Republic of Malawi

Syllabus for

Mathematics

Forms 3 and 4

Ministry of Education, Science and Technology

Syllabus for

Mathematics

Forms 3 and 4

Ministry of Education, Science and Technology

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Contents

Foreword

Education is the vehicle through which every citizen can realise his or her potential and contribute to national development. The vision of the education sector in Malawi is to be a catalyst for socio-economic development, industrial growth and an instrument for empowering the poor, the weak and the voiceless. Its mission is to provide quality and relevant education to Malawians. As a catalyst for the development, education should equip the individual with knowledge, skills, values and attitudes to enable one to perform one's roles effectively, in an attempt to promote and sustain the social-economic development of a nation.

It is the conviction of the Ministry of Education, Science and Technology that primary education alone is not sufficient for achieving socio-economic development. As argued in the NESP (2008-2017), 'In an evolving and changing world of education, there is no way basic education can be taken as a complete transformer of our society when the world at large is getting more complex and sophisticated'. Therefore, secondary education is critical as it provides additional knowledge, skills and attitudes crucial for enabling Malawians to cope with the complex and sophisticated socio-economic and political environment of the global village to which Malawi belongs. Specifically, secondary education is:

- a human right, and important for achieving gender equity
- important for improving the health and quality of life for individuals, families and communities
- important for the socio-economic and political development of the nation
- necessary for reaching the Millennium Development Goals (MDGs), Education For All (EFA) and for promoting Universal Primary Education (UPE)

Against this background, the Malawi Government through the Ministry of Education, Science and Technology has reviewed the secondary school curriculum with a view to improving its quality and relevance, and to align it with the primary curriculum which has since been reviewed and emphasises continuous assessment as a tool for learning.

The rationale for reviewing the secondary school curriculum is contained in the NESP (2008-2017), and PIF (2000). The documents clearly state that the purpose of secondary education is to provide students with the academic basis for gainful employment in formal, private and public sectors. They further state that secondary education will prepare students for further education according to their abilities and aptitudes. However, it is important to note that for the majority of the children in Malawi, secondary education is terminal. Consequently, the curriculum has put emphasis on practical skills that enable them to achieve self-employment.

It is also clear that a good secondary school curriculum enables a student to develop into an adult with sound intellectual, moral, physical, and emotional abilities. Therefore the curriculum needs to address the whole range of students' abilities and interests. In addition, it should aim at equipping the student to become an independent learner in order to promote personal, family, community and national development. The new curriculum has therefore been deliberately designed to achieve these important goals. The importance of this syllabus therefore, cannot be over-emphasised.

I would like to thank all those who were directly or indirectly involved in the preparation of the syllabuses. Key among the stakeholders are the Director and staff of the Department of Inspectorate and Advisory Services (DIAS) in the Ministry of Education, Science and Technology (MoEST), for facilitating the development of the syllabuses in collaboration with the Director and staff of the Malawi Institute of Education (MIE). I would also like to extend my gratitude to university colleges (both public and private), teachers from secondary schools (both public and private), members of different religious groups and officers representing special

interest groups such as the Malawi Revenue Authority (MRA), Reserve Bank of Malawi (RBM), Malawi Bureau of Standards (MBS), Anti-Corruption Bureau (ACB) and Malawi Blood Transfusion Services (MBTS) for their valuable contribution to and participation in the preparation of these syllabuses.

Most of all, I would like to express my hope that teachers will implement this curriculum diligently and in the best interest of the students so that the goals for reviewing the curriculum are achieved.
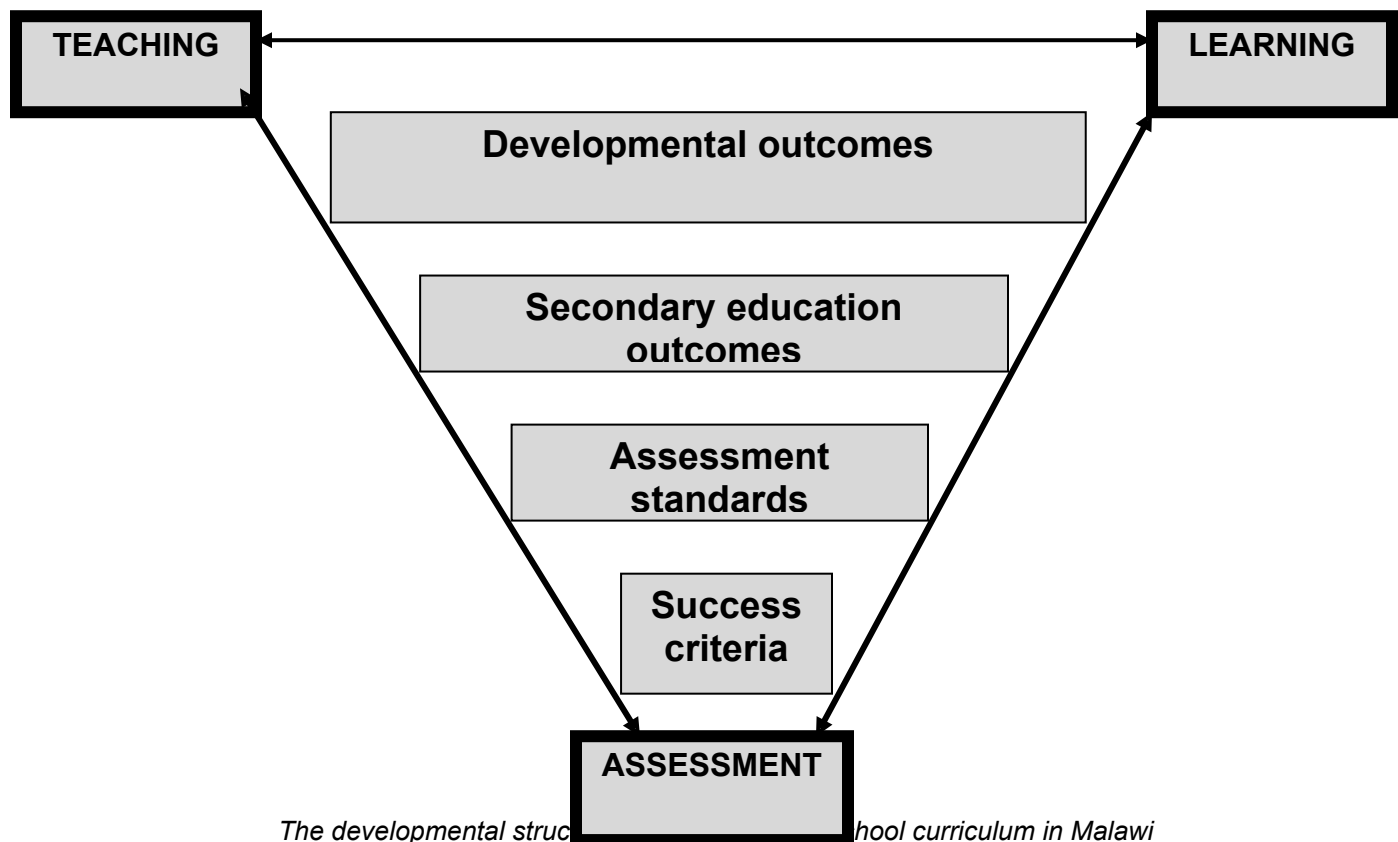

