What has changed in the EGCSE Mathematics 6880 for 2021, 2022 and 2023?

The syllabus has been revised for first examination in 2021. Some changes are significant, especially the structure of the assessment.

You are strongly advised to read the whole syllabus before planning your teaching programme.

Changes to assessment

There are now four papers, namely Paper 1, 2, 3 and 4.

Paper 1 Core (Short-answer paper)

- The duration is 1 hour.
- It consists of 60 marks.
- It is based on the Core curriculum.

Paper 2 Core (Structured/longer answer paper)

- The duration of the paper is still 2 hours.
- It consists of 90 marks.
- The questions will be based on the Core Curriculum.

Paper 3 Extended (Short-answer paper)

- The duration is 1 hour 30 minutes.
- It consists of 80 marks.
- The questions will be based on the Extended Curriculum.

Paper 4 Extended (Structured/longer answer paper)

- The duration is 2 hours 30 minutes
- It consists of 120 marks.
- The questions will be based on the Extended Curriculum.

| Significant changes to the assessment are indicated by black vertical lines either side of the text. |

CONTENTS

ESWATINI GENERAL CERTIFICATE OF SECONDARY EDUCATION

Broad Guidelines

The Ministry of Education and Training is committed, in accordance with the National Policy Statement on Education, to provide a Curriculum and Assessment System (Form 4 and Form 5) so that at the completion of secondary education, learners will

- be equipped to meet the changing needs of the Nation, and
- have attained internationally acceptable standards.

Eswatini's National Education Policy Directives

EGCSE syllabuses for studies in Form 4 and Form 5 will individually, and collectively, enable learners to develop **essential skills** and provide a broad **learning experience** which

- inculcates values and attitudes as well as knowledge and understanding,
- encourages respect for human rights and freedom of speech,
- respects the values and beliefs of others, relating to issues of gender, culture and religion,
- develops desirable attitudes and behaviour towards the environment,
- provides insight and understanding of global issues which affect quality of life in Eswatini and elsewhere, e.g., the AIDS pandemic; global warming; maldistribution of wealth; and technological advances.

The National Curriculum for Form 4 and Form 5

Learners will be given opportunities to develop **essential skills** which will overlap across the entire range of subjects studied. These skills are listed below.

- Communication and language skills
- Numeracy skills: mathematical ideas, techniques and applications
- Problem-solving skills
- Technological awareness and applications
- Critical thinking skills
- Work and study skills
- Independent learning
- Working with others

To develop these skills, learners must offer five compulsory subjects and at least two elective subjects chosen from one or more Field of Study.

Compulsory Subjects
- SiSwati – either First Language or Second Language
- English Language
- Mathematics
- Sciences (Biology or Physical Sciences)
- Religious Education

Fields of Study
- Agriculture Field of Study
- Business Studies Field of Study
- Home Economics Field of Study
- Social Sciences and Humanities Field of Study
- Technical Field of Study

INTRODUCTION

The Eswatini General Certificate of Secondary Education (EGCSE) syllabuses are designed as two-year courses for examination in Form 5. The syllabus assumes that learners have acquired knowledge, understanding and skills during their study of Mathematics at Junior Secondary Level. The Curriculum Content of the syllabus is arranged into topics covering four areas which are treated throughout in a holistic way. The areas are: Number; Shape, Position and Space; Algebra; and Data Handling. It is intended to promote imaginative and innovative styles of teaching and learning so that the course is enjoyable for all learners, and is designed to assess what learners know, understand and can do. As such, it will enable learners to progress to higher-level courses of mathematical studies.

Learners may follow either the Core curriculum or the Extended curriculum. Candidates aiming for grades A* to C should follow the Extended curriculum. The papers are described in the Scheme of Assessment.

All EGCSE syllabuses follow a general pattern. The main sections are:

Aims
Assessment Objectives
Assessment
Curriculum Content
Grade Descriptions

Mathematics falls into the Compulsory Subjects Group.

PRIOR KNOWLEDGE AND SKILLS

Learners beginning this course should normally have completed the Junior Secondary school Mathematics. Learners should also have adequate mathematical skills for the content contained in this syllabus.

PURPOSE

The EGCSE syllabus prepares students for life, helping them develop an informed curiosity and a lasting passion for learning, by equipping them with problem solving skills useful in everyday life.

PROGRESSION

EGCSE Mathematics qualification enables candidates to further their studies at tertiary institutions in Eswatini.

TEACHING HOURS

Appropriate teaching time for the Mathematics syllabus is seven (7) periods of forty (40) minutes each over a period of sixty weeks/cycles.

TEACHER SUPPORT MATERIAL

A wide range of materials and resources are available to support teachers in Eswatini schools. The resources suit a variety of teaching methods in the local context. Through targeted training forums, teachers can access the expert advice they need for teaching this syllabus.

EXAM PREPARATION RESOURCES

Examination reports, syllabuses, past papers and specimen papers are available on ECESWA website www.examscouncil.org.sz

AVAILABLE GRADES

Candidates in this syllabus are eligible for Grades A* to G.

AIMS

The aims of the curriculum are the same for all learners. The aims are set out below and describe the educational purpose of a course in Mathematics for the EGCSE Examination. They are not listed in order of priority.

The aims are to enable learners to:

1. develop their mathematical knowledge and oral, written and practical skills in a way which encourages confidence and provides satisfaction and enjoyment;
2. read mathematics, write and talk about the subject in a variety of ways;
3. develop a feel for number, carry out calculations and understand the significance of the results obtained;
4. apply mathematics in everyday situations and develop an understanding of the part which mathematics plays in the world around them;
5. solve problems, present the solution clearly, check and interpret the results;
6. develop an understanding of mathematical principles;
7. recognise when and how a situation may be represented mathematically, identify and interpret relevant factors and, where necessary, select an appropriate mathematical method to solve the problem;
8. use mathematics as a means of communication with emphasis on the use of clear expression;
9. develop the ability to apply mathematics in other subjects, particularly science and technology;
10. develop the abilities to reason logically, to generalise and to prove;
11. appreciate patterns and relationships in mathematics;
12. produce and appreciate imaginative and creative work arising from mathematical ideas;
13. develop their mathematical abilities by considering problems and conducting individual and cooperative enquiry and experiment, including extended pieces of work of a practical and investigative kind;
14. appreciate the interdependence of different branches of mathematics;
15. acquire a foundation appropriate to their further study and of other disciplines.

ASSESSMENT OBJECTIVES

There are **two** Assessment Objective in this syllabus, these are:

- AO1 Mathematical techniques
- AO2 applying mathematical techniques to solve problems

A description of the assessment objective follows.

AO1 Mathematical techniques

Learners should be able to:

1. organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms;
2. perform calculations by suitable methods;
3. use an electronic calculator;
4. understand systems of measurement in everyday use and make use of them in the solution of problems;
5. estimate, approximate and work to degrees of accuracy appropriate to the context;
6. use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy;
7. interpret, transform and make appropriate use of mathematical statements expressed in words or symbols;
8. recognise and use spatial relationships in two and three dimensions, particularly in solving problems;
9. recall, apply and interpret mathematical knowledge in the context of everyday situations;

AO2 applying mathematical techniques to solve problems

In questions which are set in context and/or which require a sequence of steps to solve, learners should be able to:

10. make logical deductions from given mathematical data;
11. recognise patterns and structures in a variety of situations, and form generalisations;
12. respond to a problem relating to a relatively unstructured situation by translating it into an appropriately structured form;
13. analyse a problem, select a suitable strategy and apply an appropriate technique to obtain its solution;
14. apply combinations of mathematical skills and techniques in problem solving;
15. set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology.

