ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

PURE MATHEMATICS SYLLABUS

FORMS 3 - 4

2015 - 2022

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CONTENTS

1.0 PREAMBLE

1.1 Introduction

In developing the Form 3 - 4 Pure Mathematics syllabus attention was paid to the need to provide continuity of mathematical concepts from Form 1through to Form 4 and lay foundations for further studies, focusing on learners who have the ability and interest. It is assumed that learners who take this syllabus will take it concurrently with the Form 1 - 4 Mathematics syllabus. The syllabus is intended to produce a citizen who is a critical thinker and problem solver in life.The two year learning phase will provide learners with opportunities to apply Mathematical concepts in other subject areas and enhance Mathematical literacy and numeracy. It also desires to produce a learner with the ability to communicate effectively.
In learning Pure Mathematics, learners should be helped to acquire a variety of skills, knowledge and processes, and develop positive attitude towards the subject and in life. This will enable them to investigate and interpret numerical and spatial relationships as well as patterns that exist in the world. The syllabus also caters for learners with diverse needs to experience Pure Mathematics as relevant and worthwhile.

1.2 Rationale

Zimbabwe is undergoing a socio-economic transformation where Pure Mathematics is key to development, therefore it is imperative that learners acquire necessary mathematical knowledge and skills to enable as many learners as possible to proceed to Form 5-6 Mathematics and beyond. The knowledge of Pure Mathematics enables learners to develop mathematical skills such as dealing with the abstract, presenting mathematical arguments, interpreting mathematical information and solving problems essential in life and for sustainable development. The importance of Ppure Mmathematics can be underpinned in inclusivity, human dignity and enterprise as it plays a pivotal role in careers such as reserach, actuarial science, materology and engineering

1.3 Summary of Content (Knowledge, Skills and Attitudes)

The syllabus will cover the theoretical and practical aspects of Pure Mathematics. This two year learning area will cover: algebra, coordinate geometry and calculus.

1.4 Assumption

The syllabus assumes that the learner has:
1.4.1 mastered concepts and skills involving number, algebra and geometry at Form 1 and 2 level
1.4.2 shown interest in pursuing Pure Mathematics
1.4.3 the ability to operate some ICT tools

1.5 Cross Cutting Themes

The following are some of the cross cutting themes in Pure Mathematics:-

1.5.1 Financial literacy
1.5.2 Disaster risk management
1.5.3 Collaboration
1.5.4 Environmentalissues
1.5.5 Enterprise skills
1.5.6 Sexuality, HIV & AIDS Education

2.0 PRESENTATION OF SYLLABUS

The Pure Mathematics syllabus is presented as singled-ocument covering Form 3 - 4.It contains the preamble, aims, syllabus objectives, syllabus topics, scope and sequence and competency matrix. The syllabus also suggests a list of resources that could be used during learning and teaching process.

3.0 AIMS

This syllabus is intended to provide a guideline for Form 3 - 4 learners which will enable them to:

3.1 acquire a firm foundation for further studies and future careers
3.2 use ICT tools for learning and solving mathematical problems
3.3 develop an ability to apply Pure Mathematics in life and other subjects, particularly Science and Technology
3.4 develop a further understanding of mathematical concepts and processes in a way that

encourages confidence, enjoyment, interest and lifelong learning

3.5 appreciate Pure Mathematics as a basis for applying the learning area in a variety of life situations

3.6 develop the ability to solve problems, reason clearly and logically as well as communicate mathematical ideas successfully

3.7 acquire enterprise skills in an indigenised and globalised economy through research and project-based learning

4.0 SYLLABUS OBJECTIVES

By the end of the two year learning period, the learners should be able to:

4.1 use relevant mathematical symbols, terms and definitions in problem solving

4.2 use formulae and generalisations to solve a variety of problems in Pure Mathematics and other related learning areas

4.3 formulate problems into mathematical terms and apply appropriate techniques for solutions

4.4 use ICT tools for learning through problem solving

4.5 apply Pure Mathematics concepts and principles in life

4.6 demonstrate an appreciation of mathematical concepts and processes

4.7 demonstrate an ability to solve problems systematically, applying mathematical reasoning

4.8 communicate mathematical concepts and principles clearly

4.9 explore ways of solving routine and non-routine problems in Pure Mathematics using appropriate formulae, algorithms and strategies

4.10 model mathematical information from one form to another e.g. verbal/words to symbolic form

4.11 conduct research projects including those related to enterprise

5.0 METHODOLOGY

It is recommended that teachers use methods and techniques in which Pure Mathematics is seen as a process which arouses an interest and confidence in tackling problems both in familiar and unfamiliar contexts. The teaching and learning of Pure Mathematics must be learner centred and ICT driven. The following are suggested methods of the teaching and learning of Pure Mathematics

- Guided discovery
- Group work
- Interactive e-learning
- Games and puzzles
- Quiz
- Problem solving
- Simulation and modelling
- Experimentation

5.1 Time Allocation

Six periods of 40 minutes each per week should be allocated for the adequate coverage of the syllabus