Dr McPhail Magwira
Secretary for Education Science and Technology (SEST)

The secondary school curriculum in Malawi

Among other reasons, the secondary school curriculum has been reviewed to align it with the primary school curriculum. This curriculum puts emphasis on student-centred teaching and learning approaches, including continuous assessment.

This curriculum focuses on student achievement. To achieve the outcomes, students must be introduced to new knowledge, skills, attitudes and values in the context of their existing knowledge, skills, attitudes and values so that they develop a deeper understanding as they learn and apply the knowledge. In this way, the process of learning is integral to the final product. The final products are the outcomes, that is, what students are expected to achieve in terms of knowledge, skills, attitudes and values, which must be clearly stated before teaching and learning begin. The achievements made at school, however, are only truly beneficial when the students transfer them to life beyond the school and view learning as a lifelong process. This is essential to keep pace with the changing social environment of home and work.

The figure below illustrates the structure and major elements of Malawi's secondary school curriculum, which are elaborated in the text below.

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TEACHING ←————————————————————————→ LEARNING

              Developmental outcomes

              Secondary education
                   outcomes

                Assessment
                 standards

                 Success
                 criteria

                ASSESSMENT
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The developmental struc[...]hool curriculum in Malawi

Developmental outcomes

The developmental outcomes are over-arching; they are what the student is expected to achieve by the end of the secondary school cycle both in and out of school. These outcomes apply to subject areas and they have been derived from the Constitution of the Republic of Malawi, Malawi Growth and Development Strategy (MGDS), National Education Sector Plan (NESP), Education Act and other education policy documents, including global policies and

multilateral agreements to which Malawi is a signatory, as well as from the Secondary School Curriculum and Assessment Review (SSCAR). That is, students should be able to:

1 demonstrate appropriate moral and ethical behaviour in accordance with the accepted norms and values of the society
2 demonstrate local, regional, and international understanding
3 communicate competently, effectively, and relevantly in a variety of contexts, in an appropriate local or international language
4 apply mathematical concepts in socio-cultural, political, economic, environmental, scientific, and technological contexts to solve problems
5 apply scientific, technological, vocational, and managerial skills in a creative and innovative way to identify problems and develop appropriate solutions, so as to participate productively in society
6 demonstrate health-promoting behaviour in their personal lives as well as in their communities and the wider environment, with particular attention to prevalent diseases
7 appreciate and interact with the environment in a responsible and sustainable manner
8 apply the indigenous and non-indigenous knowledge and skills necessary for lifelong learning, personal advancement, employment, and the development of society
9 use Information and Communication Technology (ICT) responsibly and productively
10 demonstrate an understanding of the functioning of the economy and the contribution of agriculture and other sectors to national development
11 make use of entrepreneurial and vocational skills for personal and national development
12 apply research skills for problem-solving
13 demonstrate an understanding and appreciation of issues of human rights, democracy, gender, governance, and other emerging issues

Secondary education outcomes
The secondary education outcomes are categorised into seven sets of essential skills to be acquired by a secondary school graduate. The skills are:
1 citizenship skills
2 ethical and socio-cultural skills
3 economic development and environmental management skills
4 occupational and entrepreneurial skills
5 practical skills
6 creativity and resourcefulness
7 scientific and technological skills

Citizenship skills
1 demonstrate an understanding and appreciation of the symbols of nationhood
2 demonstrate a spirit of patriotism and national unity
3 apply decision-making skills necessary for participation in civic affairs
4 demonstrate a spirit of leadership and service
5 show respect for one's own and other people's rights and responsibilities
6 tolerate other people's attitudes and beliefs
7 demonstrate respect for the rule of law
8 understand characteristics of good governance
9 initiate and implement community development projects
10 demonstrate a sense of good neighbourliness
11 demonstrate a sense of national, regional and international understanding
12 demonstrate cooperative behaviour
13 demonstrate personal and social responsibility

Ethical and socio-cultural skills
14 demonstrate moral, spiritual and ethical attitudes and values
15 appreciate Malawi's diverse cultures and their respective practices
16 appreciate existing national institutions and cultural heritage
17 appreciate the value of the relationship between the individual and society
18 respect one's own and other people's cultures
19 identify beliefs which promote or retard national development
20 evaluate beliefs, taboos and superstitions in relation to national development
21 uphold beliefs which promote national development

