</p> <p>Arithmetic Progression.</p> <p>Geometric Progression.</p>	<p>(i) Identify number patterns and continue them for a given number of terms.</p> <p>(ii) Deduce the general rule for a sequence.</p> <p>(iii) Determine a term in a sequence and write an expression for the general term (<math>T_n</math>).</p> <p>(iv) Calculate the sum of the first <math>n</math> terms (<math>S_n</math>).</p> <p>(v) Distinguish between <math>T_n</math> and <math>S_n</math>. identify and distinguish between arithmetic and geometric progressions.</p>
7.8 Variation	<p>Ideas and notation of direct and inverse proportions.</p> <p>Expression and use of direct and inverse variations in algebraic expressions (limit to second degree).</p>	<p>(i) Recognise situations in real life where direct and inverse proportions are involved.</p> <p>(ii) Write down expressions based on word descriptions of relations between variables.</p>
7.9 Flow Diagrams, Networks, Graphs	<p>Related terminologies: line segment, arc, vertices, traversable, endpoints, odd vertex, even vertex.</p> <p>Null graphs, complete graphs, directed graphs, mixed graphs.</p> <p>Networks in real life.</p>	<p>(i) Identify and describe networks.</p> <p>(ii) Recognise networks in real life.</p>
<b>8. TRIGONOMETRY</b>		
8.1 The Right Angled Triangle	<p>Pythagoras' Theorem.</p> <p>Use of Pythagoras' Theorem.</p>	<p>(i) Recognise the hypotenuse in a given right-angled triangle.</p> <p>(ii) Understand and apply Pythagoras' Theorem to a given triangle.</p> <p>(iii) Use real triangles (either by construction or on the <math>x</math>-, <math>y</math>-plane) to determine the application of Pythagoras' Theorem.</p>

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
8.2 Trigonometrical ratios	Sine, cosine and tangent for acute angles Sine, cosine of complementary angles Relationship between the trigonometric ratios. Solving the right angled triangle using trigonometric ratios. Sine and cosine of obtuse angles. Trigonometric ratios of special angles ( $0^\circ$ , $30^\circ$ , $45^\circ$ , $60^\circ$ , $90^\circ$ ).	(i) Establish the three basic ratios from a given right-angled triangle. (ii) State the relationship between the three basic ratios. (iii) Establish and use the relationship between sine and cosine of complementary angles. (iv) Define the ratios for some special angles.
8.3 Applications of trigonometry	Angles of elevation and depression Bearings. 3-D problems (by calculation and scale drawing). Angles between two lines.	(i) Apply their knowledge of trigonometry to real life situations. (ii) Apply their knowledge of trigonometry to bearings and angles of elevation and depression. (iii) Draw a diagram to illustrate the bearings of different points from one another. (iv) Draw a diagram to illustrate the angles of elevation and/or depression between various points.
<b>9. VECTORS</b>		
9.1 Vector quantities	Scalar and vector quantities in two dimensions. Representation of a vector by a directed line segment. Free vectors. Position vectors, the zero vector. Magnitude of a vector. Direction of vector	(i) Represent vectors in column matrix form, in unit vector form or by a directed line segment. (ii) Calculate the magnitude of a given vector. (iii) Find the direction of a given vector. (iv) Distinguish between position vectors and free vectors. (v) Relate the position vector of a point to its coordinates.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
9.2 Operations on vectors	Sum and difference between two vectors. Parallel vectors. Multiplication by a scalar. Perpendicular vectors.	(i) Calculate the sum and the difference of a given vectors. (ii) Multiply a vector by a scalar. (iii) State parallel and perpendicular vectors.
9.3 Vector geometry	Simple cases of vector geometry. Vectors and coordinate geometry: use of base unit vectors <b>i</b> and <b>j</b> .	(i) Apply vector methods in geometry.
<b>10. MATRICES AND TRANSFORMATIONS</b>		
10.1 Matrices	Displaying information in matrix form. Types of matrices. Order of a matrix. Addition and subtraction of matrices. Multiplication of a matrix by a scalar. Determinant of a 2 by 2 matrix. Singular matrix and identity matrix. Transpose of a matrix. Multiplicative inverse of a 2 by 2 matrix. Application to solution of linear simultaneous equations in two unknowns.	(i) Present a given set of data in matrix form. (ii) State the order of a matrix. (iii) Write down the transposition of a given matrix. (iv) Determine which matrices are compatible for addition and multiplication. (v) Form the differences and products of compatible matrices. (vi) Identify a null matrices and evaluate the determinant of a matrix. (vii) Identify singular matrices and find the inverse of a given matrix. (viii) Use a matrix method to solve simultaneous equations.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
10.2 Transformations in two dimensions	Transformation in the Cartesian plane. Transformation matrices (2 by 2 only). Enlargement: centre, scale factor (positive, negative, fractional scale factors). Property: angle is preserved. Isometries. Translation (specify the distance and the direction vector). Reflection (the mirror line) in the x-axis and y-axis. Rotation (centre, angle of rotation). Shear and stretch in the x-axis and y-axis. Invariant properties for a shear. Identifying and describing transformations. Transforming triangles and other plane shapes.	(i) Identify and describe the following transformations: reflection, rotation, translation, enlargement, shear and stretch. (ii) Draw the image of a figure after transformation by any of the transformations named above. (iii) State the invariant properties for the above transformations. (iv) Draw or write the equation of the invariant line for a transformation. (v) Determine the application of transformations to real life situations.
<b>11. STATISTICS AND PROBABILITY</b>		
11.1 Data collection	Different types of data collection. Discrete and continuous data. Grouped and ungrouped data.	(i) Collect and organize data. (ii) Group data into reasonable classes. (iii) Tabulate data. (iv) Interpret data from real life situations.
11.2 Data display	Graphs of temperature, growth, etc. Representation of data using pictograms, bar charts, pie charts, histograms and line graphs.	(i) Present data by statistical diagrams. (ii) Read, interpret and draw inferences from statistical tables and diagrams.