Weightings for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) is summarised in the table below.

Assessment objectives as a percentage of the Core and Extended qualifications

Assessment objective	Core qualification	Extended qualification
AO1 Mathematical techniques	(60-70)%	(40-50)%
AO2 Applying mathematical techniques to solve problems	(30-40)%	(50-60)%

Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %			
	Paper 1	Paper 2	Paper 3	Paper 4
AO1 Mathematical techniques	60-70	60-70	40-50	40-50
AO2 Applying mathematical techniques to solve problems	30-40	30-40	50-60	50-60

ASSESSMENT

Scheme of Assessment

The scheme of assessment is intended to encourage positive achievement by all candidates.

All candidates must be entered for two papers. These will be Paper 1 and Paper 2 for Core Curriculum and Paper 3 and Paper 4 for Extended Curriculum.

A description of each paper follows.

Core Curriculum Grades C to G available	**Extended Curriculum** Grades A* to E available
Paper 1 Core (1 hour) Short-answer paper consisting of 60 marks, with questions designed to discriminate between grades C to G. The questions will be based on the Core Curriculum. This paper will be weighted at 40% of the final total available marks.	
Paper 2 Core (2 hours) Structured/longer answer paper consisting of 90 marks, with questions designed to discriminate between grades C to G. The questions will be based on the Core Curriculum. This paper will be weighted at 60% of the final total available marks.	
	Paper 3 Extended (1 hour 30 minutes) Short-answer paper consisting of 80 marks, with questions designed to discriminate between grades A* to E. The questions will be based on the Extended Curriculum. This paper will be weighted at 40% of the final total available marks.
	Paper 4 Extended (2 hour 30 minutes) Structured/longer answer paper consisting of 120 marks, with questions designed to discriminate between grades A* to E. The questions will be based on the Extended Curriculum. This paper will be weighted at 60% of the final total available marks.

Notes:

1. Use of an Electronic Calculator and Mathematical Tables:
   (i) All candidates should be able to use an electronic calculator efficiently and apply it appropriately to the required degree of accuracy.
   (ii) The syllabus assumes that candidates will be in possession of a scientific electronic calculator for all papers. Algebraic or graphical calculators are not permitted. Three significant figures will be required in answers except where otherwise stated.
   (iii) The use of electronic calculators or mathematical tables is allowed for all papers.
2. Use of Mathematical Instruments:
   Apart from the usual mathematical instruments, candidates may use flexicurves in this examination.
3. Candidates are encouraged to use the value of pi (π) from their calculators if their calculator provides this. Otherwise, they should use the value of π as given in the question or on the front page of the question paper. ($\frac{22}{7}$ should **not** be used as a value of π)
4. Tracing paper may be used as an optional additional material for each of the written papers.

Weighting of Papers

Paper	Weighting Core Curriculum (Papers 1 and 2 only)	Weighting Extended Curriculum (Papers 3 and 4 only)
1	40%	
2	60%	
3		40%
4		60%

CURRICULUM CONTENT

Learners may follow either the Core or the Extended Curriculum. The curriculum content that follows is divided into topics covering four areas: Number; Shape, Position and Space; Algebra; and Data Handling. An indication of the area covered by a topic is provided in brackets after the topic heading. The table below shows the approximate weighting of these areas in each of the components of the examination.

Paper	Number	Shape Position Space	Algebra	Data Handling
Core Curriculum				
1	30%	35%	25%	10%
2	20%	35%	30%	15%
Extended Curriculum				
3	20%	35%	30%	15%
4	10%	35%	35%	20%

As well as demonstrating skill in the following techniques, candidates will be expected to apply them in the solution of problems.

Appropriate teaching time for the Mathematics syllabus should be equivalent to seven (7) periods of forty (40) minutes each over a period of sixty (60) weeks/cycles.

CORE	**EXTENDED**
1. Types of Numbers and their Sequences, Sets and Set Notation and Language *[Topic Area: Number and Algebra]*	
Learners should be able to: 1.1 Identify sets of numbers e.g. primes, multiples, factors, squares, cubes in natural numbers. (*Identify includes listing and describing*) 1.2 Express natural numbers as products of their prime factors. 1.3 Identify common multiples and common factors (e.g. LCM and HCF). 1.4 Identify and use directed numbers. 1.5 Identify sets and subsets of real numbers. (e.g. natural numbers, primes, integers, rational and irrational numbers). 1.6 Find missing numbers in a sequence of: (i) composite numbers (ii) triangle numbers (iii) rectangle or square numbers (iv) Pascal's triangle 1.7 Find rules for simple number patterns (e.g. add 3). 1.8 Recognise patterns in sequences and	Learners should be able to: 1.1 Identify sets of numbers e.g. primes, multiples, factors, squares, cubes in natural numbers. (*Identify includes listing and describing*) 1.2 Express natural numbers as products of Their prime factors. 1.3 Identify common multiples and common factors (e.g. LCM and HCF). 1.4 Identify and use directed numbers. 1.5 Identify sets and subsets of real numbers. (e.g. natural numbers, primes, integers, rational and irrational numbers). 1.6 Find missing numbers in a sequence of: (i) composite numbers (ii) triangle numbers (iii) rectangle or square numbers (iv) Pascal's triangle 1.7 Find rules for simple number patterns (e.g. add 3). 1.8 Recognise patterns in sequences and

relationships between different sequences. 1.9 Complete and generate number patterns e.g (linear sequences, simple quadratic and cubic sequences). 1.10 Extended curriculum only. 1.11 Extended curriculum only. 1.12 For 2 sets and a universal set, draw Venn diagrams and use the language and notation of sets (i.e. subsets, union, intersection, complement and number of elements). 1.13 Describe and use set symbols: {… } "… is a set of …" $\in$ "… is an element of…" $\notin$ "…is not an element of…" $\varnothing$, { } the empty set $\cap$ intersection of $\cup$ union of $\subset$ proper subset of $\subseteq$ is a subset of $\not\subset$ is not a proper subset of A' complement of set A E universal set n(A) number of elements in set A 1.14 Extended curriculum only. 1.15 Extended curriculum only. 1.16 Extended curriculum only.	relationships between different sequences. 1.9 Complete and generate number patterns e.g. (linear sequences, quadratic sequences, cubic sequences, exponential sequences and simple combinations of these) 1.10 Generalise number patterns to simple algebraic statements. 1.11 Form an equation by generalisation (nth term) of a given sequence. 1.12 For 2 sets and a universal set, draw Venn diagrams and use the language and notation of sets (i.e. subsets, union, intersection, complement and number of elements) 1.13 Describe and use set symbols: {… } "… is a set of …" $\in$ "… is an element of…" $\notin$ "…is not an element of…" $\varnothing$, { } the empty set $\cap$ intersection of $\cup$ union of $\subset$ proper subset of $\subseteq$ is a subset of $\not\subset$ is not a proper subset of A' complement of set A E universal set n(A) number of elements in set A . 1.14 List and describe elements and use set symbols for more than two sets. 1.15 For 3 sets and a universal set, draw Venn diagrams and use the language and notation of sets (i.e. subsets, union, intersection, complement and number of elements). 1.16 Use set builder notation to describe sets.
2. Place Value, Estimation and Limits of Accuracy *[Topic Area: Number]*	
Learners should be able to: 2.1 Write numbers in words or in numerals. 2.2 Round off to specified level of accuracy e.g. nearest 50. 2.3 make estimates on numbers, quantities (e.g. length, volume, capacity, area, population, etc.), give approximations to specified numbers of significant figures and	Learners should be able to: 2.1 Write numbers in words or in numerals. 2.2 Round off to specified level of accuracy e.g. nearest 50. 2.3 make estimates on numbers, quantities (e.g. length, volume, capacity, area, population, etc.), give approximations to specified numbers of significant figures and decimal places and round off answers to