Economic development and environmental management skills
22 understand Malawi's economy and economic structure
23 demonstrate entrepreneurial and/or vocational skills for formal or informal employment
24 exploit economic opportunities stemming from agriculture
25 demonstrate an interest in land husbandry, animal husbandry and aquaculture
26 apply appropriate agricultural practices and methods
27 acquire positive attitudes and skills, and apply them to the sustainable development of the natural and physical environment
28 understand the importance of diversified agriculture for Malawi's economy
29 understand the impact of technologies on economic productivity
30 apply relevant technologies to various economic activities
31 apply value addition practices to agricultural and environmental resource utilisation and management
32 appreciate Malawi's environmental resources
33 understand the impact of rapid population growth on natural resources and the delivery of social services
34 apply a variety of measures to conserve Malawi's natural resources
35 apply ICT skills to improve intellectual growth, personal enhancement and communication
36 demonstrate the ability to adapt to climate change and mitigate its impact on the economy and environment
37 appreciate the importance of energy in economic development
38 understand the importance of diversifying the economy through sectors such as tourism, mining and manufacturing

Occupational and entrepreneurial skills
39 demonstrate the spirit of self-reliance through vocational and entrepreneurial activities
40 apply appropriate vocational, occupational and entrepreneurial skills to individual and national advancement
41 demonstrate effective communication skills for the transfer of occupational and entrepreneurial knowledge, skills, attitudes and values
42 apply the principles of science and technology, entrepreneurship and management to promote active and productive participation in the society
43 demonstrate creativity and innovation for the benefit of the individual, community and the nation as a whole
44 demonstrate an understanding of indigenous and non-indigenous knowledge, skills, attitudes and values, and apply them to personal intellectual growth and national development
45 use vocational, occupational and entrepreneurial skills for the creation of economic opportunities in agriculture and other sectors

Practical skills
46 acquire entrepreneurial skills related to agriculture, commerce and industry

47 apply appropriate skills to agricultural, commercial and industrial production
48 demonstrate positive attitudes to manual work
49 demonstrate excellence in any kind of workmanship
50 demonstrate sporting ability and sportsmanship
51 demonstrate the ability to use creative and innovative artistic talents for self-employment

Creativity and resourcefulness
52 demonstrate a spirit of inquiry and creative, critical and lateral thinking
53 use problem-solving techniques to solve practical problems
54 demonstrate an imaginative and creative mind
55 exploit creative potential
56 understand personal strengths and weaknesses and use strengths to promote healthy self-esteem
57 maximise the use of available resources

Scientific and technological skills
58 apply appropriate scientific, technological and vocational skills to improve economic productivity
59 apply relevant innovations in science and technology
60 demonstrate a capacity to utilise appropriate technology
61 demonstrate basic research skills

Rationale for mathematics

Mathematics is a vehicle for the development and improvement of a person's intellectual competence in logical reasoning, spatial visualisation, analysis and abstract thought. Learners develop such skills as computational, reasoning, critical thinking, and problem solving through the learning and application of mathematics. Mathematics is also vital in enabling learners to communicate competently and effectively in different contexts using mathematical language. These skills are valuable not only in learning other disciplines, but also in everyday life and in the workplace. The development of a highly skilled, scientifically and technologically based human resources requires a strong grounding in mathematics. An emphasis on mathematics learning in secondary schools will ensure that we have an increasingly competitive workforce to meet the challenges of the 21st century.

Mathematics is also a subject of enjoyment and excitement, which offers students opportunities for creative work and moments of enlightenment and joy. When ideas are discovered and insights gained, students are encouraged to pursue mathematics beyond the classroom walls.

Core elements and their outcomes

Number and numeration
The students will be able to describe number systems and apply their properties in arithmetical operations.

Structure
The students will be able to describe sets of numbers including properties of vectors, rotation, reflection, translation and matrices in terms of quantity, structure, and space.

Space and shape

The students will be able to solve problems involving shape, size, space, relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Patterns, functions and change
The students will be able to draw and interpret graphs and charts, organize and interpret information, relationships and changes.

Statistics
The students will be able to formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; select and use appropriate simple statistical methods to analyze data; develop and make predictions that are based on data; understand and apply basic concepts of probability.

Scope and sequence chart for Forms 1 to 4

Core element	Form 1	Form 2	Form 3	Form 4
Number and numeration	• number systems • algebraic expressions • simple algebraic fractions • approximations and estimations • HCF and LCM • factorisation • commercial arithmetic • linear equation • number patterns	• number patterns • algebraic expressions • linear simultaneous equations • proportion • mixtures • indices • standard form • logarithms • quadratic equations	• quadratic equations • irrational numbers • algebraic fractions with linear or quadratic denominators • subject of the formulae • exponential and logarithmic equations	• matrices • simultaneous linear and quadratic equations • progressions • polynomials
Structure	• sets • transformation		• sets • transformations	• vectors
Space, shape and measurement	• lines and angles • triangles and polygons • geometric constructions	• Pythagoras theorem • congruent triangles • quadrilaterals • similar triangles • mensuration • geometric construction	• circle geometry (chord properties) • circle geometry (angle properties) • trigonometry • similarity	• tangents to circles • trigonometry • mensuration
Core element	**Form 1**	**Form 2**	**Form 3**	**Form 4**
Pattern, relations,	• co-ordinate geometry	• graphs simultaneous equations	• mapping and functions • co-ordinate geometry	• travel – graphs • linear programming

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functions and change		• inequalities • distance – time graphs	• variations • inequalities • graphs of quadratic functions	• cubic graphs
Statistics	• statistics	• probability	• statistics	• statistics • probability