Topic	Sub-topics	Objectives- Candidates will be assessed on their ability to:
11.3 Measures of central tendency	Mean, mode and median for discrete data. Mean for grouped data. Modal class.	(i) Tabulate their work and calculate the mean, mode and median of discrete data. (ii) Tabulate their work and calculate the mean of grouped data. (iii) Find the modal class of grouped data.
11.4 Measures of dispersion	Range, quartile, interquartile range.	(i) Identify range, quartile and interquartile range.
11.5 Frequency distribution	Frequency tables and graphs. Construction and use of cumulative frequency graphs (to estimate median, interquartile range, etc.)	(i) Draw up frequency tables based on data collected, either individual values or grouped data. (ii) Draw up a cumulative frequency. (iii) Draw a cumulative frequency graph. (iv) Use a cumulative frequency graph to find median and interquartile range.
11.6 Probability	The idea of probability Vocabulary: sample space, events, equiprobable events, random, unbiased, etc. Calculation of the probability of a single event as a fraction or decimal probability Scale. Use of $P(A') = 1 - P(A)$ . Mutually exclusive and independent events. Sum and product laws of probability (for simple combined events). Tree diagram and its use to find probabilities. (not to go beyond the second branch).	(i) Use appropriately the vocabulary of probability. (ii) Identify events with probabilities of 0 or 1. (iii) Place the probability of events on the probability scale. (iv) Identify mutually exclusive and independent events. (v) Correctly use the sum and product laws. (vi) Draw tree diagrams and write the appropriate probabilities on the branches.

## 7. RECOMMENDED TEXTBOOKS:

1. Rayner: Mathematics: Revision and Practice – OUP.
2. Tamambang et al: Mastering Mathematics O-level – Cambridge.
3. Lyonga: Cameroon Secondary Mathematics, Book 4 – Macmillan.
4. Numfor: O-level Mathematics – Anucam.