decimal places and round off answers to reasonable accuracy in the context of a given problem. 2.4 Approximate numbers to a given place value and/or decimal place. 2.5 Extended only 2.6 Extended only 2.7 Extended only	reasonable accuracy in the context of a given problem. 2.4 Approximate numbers to a given place value and/or decimal place. 2.5 Find the upper and lower bounds for a given specified accuracy e.g. population, time, distance, speed, etc. 2.6 Use determined limits of measurements to calculate the limits of a perimeter of a given figure. 2.7 Use determined limits of measurements to calculate the limits of area of a given figure
3. Operations *[Topic Area: Number]*	
Learners should be able to: 3.1 Add and subtract fractions. 3.2 Multiply and divide fractions by (i) whole numbers (ii) fractions. 3.3 Apply the four operations on directed numbers. 3.4 Convert fractions to their equivalent fractions. 3.5 Add and subtract decimals. 3.6 Divide and multiply decimals by powers of 10. 3.7 Multiply and divide decimals by (i) a whole number, (ii) decimals. 3.8 Simplify numerical expressions involving mixed operations. 3.9 Apply correct order of operations. 3.10 Convert fractions into decimals and percentages, and decimals into fractions and percentages. 3.11 Convert percentages into fractions and decimals. 3.12 Find squares, cubes, square roots and cube roots of numbers. 3.13 Understand the four operations on numbers. 3.14 Apply appropriate checks of accuracy. 3.15 Order quantities by magnitude (e.g. fractions, decimals, percentages, directed numbers) and demonstrate familiarity with the symbols =, ≠, <, >, ≤, ≥.	Learners should be able to: 3.1 Add and subtract fractions. 3.2 Multiply and divide fractions by (i) whole numbers (ii) fractions. 3.3 Apply the four operations on directed numbers. 3.4 Convert fractions to their equivalent fractions. 3.5 Add and subtract decimals. 3.6 Divide and multiply decimals by powers of 10. 3.7 Multiply and divide decimals by (i) a whole number, (ii) decimals. 3.8 Simplify numerical expressions involving mixed operations. 3.9 Apply correct order of operations. 3.10 Convert fractions into decimals and percentages, and decimals into fractions and percentages. 3.11 Convert percentages into fractions and decimals. 3.12 Find squares, cubes, square roots and cube roots of numbers. 3.13 Understand the four operations on numbers. 3.14 Apply appropriate checks of accuracy. 3.15 Order quantities by magnitude (e.g. fractions, decimals, percentages, directed numbers) and demonstrate familiarity with the symbols =, ≠, <, >, ≤, ≥.
4. Percentages *[Topic Area: Number]*	
Learners should be able to: 4.1 Calculate a percentage of a given quantity. 4.2 Calculate one quantity as a percentage of	Learners should be able to: 4.1 Calculate a percentage of a given quantity. 4.2 Calculate one quantity as a percentage of another.

another. 4.3 Calculate (i) the percentage change given the new and original value, (ii) the new value given the original and percentage change. 4.4 Calculate the simple interest due to a customer after a certain period of time, given the percentage interest per annum and the amount deposited. 4.5 Extended only 4.6 Extended only	4.3 Calculate (i) the percentage change given the new and original value, (ii) the new value given the original and percentage change. 4.4 Calculate the simple interest due to a customer after a certain period of time, given the percentage interest per annum and the amount deposited. 4.5 Calculate repeated percentage change e.g. depreciation and population increase. 4.6 Calculate the original quantity given the final quantity and the percentage change (Reverse percentages).
5. Personal and Household Finance *[Topic Area: Number]*	
Learners should be able to: 5.1 Calculate using money and convert from one currency to another including conversion graphs. 5.2 Use given data to solve problems on simple interest. 5.3 Calculate compound interest including the knowledge of compound interest formula. Value of investment = $P\left(1+\frac{r}{100}\right)^n$, where P is the amount invested, *r* is the percentage rate of interest and *n* is the number of periods of investment. 5.4 Solve problems involving tax. 5.5 Extract, interpret and use information from tables, and charts e.g. rates and bills.	Learners should be able to: 5.1 Calculate using money and convert from one currency to another including conversion graphs. 5.2 Use given data to solve problems on simple interest. 5.3 Calculate compound interest including the knowledge of compound interest formula. Value of investment = $P\left(1+\frac{r}{100}\right)^n$, where P is the amount invested, *r* is the percentage rate of interest and *n* is the number of periods of investment. 5.4 Solve problems involving tax. 5.5 Extract, interpret and use information from tables, and charts e.g. rates and bills.
6. Ratio and Proportion *[Topic Area: Number and Algebra]*	
All learners should be able to: 6.1 Demonstrate understanding of the elementary ideas and notation of ratio e.g simplifying ratios, expressing quantities in ratio form; direct and inverse proportion	All learners should be able to: 6.1 Demonstrate understanding of the elementary ideas and notation of ratio e.g simplifying ratios, expressing quantities in ratio form; direct and inverse proportion

(variation). 6.2 Divide quantities in a given ratio. 6.3 Extended curriculum only. 6.4 Use scales in practical situations. 6.5 Complete tables for simple direct variation. 6.6 Extended curriculum only. 6.7 Extended curriculum only. 6.8 Solve problems involving time and distance.	(variation). 6.2 Divide quantities in a given ratio. 6.3 Increase and decrease a quantity by a given ratio. 6.4 Use scales in practical situations. 6.5 Complete tables for simple direct variation. 6.6 Express direct and inverse variation in algebraic terms and use this form of expression to find unknown quantities. 6.7 Work out problems involving joint variation. 6.8 Solve problems involving time and distance.
7. Indices *[Topic Areas: Number and Algebra]*	
Learners should be able to: 7.1 Use and evaluate positive, negative and zero indices. 7.2 Use and evaluate fractional indices. 7.3 Use the rules of indices $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$ and $(a^m)^n = a^{m \times n}$ 7.4 Extended curriculum only.	Learners should be able to: 7.1 Use and evaluate positive, negative and zero indices. 7.2 Use and evaluate fractional indices. 7.3 Use the rules of indices $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$ and $(a^m)^n = a^{m \times n}$ 7.4 Solve problems involving indices including fractional indices e.g. solve $32^x = 2$ (the use of logarithms is not required).
8. Standard Form *[Topic Area: Number]*	
Learners should be able to: 8.1 Express numbers in standard form $A \times 10^n$ where n is an integer and $1 \leq A < 10$. 8.2 Use numbers in standard form. 8.3 Extended curriculum only.	Learners should be able to: 8.1 Express numbers in standard form $A \times 10^n$ where n is an integer and $1 \leq A < 10$. 8.2 Use numbers in standard form. 8.3 Solve problems involving standard form.
9. Properties of Shapes *[Topic Area: Shape, Position and Space]*	