Teaching syllabus for Forms 3 and 4

Form 3

Core element : Number and numeration

Outcome : The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving quadratic equations	Students must be able to: 1 factorise quadratic expressions 2 solve quadratic equations	**Quadratic equations**	• discussing quadratic expressions • factorising quadratic expressions • solving quadratic equations by factorization • completing the square of quadratic expressions • solving quadratic equations by completing the square	• problem solving • discussion • question and answer • written exercises • pair work	• charts
Assessment standard	**Success criteria**	**Theme/topic**	**Suggested teaching, learning and assessment activities**	**Suggested teaching, learning and assessment methods**	**Suggested teaching, learning and assessment resources**
	3 solve practical		• deriving the quadratic formula • solving quadratic equations using the formula • formulating quadratic	• problem solving • discussion • question and answer • written exercises • pair work	• charts

	problems involving quadratic equations		equations from practical (everyday life) problems • solving quadratic equations		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
• carry out basic operations involving irrational numbers	1 recognise irrational numbers 2 simplify surds	**Irrational numbers**	• describing irrational numbers • identifying irrational numbers • discussing surds • expressing surds in their simplest form • adding surds • subtracting surds • multiplying surds	• problem solving • discussion • oral exercises • question and answer • demonstration	• charts

			• dividing surds • writing conjugate surds • expanding conjugate surds • rationalising surd denominators		

Core element : Space, shape and measurement

Outcome : The students will be able to solve problems involving shape, size, spaces relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving circles	Students must be able to: 1 describe chord properties of a circle	**Circle geometry (Chord properties)**	• identifying parts of the circle such as chord, radius, sector, segment, diameter, arc • describing chord properties of a circle • discussing theorems on chord properties	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment	• charts • mathematical sets • geoboards • models of circles

| | | | of a circle:
 - the perpendicular to a chord from the centre bisects the chord and its converse
 - equal chords of the circle are equidistant from the centre and its converse | • practical work
 • pair work | |

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 apply chord properties to solve problems		• calculating the length of the chord given radius and distance from the center • calculating the distance from the centre given the length of a chord and radius • calculating radius given length of a chord and distance from the centre • solving practical problems involving chords	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • geoboards • models of circles

Core element : Number and numeration

Outcome : The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • carry out basic operations on algebraic expressions	Students must be able to: 1 express fractions to their lowest term 2 simplify algebraic fractions	**Algebraic fractions with linear or quadratic denominators**	• identifying common factors • reducing fractions to their lowest term • expressing algebraic fractions into their lowest terms • finding the common denominator of algebraic fractions • adding algebraic fractions • subtracting algebraic fractions • multiplying algebraic fractions	• problem solving • discussion • question and answer • written exercises • pair work	• charts

			• dividing algebraic fractions		

Core element : Structure
Outcome : The students will be able to describe sets of numbers including properties of vectors, rotation, reflection, translation and matrices in terms of quantity, structure, and space.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving sets	Students must be able to: 1 describe elements of a set	**Sets**	• describing set builder notation • describing a universal set • identifying elements of a compliment of a set • identifying elements of a union of two or three sets • identifying elements of an intersection of two or three sets	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• natural environment • charts of the number line • playing cards • number cards

Assessment	Success criteria	Theme/topic	Suggested teaching,	Suggested	Suggested

standard			learning and assessment activities	teaching, learning and assessment methods	teaching, learning and assessment resources
	2 represent sets in Venn diagrams		• drawing Venn diagrams to illustrate the union of two or three sets • drawing a Venn diagram to illustrate the intersection of two or three sets • solving problems involving sets using Venn diagrams	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• natural environment • charts of the number line • playing cards • number cards

Core element : Patterns, relations, functions and change

Outcome : The students will be able to demonstrate an understanding of graphs, charts, relations and functions and use them effectively in different contexts.

Assessment	Success criteria	Theme/topic	Suggested teaching,	Suggested	Suggested

standard			learning and assessment activities	teaching, learning and assessment methods	teaching, learning and assessment resources
We will know this when students are able to: • workout problems involving functions	Students must be able to: 1 represent functions in different forms 2 find the range and domain of functions	**Mapping and functions**	• defining mapping and functions • identifying functions • writing functions in different forms (ie notation of functions) • drawing arrow diagrams • finding the range given the domain • finding the domain given the range • solving real life problems involving functions (causal-effect problems)	• question and answer • demonstration • explanations • discussions • pair and group work • written exercises • problem solving • oral exercises	• chart paper • input and output machine models

Core element : Space, shape and measurement
Outcome : The students will be able to solve problems involving shape, size, spaces relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are	Students must be able to:				

able to: • solve problems involving angle properties of a circle	1 describe angle properties of a circle	**Circle geometry (Angle properties)**	• establishing that the angle at the centre is twice the angle at the circumference • establishing that angle in a semicircle is a right angle • proving that angles subtended by the same arc/chord are equal	• question and answer • demonstration • explanations • discussions • pair and group work • written exercises • problem solving • oral exercises	• chart paper • input and output machine models

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 prove theorems involving angle properties		• discussing formal proofs of theorems: - angle at the centre is twice the angle at the circumference - angle in a	• question and answer • demonstration • explanations • discussions • pair and group work	• chart paper • input and output machine models

				written exercises • problem solving • oral exercises	
			semicircle is a right angle - angles subtended by the same arc/chord are equal		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 describe properties of a cyclic quadrilateral 4 apply properties of a cyclic quadrilateral to solve problems		• describing a cyclic quadrilateral • discussing properties of a cyclic quadrilateral • proving that opposite angles of a cyclic quadrilateral are supplementary • proving that the exterior angle of	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • geoboards • models of circles

			cyclic quadrilateral is equal to the interior opposite angle • showing that points are concyclic • showing that a given quadrilateral is cyclic		

Core element : Structure
Outcome : The students will be able to describe sets of numbers including properties of vectors, rotation, reflection, translation and matrices in terms of quantity, structure, and space.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • describe transformations of simple plane shapes	Students must be able to: 1 rotate a simple plane figure about a given point through a given angle clockwise or anticlockwise 2 translate a simple plane figure in column vector	**Transformations**	• drawing rotations using squared paper • describing rotations using directions and angles • describing translation • drawing a translation	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• charts • mathematical sets • squared paper • graph paper • interlocking blocks • crayons (coloured pencils/chalk)