Learners should be able to:	Learners should be able to:
9.1 Use and interpret vocabulary of *n*-sided polygons (regular, irregular) e.g. naming (up to ten sides), interior, exterior, angle sum.	9.1 Use and interpret vocabulary of *n*-sided polygons (regular, irregular) e.g. naming (up to ten sides), interior, exterior, angle sum.
9.2 Identify and name prisms using their cross section (including cylinders) and pyramids using their bases (including cones).	9.2 Identify and name prisms using their cross section (including cylinders) and pyramids using their bases (including cones).
9.3 Identify and draw nets of different solids.	9.3 Identify and draw nets of different solids.
9.4 Use and interpret vocabulary of solid figures: (a) Vertices (b) Edges (c) Faces (d) Net of a solid.	9.4 Use and interpret vocabulary of solid figures: (a) Vertices (b) Edges (c) Faces (d) Net of a solid.
9.5 Recognise rotational and line symmetry (including order of rotational symmetry) in 2-dimensions (including properties of triangles, quadrilaterals and circles related to their symmetries).	9.5 Recognise rotational and line symmetry (including order of rotational symmetry) in 2-dimensions (including properties of triangles, quadrilaterals and circles related to their symmetries).
9.6 Extended curriculum only.	9.6 Recognise symmetry properties of the prism and pyramid (including cylinder and cone for each case).
9.7 Calculate unknown angles using the following geometric properties (a) angles at a point, (b) angles on a straight line and intersecting lines, (c) angles formed with parallel lines, (d) angle properties of triangles and quadrilaterals, (e) angle properties of regular and irregular polygons.	9.7 Calculate unknown angles using the following geometric properties (a) angles at a point, (b) angles on a straight line and intersecting lines, (c) angles formed with parallel lines, (d) angle properties of triangles and quadrilaterals, (e) angle properties of regular and irregular polygons.
9.8 Identify similar and congruent plane shapes.	9.8 Identify similar and congruent plane shapes.
9.9 Use similarity to calculate a required angle or side.	9.9 Use similarity to calculate a required angle or side.
9.10 Extended curriculum only.	9.10 Use the basic congruence criteria for triangles (SSS, ASA, SAS, RHS).
9.11 Extended curriculum only.	9.11 Understand and use the relationships between length, area and volume of similar shapes.
9.12 Extended curriculum only.	9.12 Identify and apply symmetry properties of circles (a) equal chords are equidistant from the centre, (b) the perpendicular bisector of a chord passes through the centre, (c) tangents from an external point are equal in length.
9.13 Extended curriculum only.	9.13 Calculate unknown angles using the following geometric properties (a) angle between tangent and radius of a circle, (b) angle in a semi-circle,
9.14 Extended curriculum only.	

	(c) angle at the centre of a circle is twice the angle at the circumference, (d) angles in the same segment are equal, (e) opposite angles in cyclic quadrilaterals are supplementary. (f) angle between the tangent and chord is equal to the angle in the opposite segment subtended by the same chord. 9.14 Use geometric properties for simple geometric proofs including congruency and similarity for triangles.
10. Geometrical Terms and Constructions *[Topic Area: Shape, Position and Space]*	
Learners should be able to: 10.1 Use the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse, reflex, perpendicular, isosceles, equilateral, similarity and congruence. 10.2 Understand and use the vocabulary of triangles, quadrilaterals, circles, polygons and simple figures including nets. 10.3 Measure length of lines and size of angles. 10.4 Construct a triangle given the three sides using a ruler and compasses only. 10.7 Make, use and interpret scale drawings.	Learners should be able to: 10.1 Use the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse, reflex, perpendicular, isosceles, equilateral, similarity and congruence. 10.2 Understand and use the vocabulary of triangles, quadrilaterals, circles, polygons and simple figures including nets. 10.3 Measure length of lines and size of angles. 10.4 Construct a triangle given the three sides using a ruler and compasses only. 10.7 Make, use and interpret scale drawings.
11. Transformations *[Topic Area: Shape, Position and Space]*	
Learners should be able to: 11.1 Reflect simple plane figures in horizontal or vertical lines. 11.2 Extended curriculum only. 11.3 Rotate simple plane figures about any point, with given coordinates, through multiples of 90°. 11.4 Construct given translations and enlargements of simple plane figures on a grid. 11.5 Recognise and give precise descriptions of reflections, rotations, enlargements and translations on a grid. 11.6 Extended curriculum only. 11.7 Extended curriculum only. 11.8 Extended curriculum only. 11.9 Extended curriculum only.	Learners should be able to: 11.1 Reflect simple plane figures in horizontal or vertical lines. 11.2 Reflect simple plane figures in sloping lines. 11.3 Rotate simple plane figures about any point, with given coordinates, through multiples of 90°. 11.4 Construct given translations and enlargements of simple plane figures on a grid. 11.5 Recognise and give precise descriptions of reflections, rotations, enlargements and translations on a grid. 11.6 Carry out combined transformations. 11.7 Use function notation to represent transformations (i.e., reflection (*M*),

11.10 Extended curriculum only.	rotation (*R*), translation (*T*), enlargement (*E*) and their combinations (e.g. *RM*(*A*)). 11.8 Use matrices in transformations (singular matrices are excluded). 11.9 Recognise and give precise descriptions of transformations connecting given figures. 11.10 Describe transformations using coordinates and matrices (singular matrices are excluded).
12. Measurement, Time, Units and Mensuration *[Topic Area: Shape, Position and Space]*	
Learners should be able to:	Learners should be able to:
12.1 Use metric units of mass, length, area, volume, density and capacity in practical situations and express quantities in terms of larger or smaller units (including conversions of areas and volumes). 12.2 Calculate times in terms of the 24-hour and 12-hour clock, including the conversion between units of time e.g. 2.4 hours = 2 hours 24 minutes. 12.3 Calculate speed, time and distance; and solve problems involving these. 12.4 Extended curriculum only. 12.5 Read and interpret clocks, dials and timetables. 12.6 Calculate perimeter and area of (a) rectangles, (b) triangles, (c) circles, (d) parallelograms, (e) trapeziums, (f) other polygons, (g) composite shapes. 12.7 Calculate surface area and volume of (a) cones, (b) spheres, (c) pyramids, (d) composite solids. (*Formulae for pyramid, cone, and sphere will be given.*) 12.8 Extended curriculum only. 12.9 Calculate surface area and volume of (a) cuboids, (b) cylinders, (c) other prisms. 12.10 Solve problems involving the arc length and sector area as fractions of the	12.1 Use metric units of mass, length, area, volume, density and capacity in practical situations and express quantities in terms of larger or smaller units (including conversions of areas and volumes). 12.2 Calculate times in terms of the 24-hour and 12-hour clock, including the conversion between units of time e.g. 2.4 hours = 2 hours 24 minutes. 12.3 Calculate speed, time and distance; and solve problems involving these. 12.4 Solve problems involving rates of change. 12.5 Read and interpret clocks, dials and timetables. 12.6 Calculate perimeter and area of (a) rectangles, (b) triangles, (c) circles, (d) parallelograms, (e) trapeziums, (f) other polygons, (g) composite shapes. 12.7 Calculate surface area and volume of (a) cones, (b) spheres, (c) pyramids, (d) composite solids. (*Formulae for pyramid, cone, and sphere will be given.*) 12.8 Solve problems involving solids (e.g., hollow solids and truncated solids-frustums). 12.9 Calculate surface area and volume of (a) cuboids, (b) cylinders, (c) other prisms. 12.10 Solve problems involving the arc length and sector area as fractions of the