			• writing down coordinates of a translation in column vectors • translating shapes using column vectors		• computers • pictures • magnifying glasses • geoboards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 enlarge a simple plane figure by a scale factor and a given centre of enlargement		• defining the term 'enlargement' • finding the scale factor of an enlargement • finding the center of an enlargement • enlarging shapes by a positive whole number scale factor • enlarging shapes by a fractional scale factor	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• charts • mathematical sets • squared paper • graph paper • interlocking blocks • crayons (coloured pencils/chalk) • computers • pictures • magnifying glasses • geoboards

Core element : Number and numeration
Outcome : The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve equations • work out problems involving exponential and logarithmic equations	Students must be able to: 1 change the subject of literal equations 2 change the subject of a formula involving powers and roots 1 solve exponential equations	**Subject of the formulae** **Exponential and logarithmic equations**	• identifying the subject of formula • changing the subject of a formula • identifying subject of the formula • transposing formula involving powers and roots • • expressing numbers as powers of given bases • modelling exponential equations • solving exponential equations	• problem solving • discussion • question and answer • written exercises • pair work • problem solving • discussion • question and answer • written exercises • pair work • group work • explanation • demonstration • oral exercises	• charts • calculators • strings

Assessment standard	Success criteria	Theme /topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 solve logarithmic equations		• deriving the rules of logarithms • simplifying logarithm of numbers to a given base • formulating logarithmic equations from exponential equations and vice versa • simplifying logarithmic expressions • solving logarithmic equations using rules of logarithms	• problem solving • discussion • question and answer • written exercises • pair work • group work • explanation • demonstration • oral exercises	• charts • calculators • strings

Core element : Space, shape and measurement

Outcome : The students will be able to solve problems involving shape, size, spaces relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment	Success criteria	Theme/topic	Suggested teaching,	Suggested	Suggested

standard			learning and assessment activities	teaching, learning and assessment methods	teaching, learning and assessment resources
We will know this when students are able to: • use trigonometric ratios of acute angles to calculate the unknown sides and angles in triangles	Students must be able to: 1 calculate angles and sides of right angled triangles using trigonometric ratios	**Trigonometry**	• identifying the hypotenuse of a triangle • identifying an adjacent and opposite side of a given angle • defining the sine, cosine and tangent of an angle • finding the three ratios of given angles • discussing how to use a calculator to work out problems involving trigonometry • finding angles and sides of given triangle	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • geoboards • calculators
Assessment standard	**Success criteria**	**Theme/topic**	**Suggested teaching, learning and assessment activities**	**Suggested teaching, learning and assessment methods**	**Suggested teaching, learning and assessment resources**
	2 derive the fractional trigonometric ratios of 30^0, 45^0,		• deriving the fractional trigonometric ratios of 30^0, 45^0, 60^0 and 90^0	• discussion • demonstration • explanation • question and	• charts • mathematical sets • geoboards

			Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	60^0 and 90^0		• solving problems involving fractional trigonometric ratios without using a calculator	answer • written exercises • peer assessment • group assessment • practical work • pair work	• calculators
	3 solve practical problems involving trigonometry		• finding the angle of elevation and depression • calculating the bearing of a point relative to a given point using trigonometric ratios		

Core element : Space, shape and measurement
Outcome : The students will be able to solve problems involving shape, size, spaces relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems	Students must be able to: 1 apply the ratio of	**Similarity**	• identifying a scale	• discussion	• charts

involving similar shapes	areas to calculate areas and sides of similar figures		factor • finding the area factor • calculating ratios of areas of similar solids • calculating areas of similar shapes • finding the lengths of sides of similar shapes using area factor	• demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• mathematical sets • strings • pieces of paper • models of similar shapes

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 apply the ratio of volumes to calculate volumes and sides of similar solids		• finding volume scale factor • calculating ratios of volumes of similar solids • calculating volumes of similar solids • finding lengths of sides of similar shapes using volume	• discussion • demonstration • explanation • question-and-answer • written exercises • peer assessment • group assessment • practical work	• charts • mathematical sets • strings • pieces of paper • models of similar shapes

			factor		

Core element : Patterns, relations, functions and change
Outcome : The students will be able to demonstrate an understanding of graphs, charts, relations and functions and use them effectively in different contexts.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve geometric problems involving the use of coordinates	Students must be able to: 1 calculate the distance between two points on a straight line 2 find the equation	**Coordinate geometry**	• calculating the distance between two points using Pythagoras' theorem • writing the equation	• discussion • demonstration • explanation • question and answer • written exercises	• graph paper • graph boards

	of a straight line		of a straight line in the form y = mx + c • relating the gradient to the tangent of an angle • using the relationship to find the gradient of a line • formulating the equation of a line with a given gradient through a given point	• peer assessment • group assessment • practical work • pair work	

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 describe the condition for two lines to be parallel 4 find mid-point of line segment		• finding the equation of a line passing through two given points • finding the equation of a line from a graph • explain the relationship between gradients of parallel lines • calculating gradients of parallel lines • finding the equation of a line through a given point and parallel to a given line • deriving the formula for the mid-point of a line segment • finding the mid-point of a line segment	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• graph paper • graph boards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment	Suggested teaching, learning and

				methods	assessment resources
We will know this when students are able to: • work out problems involving variations	Students must be able to: 1 solve problems involving direct variation	**Variations**	• modeling direct variation • deriving general equation involving direct variation • finding constant of variation in direct variation • developing a table of values • presenting direct variation relation graphically • solving direct variation problems	• problem solving • discussion • demonstration • written exercise • group work • individual exercises • oral questions	• calculators • graph papers • graph boards • rulers • mathematical instruments • checklists • charts

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources

	2 solve problems involving inverse variations		• modelling inverse variation • deriving general equations involving inverse variation • finding constant of variation in inverse variation • presenting inverse variation relation graphically • solving inverse variation problems	• demonstration • explanation • question and answer • problem solving • group work • written exercises • observation • projects	• calculators • graph papers • graph boards • rulers • mathematical instruments • checklists • charts
	3 solve problems involving joint variation		• deriving general equation involving joint variation • finding constant of variation in joint variation • solving joint variation problems		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	4 solve problems involving partial		• formulating general equation involving	• discussion • demonstration	• charts • calculators

| | | | partial variation
• finding constants of variation in partial variation
• presenting partial variation relation graphically
• solving partial variation problems | • question and answer
• explanation
• problem solving
• group work
• written exercises
• oral exercises
• tests | • learners' experiences
• computers |
| variation | | | | | |

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
• sketch the graphs of the regions described by the inequalities	1 present inequalities graphically	**Inequalities**	• sketching graphs to show the region represented by inequalities: (a) $x > b$	• discussions • group work • demonstration • written	• calculators • rulers • textbooks • computers

			(b) $x \geq b$ (c) $y < b$ (d) $y \leq b$ • sketching graphs to show the region represented by inequalities: (e) $x > b$ or $x < b$ (f) $x \geq b$ or $x \leq b$ (g) $y > b$ or $y < b$ (h) $y \geq b$ or $y \leq b$	exercises • question and answer • pair work • individual work	• chart paper • graph paper • graph boards • markers
on the *xy*-plane					

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 illustrate simultaneous linear inequalities graphically		• sketching graphs to show the region represented by inequalities: a) $x > b$ and $x < c$ b) $x \geq b$ and $x \leq c$ c) $y > b$ and $y < c$	• discussions • group work • demonstration • written exercises • question and answer	• calculators • rulers • textbooks • computers • chart paper • graph paper • graph boards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 illustrate graphically the solution of simultaneous inequalities in two variables		d) $y \geq b$ and $y \leq c$ • writing down an inequality that describes the given region • finding inequalities in two variables that describe a region • sketching linear graphs in two variables	• pair work • individual work	• markers

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	4 present inequalities in two		• finding the solution represented by simultaneous linear inequalities • writing down two inequalities that describe a given region • showing the region	• discussions • group work • demonstration • written exercises • question and answer • pair work • individual work	• calculators • rulers • textbooks • computers • chart paper • graph paper • graph boards • markers

	variables graphically		represented by inequalities of the form: (a) $ax + by < c$ (b) $ax + by \le c$ (c) $ax + by > c$ (d) $ax + by \ge c$ • showing a region represented by simultaneous inequalities in two variables		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
• analyse graphs of quadratic functions	1 draw graphs of quadratic functions 2 interpret graphs of quadratic functions	**Graphs of quadratic functions**	• constructing tables of values • drawing graphs of quadratic functions • describing the effect of a, b and c on the nature of graph of $y = ax^2 + bx + c$ • finding maximum and minimum values of a quadratic function • finding equation of	• demonstration • problem solving • question and answer • written exercises • pair work • group work • discussion • explanation • projects	• charts • rows and columns in a classroom • graph paper • mathematical instruments • rulers • graph boards • observation checklists • graphic

			the line of symmetry		• calculators • computers

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 solve quadratic equations graphically 4 solve simultaneous linear and quadratic equations graphically		• finding points of intersection of quadratic graph and any horizontal line • solving quadratic equations graphically • drawing linear and quadratic graphs on the same axis • solving simultaneous linear and quadratic equations graphically	• explanation • discussion • question and answer • demonstration • problem solving • written exercises • tests • projects	• charts • graph papers • mathematical instruments • rulers • graph boards • graphic calculators • computers

	5 formulate quadratic equations given quadratic graphs which cuts the x-axis			• identifying x and y intercepts • formulating quadratic equations from graphs		

Core element : Statistics

Outcome : The students will be able to demonstrate an understanding of basic concepts of data handling procedures and apply them in every day life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • analyse data	Students must be able to: 1 organize data	**Statistics**	• classifying grouped data • forming class intervals • determining class boundaries • finding mid-points of class intervals • finding frequencies of grouped and non-grouped data	• practical work • projects • group work • discussion • demonstration • written exercises • question and answer • group assessment • observation • explanation	• charts • rulers • mathematical instruments • calculators • graph papers

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 present data in form of charts and tables 3 calculate measures of central tendency and spread 4 interpret data		• presenting data in the form of diagrams such as frequency tables, histograms, pie charts and frequency polygons • calculating the median of ungrouped data • calculating the mean of grouped data • finding the mode of grouped data • calculating the range of data • interpreting data using measures of central tendency and spread	• practical work • projects • group work • discussion • demonstration • written exercises • question and answer • group assessment • observation • explanation	• charts • rulers • mathematical instruments • calculators • graph papers

Form 4

Core element   :   Number and numeration

Outcome   :   The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving matrices	Students must be able to: 1 describe matrices 2 carry out basic operations involving matrices	**Matrices**	• defining a matrix • presenting information in matrix form • identifying the order of matrix • identifying types of matrices (square matrix, row matrix, column matrix, zero matrix) • adding matrices • subtracting matrices • multiplying a matrix by scalar • multiplying 2 x 2 matrices	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment	• bottle tops • seeds • tables of frequencies • arrays of prices and frequencies • squared paper

Core element   :   Space, shape and measurement

Outcome : The students will be able to solve problems involving shape, size, spaces relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving tangents to circles	Students must be able to: 1 describe the properties of tangents to circles	**Tangents to circles**	• defining a tangent to a circle • establishing the relationship between a tangent and the radius of a circle at the point of contact • establishing that tangents from an external point are equal in length • discussing the formal proof that tangents from an external point are equal in length	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • geoboards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment

					resources
			- establishing that the line joining an external point to the centre of a circle bisects the angle between the tangents - discussing the formal proof that the line joining an external point to the centre of a circle bisects that angle between the tangents - establishing that the angle between a chord and a tangent is equal to the angle subtended by the chord in the alternate segment	- discussion - demonstration - explanation - question and answer - written exercises - peer assessment - group assessment - practical work - pair work	- charts - mathematical sets - geoboards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
			discussing the formal	discussion	charts

			proof that the angle between a chord and a tangent is equal to the angle subtended by the chord in the alternate segment	• demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• mathematical sets • geoboards
	2 apply the properties of tangents to circles in solving problems		• solving problems involving tangents to circles • using properties of tangents to circles to prove that sides or angles are equal		
	3 construct tangents		• constructing a tangent to a circle • constructing tangents from an external point to a circle		