circumference and area of a circle respectively.	circumference and area of a circle respectively.
13. Trigonometry *[Topic Area: Shape, Position and Space]*	
Learners should be able to: 13.1 Apply Pythagoras Theorem. 13.2 Calculate sides and angles of a right-angled triangle using sine, cosine and tangent ratios. 13.3 Solve simple problems involving angles of depression and elevation (from right angled-triangles). 13.4 Extended curriculum only. 13.5 Extended curriculum only. 13.6 Extended curriculum only. 13.7 Extended curriculum only. 13.8 Extended curriculum only. 13.9 Extended curriculum only. 13.10 Extended curriculum only.	Learners should be able to: 13.1 Apply Pythagoras Theorem. 13.2 Calculate sides and angles of a right-angled triangle using sine, cosine and tangent ratios. 13.3 Solve simple problems involving angles of depression and elevation (from right angled-triangles). 13.4 Recognise, sketch and interpret graphs of simple trigonometric functions. 13.5 Graph and know the properties of trigonometric functions. 13.6 Solve simple trigonometric equations for values between 0° and 360°. e.g. $\sin x = \sqrt{\frac{3}{2}}$ for values of x between 0° and 360°. 13.7 Use sine and cosine values for obtuse angles. 13.8 Use sine rule and the cosine formula for trigonometrical problems in 2-dimensions. 13.9 Use the formula $A = \frac{1}{2} ab \sin C$ for the area of a triangle. 13.10 Solve trigonometric problems in 3-dimensions including angle between a line and a plane.
14. Bearings *[Topic Area: Shape, Position and Space]*	
Learners should be able to: 14.1 Draw and interpret bearings. 14.2 Interpret and use three-figure bearings measured clockwise from the North (i.e., 000° to 360°). 14.3 Apply bearings to solve simple problems involving not more than three North lines. 14.4 Find distances and make simple scale drawings.	Learners should be able to: 14.1 Draw and interpret bearings. 14.2 Interpret and use three-figure bearings measured clockwise from the North (i.e., 000° to 360°). 14.3 Apply bearings to solve simple problems involving not more than three North lines. 14.4 Find distances and make simple scale drawings.
15. Graphs in Practical Situations *[Topic Areas: Algebra and Shape, Position and Space]*	
Learners should be able to:	Learners should be able to:

15.1 Draw simple graphs in practical situations including conversion graphs and distance-time graphs. 15.2 Interpret and use simple graphs in practical situations including conversion graphs and distance-time graphs. 15.3 Extended curriculum only. 15.4 Extended curriculum only. .	15.1 Draw simple graphs in practical situations including conversion graphs and distance-time graphs. 15.2 Interpret and use simple graphs in practical situations including conversion graphs and distance-time graphs. 15.3 Construct/draw a speed-time graph. 15.4 Interpret speed-time graphs including acceleration/deceleration (gradient) and area under the graph (distance). This includes estimation and interpretation of the gradient of a tangent at a point. .
16. Vectors *[Topic Areas: Algebra and Shape, Position and Space]*	
Learners should be able to: 16.1 represent a vector by a directed line segment. 16.2 Represent a vector by $\begin{pmatrix} x \\ y \end{pmatrix}$ or $\overrightarrow{AB}$ or $\underline{\mathbf{a}}$. 16.3 Add and subtract vectors. 16.4 Multiply a vector by a scalar. 16.5 Extended curriculum only. 16.6 Extended curriculum only. 16.7 Calculate the magnitude / length of a vector and use the notation $\lvert\underline{a}\rvert$ to represent vector magnitude or length of vector. 16.8 Extended curriculum only. 16.9 Extended curriculum only.. 16.10 Extended curriculum only. 16.11 Extended curriculum only.	Learners should be able to: 16.1 represent a vector by a directed line segment. 16.2 Represent a vector by $\begin{pmatrix} x \\ y \end{pmatrix}$ or $\overrightarrow{AB}$ or $\underline{\mathbf{a}}$. 16.3 Add and subtract vectors. 16.4 Multiply a vector by a scalar. 16.5 Identify parallel vectors as those that are scalar multiples of each other. 16.6 Use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors. 16.7 Calculate the magnitude / length of a vector and use the notation $\lvert\underline{a}\rvert$ to represent vector magnitude or length of vector. 16.8 Simplify vector expressions. 16.9 Use base vectors to represent vectors on a plane. 16.10 Use position vectors. 16.11 Identify collinear points using vectors.

17. Algebraic Representation and Formulae *[Topic Area: Algebra]*

Learners should be able to:

17.1 Use letters for numbers to express generalised numbers and expressions algebraically.
17.2 Substitute numbers for words and letters in formulae.
17.3 Change the subject of simple formulae.
17.4 Extended curriculum only.
17.5 Construct simple algebraic expressions and set up simple equations.
17.6 Extended curriculum only.
17.7 Expand brackets including double brackets. e.g 4y(3x +y) , (x + 3)(2x – 5)
17.8 Extended curriculum only.
17.9 Simplify algebraic expressions
e.g. $5(x + 3) – 2 (x – 5)$.
17.10 Factorise two-term expressions using a common factor.
17.11 Factorise expressions of the form
$x^2 + bx + c$, $x^2 – y^2$.
17.12 Extended curriculum only

17.13 Simplify algebraic fractions of the form
$\frac{ax}{k_1} \pm \frac{bx}{k_2}$ or $\frac{x \pm a}{k_1} \pm \frac{x \pm b}{k_2}$, $k_1, k_2 \neq 0$

e.g. $\frac{2x}{3} - \frac{x}{4}$, $\frac{x-2}{3} + \frac{x+4}{5}$,
or of the form $\frac{k_1}{ax} \times \frac{k_2}{bx}$, $\frac{ax}{k_1} \div \frac{bx}{k_2}$
e.g. $\frac{2}{3a} \times \frac{4}{5a}$, $\frac{2x}{3} \div \frac{x}{4}$.

17.14 Extended curriculum only.
17.15 Extended curriculum only.

Learners should be able to:

17.1 Use letters for numbers to express generalised numbers and expressions algebraically.
17.2 Substitute numbers for words and letters in formulae.
17.3 Change the subject of simple formulae.
17.4 Change the subject of a formula
(i) when the new subject appears on both sides by collecting like terms and factorising,
(ii) when there is a square root or a square or a cube

17.5 Construct simple algebraic expressions and set up simple equations.
17.6 Construct and simplify more complicated formulae and equations (square and cubic).

17.7 Expand brackets including double brackets. e.g 4y(3x +y) , (x + 3)(2x – 5)
17.8 Expand products of algebraic expressions. Including products of more than two brackets, e.g. (x + 4)(x – 7)(2x + 1)
17.9 Simplify algebraic expressions
e.g. $5(x + 3) – 2 (x – 5)$.
17.10 Factorise two-term expressions using a common factor.
17.11 Factorise expressions of the form
$x^2 + bx + c$, $x^2 – y^2$.
17.12 Factorise expressions of the form
$ax + bx + kay + kby$, $a^2x^2 – b^2y^2$,
$p^2 + 2pq + q^2$ and $ax^2 + bx + c$, where $a \neq 1$ (i.e., a can be negative or greater than 1).

17.13 Simplify algebraic fractions of the form
$\frac{ax}{k_1} \pm \frac{bx}{k_2}$ or $\frac{x \pm a}{k_1} \pm \frac{x \pm b}{k_2}$, $k_1, k_2 \neq 0$

e.g. $\frac{2x}{3} - \frac{x}{4}$, $\frac{x-2}{3} + \frac{x+4}{5}$,
or of the form $\frac{k_1}{ax} \times \frac{k_2}{bx}$, $\frac{ax}{k_1} \div \frac{bx}{k_2}$
e.g. $\frac{2}{3a} \times \frac{4}{5a}$, $\frac{2x}{3} \div \frac{x}{4}$.

.
17.14 Simplify algebraic fractions of the form
$\frac{k}{x-a} \pm \frac{w}{x+b}$
(Two term denominator).

17.15 Simplify algebraic fractions where numerator and denominator are rational quadratic expressions such as

	$\frac{hx^2 - kx}{ax^2 - bx + c}$, e.g. $\frac{x^2 - 2x}{x^2 - 5x + 6}$

18. Coordinates, Graphs, Relations and Function Notation *[Topic Area: Algebra]*	
Learners should be able to:	Learners should be able to:
18.1 Use the words domain and range interchangeably with input and output respectively. 18.2 Use basic linear language for linear functions e.g. f$(x) = x + 3$ or f: $x \rightarrow x + 3$ or $y = x + 3$. 19.3 Evaluate a linear function by substituting for a given value of the domain. 18.4 Find the inverse of a linear function using a flow chart. 18.5 Find the inverse of a linear function algebraically. 18.6 Extended curriculum only. 18.7 Extended curriculum only. 18.8 Extended curriculum only. 18.9 Write coordinates and plot points. 18.10 Calculate the gradient of a straight line. 18.11 Identify the gradient and the y-intercept when an equation of line is written in the form $y = mx + c$. 18.12 Interpret and obtain the equation of a straight line in the form $y = mx + c$ given: (i) the coordinates of two points on it (ii) the gradient and one point on it (iii) a graph 18.13 Extended curriculum only. 18.14 Extended curriculum only. 18.15 Extended curriculum only. 18.16 Extended curriculum only. 18.17 Recognise, sketch and interpret graphs of functions (linear and quadratic only). 18.18 Extended curriculum only. 18.19 Construct tables of values and draw and recognise graphs for functions of the form $bx + c$, $\pm x^2 + bx + c$, and $\frac{b}{x}$ $(x \neq 0)$ where b and c are integral constants. 18.20 Extended curriculum only. 18.21 Extended curriculum only. 18.22 Extended curriculum only.	18.1 Use the words domain and range interchangeably with input and output respectively. 18.2 Use basic linear language for linear functions e.g. f$(x) = x + 3$ or f: $x \rightarrow x + 3$ or $y = x + 3$. 18.3 Evaluate a linear function by substituting for a given value of the domain. 18.4 Find the inverse of a linear function using a flow chart. 18.5 Find the inverse of a linear function algebraically. 18.6 Form a composite function of the form fg(x) given g and f by first applying function g on x, and then function f on g(x). 18.7 Evaluate composite functions by substitution. 18.8 Find the inverse of composite functions using: (i) the flow diagram, (ii) the algebraic method. 18.9 Write coordinates and plot points. 18.10 Calculate the gradient of a straight line. 18.11 Identify the gradient and the y-intercept when an equation of line is written in the form $y = mx + c$. 18.12 Interpret and obtain the equation of a straight line in the form $y = mx + c$ given: (i) the coordinates of two points on it (ii) the gradient and one point on it 18.13 Find the gradient of parallel and perpendicular lines. e.g find the gradient of a line perpendicular to y = 3x + 1. e.g find the equation of a line perpendicular to one passing through coordinates (1 , 3) and (-2, -9) 18.14 Calculate the length of a straight line segment from the coordinates of its end points. 18.15 Calculate the coordinates of the midpoint of a straight line segment given its end points. 18.16 Estimate gradients of curves by drawing

	tangents. 18.17 Recognise, sketch and interpret graphs of functions (linear and quadratic only). 18.18 Recognise, sketch and interpret graphs of functions cubic, reciprocal and exponential. Knowledge of turning points and asymptotes is required. 18.19 Construct tables of values and draw and recognise graphs for functions of the form $bx + c$, $\pm x^2 + bx + c$, and $\frac{b}{x}$ ($x \neq 0$) where b and c are integral constants. 18.20 Construct tables of values and draw and interpret graphs for the functions of the forms $y = ax^n$ and $y = ax^n + bx + c$, where a is a rational constant and n = –2, –1, 2, 3 (a,b,c are constants where a is not equal to zero). 18.21 Construct tables and draw and interpret functions of the form $ab^x + c$ where a is a positive integer. 18.22 Solve equations associated with curve graphs approximately by graphical methods.

19. Differentiation *[Topic Area: Algebra and Shape and Space]*	
19.1 Extended curriculum only. 19.2 Extended curriculum only. 19.3 Extended curriculum only. 19.4 Extended curriculum only.	19.1 Understand the idea of a derived function. 19.2 Use the derivatives of functions of the form ax^n, and simple sums of not more than three of these. 19.3 Apply differentiation to gradients and turning points (stationary points). 19.4 Discriminate between maxima and minima by any method. a is a rational constant and n is a positive integer or 0. e.g. $2x^3 + x - 7$
20. Solution of Equations and Inequalities *[Topic Area: Algebra]*	
Learners should be able to: 20.1 Form and/or solve simple linear equations e.g., $3x + 2 = 14$, $5(2x - 3) - 3(x + 4) = 2$. 20.2 Solve linear fractional equations with numerical denominators. 20.3 Solve linear equations by graphical methods. 20.4 Solve simple linear inequalities including fractional inequalities with numerical denominators. 20.5 Extended curriculum only.	Learners should be able to: 20.1 Form and/or solve simple linear equations e.g., $3x + 2 = 14$, $5(2x - 3) - 3(x + 4) = 2$. 20.2 Solve linear fractional equations with numerical denominators. 20.3 Solve linear equations by graphical methods. 20.4 Solve simple linear inequalities including fractional inequalities with numerical denominators. 20.5 Solve double linear inequalities e.g.

20.6 Extended curriculum only. 20.7 Form and solve simultaneous linear equation in two unknowns by (i) the method of substitution, (ii) the method of elimination, (iii) graphical method. 20.8 Extended curriculum only. 20.9 Solve quadratic equations of the form $x^2 + bx + c = 0$ by the method of factorisation, 20.10 Solve quadratic equations of the form $x^2 + bx + c = k$ by the graphical method.. 20.11 Extended curriculum only. 20.12 Extended curriculum only. 20.13 Extended curriculum only.	$-5 < 2x + 3 \leq 10$. 20.6 Solve simultaneous inequalities e.g. $2x + 3 < 10$ and $x + 7 \geq 2$. 20.7 Form and solve simultaneous linear equation in two unknowns by (i) the method of substitution, (ii) the method of elimination, (iii) graphical method. 20.8 Derive and solve simultaneous equations, involving one linear and one quadratic. 20.9 Solve quadratic equations of the form $x^2 + bx + c = 0$ by the method of factorisation, 20.10 Solve quadratic equations of the form $x^2 + bx + c = k$ by the graphical method. 20.11 Form and solve non-linear equations (e.g. quadratic) from statements by first defining an unknown. 20.12 Solve quadratic equations by (i) graphical method, (ii) factorisation, (iii) completing the square, (iv) the quadratic formula. 20.13 Solve non-linear fractional equations with linear algebraic denominators.

21. Matrices *[Topic Areas: Number, Algebra, Data Handling and Shape, Position and Space]*	
Learners should be able to: 21.1 Display information in the form of a matrix of any order. 21.2 Determine the order of a matrix 21.3 Calculate the product of a matrix and a scalar quantity. 21.4 Perform basic matrix operations: addition, subtraction and multiplication on matrices of any order (where compatible). 21.5 Understand and use the zero and identity 2 x 2 matrices. 21.6 Use equality of matrices in simple matrix equations. 21.7 Extended curriculum only. 21.8 Extended curriculum only. 21.9 Extended curriculum only. 21.10 Extended curriculum only.	Learners should be able to: 21.1 Display information in the form of a matrix of any order. 21.2 Determine the order of a matrix 21.3 Calculate the product of a matrix and a scalar quantity. 21.4 Perform basic matrix operations: addition, subtraction and multiplication on matrices of any order (where compatible). 21.5 Understand and use the zero and identity 2 x 2 matrices. 21.6 Use equality of matrices in simple matrix equations. 21.7 Use the algebra of 2 x 2 matrices including the zero and identity matrices. 21.8 Calculate and use the determinant ($\lvert\mathbf{A}\rvert$) and inverse ($\mathbf{A}^{-1}$) of a 2 × 2 non-singular matrix **A**. 21.9 Solve simultaneous equations using matrices. 21.10 Use matrices in transformations.