Core element **:** Statistics

Outcome : The students will be able to demonstrate an understanding of basic concepts of data handling procedures and apply them in every day life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this	Students must be				

when students are able to: • analyse data	able to: 1 calculate measures of spread 2 interpret data using measures of spread	**Statistics**	• discussing variance • calculating variance of ungrouped data • discussing standard deviation • calculating standard deviation of ungrouped data • interpreting data using variance • interpreting data using standard deviation	• practical • projects • group work • discussion • demonstration • written exercises • question and answer • group assessment • observation • explanation	• charts • rulers • mathematical instruments • calculators • graph paper

Core element : Number and numeration
Outcome : The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve simultaneous	Students must be able to: 1 solve simultaneous	**Simultaneous linear and**	• discussing simultaneous linear	• problem solving • discussion	• charts

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linear and quadratic equations	linear and quadratic equations 2 solve practical problems involving simultaneous linear and quadratic equations	**quadratic equations**	and quadratic equations • solving simultaneous linear and quadratic equations • formulating simultaneous linear and quadratic equations from practical problems • solving practical problems involving simultaneous linear and quadratic equations	• question and answer • written exercises • pair work	

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
• solve practical problems involving progressions	1 find the terms of an arithmetic progression	**Progressions**	• recognising an arithmetic progression (AP) • calculating the common difference • finding terms of an arithmetic progression • generating the formula for the nth term of an AP • using the formula for	• problem solving • discussion • question and answer • written exercises • pair work • group work • demonstration • oral exercises	• bottle tops • match sticks • match boxes

			the nth term of an AP to calculate the common difference, the number of terms and terms of the AP		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 find the sum of terms of arithmetic progression 3 apply AP in real life situations 4 find the terms of a geometric progression		• generating the formula for finding the sum of an arithmetic progression • calculating the sum of an AP • discussing the application of APs in real life situations • solve problems involving AP • recognising geometric progression (GP)	• problem solving • discussion • question and answer • written exercises • pair work	• bottle tops • match sticks • match boxes

			• calculating the common ratio		
			• finding terms of a geometric progression		
			• generating the formula for the nth term of a GP		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	5 find the sum of the terms of a geometric progression 6 apply GP in real life situations		• using the formula for the nth term of a GP to calculate the common ratio, the number of terms and terms of the GP • generating the formula for finding the sum of a geometric progression • calculating sum of the GP • discussing the application of GP in real life situations • solving problems	• problem solving • discussion • question and answer • written exercises • pair work	• bottle tops • match sticks • match boxes

			involving GP		

Core element : Patterns, relations, functions and change

Outcome : The students will be able to demonstrate an understanding of graphs, charts, relations and functions and use them effectively in different contexts.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving motion	Students must be able to: 1 draw velocity-time graphs	**Travel graphs**	• defining speed, velocity and acceleration • describing the relationship between velocity, speed, time and acceleration • drawing velocity-time graphs	• demonstration • problem solving • question and answer • written exercises • pair work • group work • discussion • explanation • projects	• charts • graph paper • mathematical instruments • rulers • graph boards • graphic calculators • computers

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 interpret velocity-time graphs 3 calculate speed, time, acceleration/deceleration and distance using velocity-time graph		• describing motion depicted by velocity-time graphs • calculating acceleration/ deceleration • calculating distance by using average velocity and time • calculating the area under a velocity-time graph • establishing the relationship between distance covered and the area under the velocity-time graph • solving problems involving velocity-time graphs	• demonstration • problem solving • question and answer • written exercises • pair work • group work • discussion • explanation • projects	• charts • graph paper • mathematical instruments • rulers • graph boards • graphic calculators • computers

Core element : Space, shape and measurement

Outcome : The students will be able to solve problems involving shape, size, space, relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • use trigonometric rules to calculate unknown sides and angles in triangles	Students must be able to: 1 calculate a side and an angle using sine and cosine rules	**Trigonometry**	• deriving the sine rule • calculating a side and an angle using sine rule • deriving the cosine rule • calculating a side and an angle using cosine rule	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • geoboards • calculators

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	2 solve problems using sine and cosine rules		• sketching diagrams from given information	• discussion • demonstration	• charts • mathematical sets

			• calculating the bearing of a point using sine and cosine rule • calculating the distance between two points using cosine and sine rules	• explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• geoboards • calculators
	3 calculate the area and angles of a triangle using area rule		• discussing the area rule of a triangle • calculating the area and angles of a triangle using area rule		

Core element : Number and numeration

Outcome : The students will be able to demonstrate an understanding of number systems and their properties and apply them in solving problems in everyday life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve problems involving polynomials	Students must be able to: 1 divide a polynomial of a higher degree by a polynomial of lower degree 2 find the remainder	**Polynomials**	• discussing polynomials • dividing a polynomial of a higher degree by a polynomial of a lower degree • discussing the	• discussion • question and answer • written exercises • pair work	• charts

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	using remainder theorem		remainder theorem • finding the remainder using long division • finding the remainder using the remainder theorem		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 factorise polynomials		• using remainder theorem to solve problems involving polynomials • discussing factor theorem • factorising polynomials • using the factor theorem to solve problems involving polynomials	• discussion • question and answer • written exercises • pair work	• charts
	4 find the roots of polynomial equations of third degree		• describing polynomial equations of third degree • solving polynomial equations of third degree		
	5 find coefficients in identical polynomials		• discussing identical polynomials		