22. Linear Programming *[Topic Areas: Algebra, Data Handling and Shape, Position and Space]*	
Learners should be able to: 22.1 Represent inequalities in one variable on a number line. (*The convention of using open circle for* < *and* > *and solid circle for* ⩽ *and* ⩾ *will be expected.*) 22.2 Represent graphically single linear inequalities in one or two variables. (*The convention of using broken lines for* < *and* > *and solid lines for* ⩽ *and* ⩾ *will be expected.*) 22.3 Form inequalities from graphs of single regions by first determining the equation of the boundary line. 22.4 Extended curriculum only. 22.5 Extended curriculum only. 22.6 Extended curriculum only.	Learners should be able to: 22.1 Represent inequalities in one variable on a number line. (*The convention of using open circle for* < *and* > *and solid circle for* ⩽ *and* ⩾ *will be expected.*) 22.2 Represent graphically single linear inequalities in one or two variables. (*The convention of using broken lines for* < *and* > *and solid lines for* ⩽ *and* ⩾ *will be expected.*) 22.3 Form inequalities from graphs of single regions by first determining the equation of the boundary line. 22.4 Represent graphically the solution set of 2 or more simultaneous inequalities in one or two variables. (*The convention of using broken lines for* < *and* > *and solid lines for* ⩽ *and* ⩾ *will be expected.*) 22.5 Form inequalities from graphs of regions by first determining the equations of the boundary lines. 22.6 Solve simple linear programming problems by representing the information in inequality form and drawing graphs of these inequalities.
23. Statistics *[Topic Area: Data Handling]*	
Learners should be able to: 23.1 Collect, classify and tabulate data. 23.2 Read, interpret and draw simple inferences from tables and diagrams. Compare sets of data using tables, graphs and statistical measures. Appreciate restrictions on drawing conclusions from given data. 23.3 Calculate the range for ungrouped data. 23.4 Find the mean, mode and median from ungrouped data. 23.5 Calculate the mean, median and mode for discrete data. 23.6 Calculate the mean, median, mode and	Learners should be able to: 23.1 Collect, classify and tabulate data. 23.2 Read, interpret and draw simple inferences from tables and diagrams. Compare sets of data using tables, graphs and statistical measures. Appreciate restrictions on drawing conclusions from given data. 23.3 Calculate the range for ungrouped data. 23.4 Find the mean, mode and median from ungrouped data. 23.5 Calculate the mean, median and mode for discrete data. 23.6 Calculate the mean, median, mode and range for individual and discrete data and

range for individual and discrete data and distinguish between the purposes for which they are used. 23.7 Construct and use bar charts for qualitative and numerical data (discrete and grouped with equal intervals). 23.8 Construct and interpret bar charts, pie charts, pictograms, stem-and-leaf diagrams, simple frequency distributions, histograms with equal intervals and scatter diagrams. 23.9 Extended curriculum only. 23.10 Construct and use pie charts. 23.11 Construct and use scatter diagrams (including drawing a line of best fit). 23.12 Understand what is meant by positive, negative and zero correlation. 23.13 Construct frequency table for grouped data (a) for qualitative data (e.g., who liked what?), (b) quantitative data, (discrete and grouped data with equal intervals). 23.14 Extended curriculum only. 23.15 Extended curriculum only. 23.16 Extended curriculum only. 23.17 Extended curriculum only. 23.18 Extended curriculum only.	distinguish between the purposes for which they are used. 23.7 Construct and use bar charts for qualitative and numerical data (discrete and grouped with equal intervals). 23.8 Construct and interpret bar charts, pie charts, pictograms, stem-and-leaf diagrams, simple frequency distributions, histograms with equal intervals and scatter diagrams. 23.9 Construct and use histograms (equal and unequal intervals). (*Frequency Density is expected on the vertical axis.*) 23.10 Construct and use pie charts. 23.11 Construct and use scatter diagrams (including drawing a line of best fit). 23.12 Understand what is meant by positive, negative and zero correlation. 23.13 Construct frequency table for grouped data (a) for qualitative data (e.g., who liked what?), (b) quantitative data, (discrete and grouped data with equal intervals). 23.14 Calculate an estimate of the mean and identify the modal class for grouped data (from frequency tables). 23.15 Construct a cumulative frequency table for ungrouped and grouped data. 23.16 Draw and use cumulative frequency diagrams. 23.17 Estimate the median, quartiles, percentiles and inter-quartile range from cumulative frequency diagrams and distinguish the purpose for which they are used. 23.18 Find and interpret median, quartiles and interquartile range for discrete data from a cumulative frequency table.

24. Probability *[Topic Area: Data Handling]*	
Learners should be able to:	Learners should be able to:
24.1 Explain the terms and phrases used in probability. e.g fair, biased, equally likely, etc. 24.2 Calculate the probability of a single event as either a fraction, decimal or percentage (not a ratio). 24.3 Understand and use probability scale from 0 to 1. 24.4 Use the fact that the probability of an event occurring = 1 – (minus) the probability of the event not occurring. 24.5 Understand that relative frequency approximates to probability provided the number of trials is large enough. 24.6 Find probabilities of two combined events using possibility space diagrams for independent events (outcomes represented by points on a grid). 24.7 Extended curriculum only. 24.8 Find probabilities of simple combined events using tree diagrams (independent and dependent events) and Venn diagrams (limited to 2 sets). 24.9 Extended curriculum only. 24.10 Extended curriculum only.	24.1 Explain the terms and phrases used in probability. e.g fair, biased, equally likely, etc. 24.2 Calculate the probability of a single event as either a fraction, decimal or percentage (not a ratio). 24.3 Understand and use probability scale from 0 to 1. 24.4 Use the fact that the probability of an event occurring = 1 – (minus) the probability of the event not occurring. 24.5 Understand that relative frequency approximates to probability provided the number of trials is large enough. 24.6 Find probabilities of two combined events using possibility space diagrams for independent events (outcomes represented by points on a grid). 24.7 Use the basic rules of probability for the combined events *A and B* and *A or B.* 24.8 Find probabilities of simple combined events using tree diagrams (independent and dependent events) and Venn diagrams (limited to 2 sets). 24.9 Calculate the probability of simple combined events, using possibility diagrams, tree diagrams and Venn diagrams (include more than 2 sets). 24.10 Use relative frequency as probability in practice (e.g. frequency and cumulative frequency tables).

GRADE DESCRIPTIONS

Grade descriptions are provided to give a general indication of the standards of achievement likely to have been shown by candidates awarded particular grades. The grade awarded will depend on the extent to which the candidate has met the assessment objectives overall and may conceal weakness in one aspect of the examination that is balanced by above-average performance on some other.

Criteria for the standard of achievement likely to have been shown by candidates awarded Grades A, C, E and F are shown below.