			• finding coefficients in identical polynomials		

Core element : Statistics

Outcome : The students will be able to demonstrate an understanding of basic concepts of data handling procedures and apply them in every day life.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve practical problems involving probability	Students must be able to: 1 predict the occurrence of events	**Probability**	• performing experiments involving two or more events eg tossing coins, die, picking cards from a pack of cards • listing all possible outcomes in two or more events • listing favourable outcomes in two or more events • defining probability space/sample space • listing outcomes in a probability space	• practical • experiments • projects • group work • discussion • demonstration • written exercises • question and answer • group assessment • observation • explanation	• coins • die • standard packs of cards • branches of trees • balls, marbles, beans

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources

| | 2 calculate the probability of two or more events | | • calculating probability of two or more events
• determining experimental probabilities of events
• discussing independent and mutually excusive events
• calculating the probability of two events (independent, mutually exclusive)
• representing events in tree diagrams
• calculating the probability using a tree diagram
• using probability to make inference | • discussion
• experiment
• group work
• written exercises
• question and answer
• group assessment
• observation
• explanation | • coins
• die
• standard packs of cards
• branches of trees
• balls, marbles, beans |

Core element   :   Structure
Outcome   :   The students will be able to describe sets of numbers including properties of vectors, rotation, reflection, translation and matrices in terms of quantity, structure, and space.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to:	Students must be able to: 1 describe vectors	**Vectors**			

• solve geometric problems involving the use of vectors	2 add vectors		• describing vectors • presenting vectors in different notations • drawing vectors using squared paper • labelling vectors • writing vectors in column form • describing zero/null and position vectors • identifying parallel vectors • describing vector addition • adding vectors	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• squared paper • charts • graph paper • pegboards • geoboards

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	3 subtract vectors 4 multiply a vector by scalar 5 calculate the magnitude of a vector		• describing vector subtraction • subtracting vectors • discussing scalar multiplication • multiplying a vector by a scalar (number) • discussing the magnitude of a vector	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• squared paper • charts • graph paper • pegboard • geoboard

	6 find the mid-point of a vector		• calculating the magnitude of a vector • describing the mid-point of a vector • finding mid-point of a vector		

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
	7 show that points are collinear using the vector method 8 solve problems by applying a parallelogram law		• discussing the meaning of a collinear point • showing that points are collinear using the vector method • describing parallelogram and triangle laws • adding vectors using triangle and parallelogram laws • subtracting vectors using triangle and parallelogram laws • solving problems by	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work	• squared paper • charts • graph paper • pegboards • geoboards

			applying a parallelogram law		

Core element : Patterns, relations, functions and change
Outcome : The students will be able to demonstrate an understanding of graphs, charts, relations and functions and use them effectively in different contexts.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: • solve linear programming problems	Students must be able to: 1 formulate inequalities from given information 2 solve linear programming problems	**Linear Programming**	• identifying constraints • identifying variables. • formulating inequalities • identifying the feasible region • finding the vertices of the feasible region • formulating objective functions • finding maximum or minimum value of the objective function • finding solutions of	• group work • demonstration • written exercises • question and answer • pair work • individual work • discussions • study tour	• calculators • rulers • computers • chart paper • graph paper • graph boards • markers .

			linear programming problems		

Core element : Space, shape and measurement

Outcome : The students will be able to solve problems involving shape, size, space, relationships between the sides and the angles of triangles, Pythagoras theorem and trigonometric functions.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this when students are able to: 1 solve problems involving area and volume of geometric shapes.	Students must be able to: 1 calculate the surface area of cubes, cuboids, pyramids, cones, spheres and prisms 2 find volumes of 3-D shapes	**Mensuration**	• discussing 3-D shapes • sketching 3-D shapes • finding surface areas of cubes, cuboids, cylinders, pyramids, cones, spheres and prisms • finding surface areas of composite solids • finding volumes of cubes, cuboids, pyramids, cones, spheres, prisms and cylinders • sketching composite 3-D shapes • finding volumes of composite solids	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • models of cuboids, cubes, cone and prisms • calculators

Assessment	Success criteria	Theme/topic	Suggested teaching,	Suggested	Suggested

standard			learning and assessment activities	teaching, learning and assessment methods	teaching, learning and assessment resources
	3 calculate angles between lines, planes and also between a plane and a line in 3-D shapes		• identifying angles between lines, planes and also between a plane and a line • calculating angles between lines, • calculating angles between planes • calculating angles between a plane and a line	• discussion • demonstration • explanation • question and answer • written exercises • peer assessment • group assessment • practical work • pair work	• charts • mathematical sets • models of cuboids, cubes, cone and prisms • calculators
	4 calculate lengths of sides in 3-D shapes		• identifying sides in 3-D shapes • calculating lengths of sides in 3-D shapes		
	5 solve word problems involving surface areas and volumes		• sketching diagrams from given problems • solving word problems involving surface areas and volumes		

Core element : Patterns, relations, functions and change
Outcome : The students will be able to demonstrate an understanding of graphs, charts, relations and functions and use them effectively in different contexts.

Assessment standard	Success criteria	Theme/topic	Suggested teaching, learning and assessment activities	Suggested teaching, learning and assessment methods	Suggested teaching, learning and assessment resources
We will know this	Students must be able				

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when students are able to:	to:				
• workout problems involving cubic functions	1 draw graphs of cubic functions 2 solve cubic equations graphically	**Graphs of cubic functions**	• constructing tables of values • drawing graphs of cubic functions • solving cubic equations graphically • solving simultaneous linear and cubic equations graphically	• question and answer • demonstration • explanations • discussions • pair and group work • written exercises • problem solving approach • oral exercises	• charts • graph paper • mathematical instruments • rulers • graph board • observation checklists • graphic calculators • computers

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