A Grade A candidate should be able to:

1 Use and interpret fractional indices in both numerical and algebraic work.
2 Relate a percentage change to a multiplying factor and vice versa, including compound interest, e.g., multiplication by 1.03 results in a 3% increase.
3 Obtain appropriate upper and lower bounds for solutions to simple problems given data to a specified accuracy.
4 Solve problems involving solids (e.g. cone, sphere, pyramids, frustum and composite solids etc).
5 Relate scale factors to situations in both two and three dimensions.
6 Calculate actual length, areas and volumes from scale models.
7 Carry out calculations involving the use of right-angled triangles as part of work in three dimensions.
8 Add, subtract, multiply and divide algebraic fractions.
9 Manipulate quadratic equations.
10 Write down algebraic formulae and equations from a description of a situation resulting in quadratic equations.
11 Form and solve double linear inequalities.
12 Recognise and interpret graphs of the functions $f(x) = ax^n$, and $g(x) = a^x$
13 Plot, recognise and interpret graphs of functions of the form $f(x) = ax^n + bx + c$
14 Draw the tangent, estimate and interpret gradients of a curve at a point.
15 Solve problems involving sine formula, cosine formula and the use of the area formula for a triangle $A = ½\ ab\sin C$
16 Use the relationships between lengths of line segments, areas, surface area, and volume of similar shapes or solids to solve problems.
17 Construct and interpret histograms with unequal intervals.
18 Calculate the probability of simple combined events, using addition or multiplication of probabilities as appropriate.
19 Solve loci problems in 2D.
20 Recognise, describe and generalise in algebraic format patterns of non-linear sequences.
21 Process data, discriminating between necessary and redundant information.
22 Make quantitative and qualitative deductions in speed/time graphs.
23 Make clear, concise and accurate mathematical statements, demonstrating ease and confidence in the use of symbolic forms and accuracy in algebraic or arithmetic manipulation.
24 Give clear mathematical justifications for the conjectures made in problem solving.
25 Describe the single transformation equivalent to a combined transformation.
26 Draw and use graphs of linear inequalities to solve a linear programming problem.
27 Calculate an estimate of the mean for grouped data.
28 Construct and use cumulative frequency tables and graphs.
29 Compare two distributions using the mean, median and interquartile range.
30 Solve problems involving joint variation.
31 Draw and describe reflections on sloping lines.
32 Use angle properties of a circle.

A Grade C candidate should be able to:

1 Use positive and negative indices in numerical work.
2 Calculate percentage change.
3 Perform calculations involving several operations.
4 Use symmetry properties of a circle.
5 Express any number to 1, 2, or 3 significant figures.
6 Calculate the area or arc length of a sector.
7 Use and understand the standard form of a number.
8 Find the volume and surface area of a prism and a cylinder.
9 Solve ratio and proportion problems.
10 Solve problems involving perimeters and areas of compound shapes bounded by line segments and/or circular arcs.
11 Solve practical problems involving mass, volume and density.
12 Make quantitative and qualitative conclusion from distance-time graphs.
13 Manipulate algebraic fractions with denominators containing a single term (numerical or algebraic).
14 Form simple algebraic expressions.
15 Factorise quadratic expressions of the form $x^2 + bx + c$, $x^2 - y^2$.
16 Form and solve linear equations in practical situations.
17 Manipulate and solve fractional equations and quadratic equations (a =1).
18 Calculate the length of the third side of a right-angled triangle.
19 Find the angle in a right-angled triangle, given two sides.
20 Calculate angles in geometrical figures.
21 Recognise, and in simple cases formulate, rules for generating a pattern or sequence.
22 Solve simple simultaneous linear equations in two unknowns.
23 Form and solve simple linear inequalities.
24 Represent regions in the plane determined by linear inequalities.
25 Use cosine, sine and tangent ratios in right angled triangles when solving problems in two dimensions (including bearings, angles of elevation and depression).
26 Draw and/ or state loci of points in two dimensions.
27 Draw, recognise and describe transformations of shapes [rotation and enlargement].
28 Make, use and interpret scale drawings.
29 Use a scale diagram to solve a two-dimensional problem.
30 Use possibility space diagrams to calculate probability of combined events.
31 Find the magnitude of a vector.
32 Analyse a given situation, generate data, generalise the data and describe the situation using mathematical symbols, words or diagrams.
33 Transform simple formulae.
34 Substitute numbers in more difficult formulae and evaluate the remaining term.
35 Plot and interpret graphs, including travel graphs, conversion graphs and graphs of linear and simple quadratic functions.
36 Calculate the area of a trapezium.
37 Calculate a missing probability in a list of probabilities for mutually excusive events
38 Use a calculator for complex calculations involving brackets, order of operations, or powers etc.
39 Multiply a matrix by a matrix.
40 Calculate and use gradients of straight lines.

A Grade E candidate should be able to:

1 Convert a fraction to a decimal and vice versa.
2 Draw a triangle given three sides.
3 Solve simple linear equations in one unknown.
4 Calculate the mean, mode, median and range of a set of numbers.
5 Manipulate simple algebraic expressions.
6 Represent, add and subtract vectors.
7 Multiply column vectors by a scalar.
8 Apply the four rules of number to positive and negative integers, and vulgar and decimal fractions.
9 Use a calculator fluently. Give a reasonable approximation to a calculation involving the four rules.
10 Use area and volume units.
11 Draw distance-time graphs.
12 Identify and describe rotational symmetry in two dimensions.
13 Calculate the probability of single events.

14 Make and justify estimates of probability (Experimental probability).
15 Understand that relative frequency approximates to probability.
16 Use brackets and extract common factors from two-term linear algebraic expressions [e.g. 2x - 4]
17 Draw nets of solids.
18 Find angles using parallel lines (may ask for reason).
19 Calculate the area of a triangle.
20 Order a list of decimal numbers.
21 Substitute numbers into a formula using two variables.
22 Draw straight line graphs and show inequalities on a number line.
23 Draw and interpret a simple pie chart.
24 Calculate a square root and round the answer to one decimal place.
25 Solve more complex shopping problems.
26 Add and subtract matrices
27 Use words such as 'certain', unlikely', 'impossible'
28 Perform calculations involving several operations.
29 Draw, recognise and describe a reflection of shapes on vertical and horizontal lines on grid.
30 Calculate the area and circumference of a circle.

A Grade G candidate should be able to:

1 Perform the four rules on positive integers and decimal fractions (one operation only) using a calculator where necessary.
2 Calculate a simple percentage.
3 Use metric units of length, mass and capacity (mm, cm, m, km, g, kg, ml and cm^3); together with conversions between units in these areas of measure.
4 Continue a straightforward number sequence and state the rule.
5 Find the perimeter and area of a rectangle, square and parallelogram.
6 Measure a given angle.
7 Substitute numbers in a simple formula and evaluate the remaining terms.
8 Extract information from simple timetables.
9 Tabulate numerical data to find the frequency of given scores.
10 Draw a bar chart.
11 Plot and read given points.
12 Read tables, graphs including travel graphs.
13 Recognise and name plane shapes and solids.
14 Recognise, describe and translate plane shapes on a coordinate grid.
15 Identify and use line symmetry in two dimensional shapes.
16 Find the area of a rectangle by counting squares.
17 Find the volume of a cuboid by counting cubes.
18 Recognise acute, obtuse and reflex angles.
19 Use tallies to complete a frequency distribution (not grouped) from a list of data.
20 Read from a pictogram or bar chart.
21 Identify the mode on a bar chart.
22 Round numbers to the nearest 10, 100 or 1000.
23 Give all the factors of a number.
24 Work out the time for a simple journey.
25 Identify the lowest temperature in a list including negative temperatures.
26 Draw and describe horizontal and vertical lines.
27 State the order of a matrix.
28 Use and interpret geometrical terms.
29 Recognise nets of solids.
30 Find the third angle in a triangle (may ask for reason).
31 Identify cube and prime numbers