6.0 TOPICS

The following topics will be covered from Form 3 - 4

6.1 Indices and irrational numbers

6.2 Polynomials

6.3 Identities, equations and inequalities

6.4 Graphs and coordinate geometry

6.5 Vectors

6.6 Functions

6.7 Sequences

6.8 Binomial expansions

6.9 Trigonometry

6.10 Logarithmic and exponential functions

6.11 Differentiation

6.12 Integration

6.13 Numerical methods

7.0 SCOPE AND SEQUENCE

TOPIC 1: INDICES AND IRRATIONAL NUMBERS

SUB TOPIC	FORM 3	FORM 4
Indices	• Laws of indices • Equations involving indices	
Irrational numbers	• Surds	

TOPIC 2: POLYNOMIALS

SUB TOPIC	FORM 3	FORM 4
• Polynomials	• Components of polynomials • Addition • Subtraction • Partial fractions	• Multiplication • Division • Factor Theorem • Solving equations

TOPIC 3: IDENTITIES, EQUATIONS AND INEQUALITIES

SUB TOPIC	FORM 3	FORM 4
Identities and equations	• Definition of identity • Unknown coefficients • Equations	• Completing the square • Simultaneous equations
Inequalities	• Quadratic inequalities • Cubic inequalities	

TOPIC 4: GRAPHS AND COORDINATE GEOMETRY

SUB TOPIC	FORM 3	FORM 4
Graphs	• Straight line graphs • Gradient of a line segment	• Graphs of $y = kx^n$
Coordinate geometry	• Distance between two points • Coordinates of the mid-point	

TOPIC 5: VECTORS

SUB TOPIC	FORM 3	FORM 4
Vecors in three dimensions	• Types of vectors • Vector operations	• Unit vectors • Scalar product • Vector properties of plane shapes • Areas of triangles and parallelogram

TOPIC 6: FUNCTIONS

SUB TOPIC	FORM 3	FORM 4
Functions	• Definition of a function • Domain and range • Composite function	• One- one funcion • Inverse of a function • Graphs of functions

TOPIC 7: SEQUENCES

SUB TOPIC	FORM 3	FORM 4
Sequences	• Definition of a sequence • Examples of sequences	• Arithmetic progression • Geometric progression

TOPIC 8: BINOMIAL EXPANSION

SUB TOPIC	FORM 3	FORM 4
Binomial expansion		• Pasdcal's Triangle • Exapnsion of $(a+b)^n$ where n is a positive integer

TOPIC 9: TRIGONOMETRY

SUB TOPIC	FORM 3	FORM 4
Plane Trigonometry	• Sine and cosine rules • Area of a trriangle	• Radians • Length of an arc • Area of a sector • Area of a segment
Trigonometric functions	• Trigonometrical functions for angles of any size • Exact values of sine, cosine and tangent of special angles	• Equations

TOPIC 10: LOGARITHMIC AND EXPONENTIAL FUNCTIONS

SUB TOPIC	**FORM 3**	**FORM 4**
Logarithms	• Laws of logarithms • Logarithms and indices	• Natural logarithms • Equations of the form $a^x = b$
Exponential functions		• Exponential growth and decay

TOPIC 11: DIFFERENTIATION

SUB TOPIC	FORM 3	FORM 4
Differentiation	• Gradient of a curve at a point • Derived function of the form ax^n • Derivative of a sum	• Application of differentiation to gradients, tangents and normals, stationary points, rates of change, velocity and acceleration

TOPIC 12: INTEGRATION

SUB TOPIC	FORM 3	FORM 4
Integration	• Indefinite integration as the reverse process of differentiation • Integration of functions of the formaxn • Integration of a polynomial	• Area • Volume

TOPIC 13: NUMERICAL METHODS

SUB TOPIC	FORM 3	FORM 4
Numerical methods		• Simple iterative procedures • Newton Reaphson method • Trapezium Rule

8.0 COMPTETNCY MATRIX

8.1 FORM 3 COMPTETNCY MATRIX

TOPIC 1: INDICES AND IRRATIONAL NUMBERS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Indices	• state the laws of indices • use laws of indices to simplify algebraic expressions • solve equations involving indices	• Laws of indices • Equations involving indices	• Deriving the laws of indices • Simplifying algebraic expressions • Applying laws of indices to solve problems	• ICT tools • Relevant texts
Irrational numbers	• define irrational numbers • reduce a surd to its simplest form • carry out the four operations on surds • rationalise denominators	• Surds	• Distinguishing between rational and irrational numbers • Deriving and finding ways of simplifying surds • Expressing surds in simple form • Carrying out the four operations on surds • Rationalising denominators	• ICT tools • Relevant texts

TOPIC 2: POLYNOMIALS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Polynomials	• define polynomials • identify proper and improper fractions • carry out operations of addition and subtraction of polynomials • express a function as a sum of simpler fractions	• Components of polynomials • Addition • Subtraction • Partial fractions	• Discussing polynomials • Distinguishing between proper and improper fractions • Adding and subtracting polynomials • Decomposing functions into fractions with linear denominators	• ICT tools • Relevant texts

TOPIC 3: IDENTITIES, EQUATIONS AND INEQUALITIES

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: (Skills, Knowledge, Attitudes)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Identities and equations	• distinguish between an identity and an equation • use identities to determine unknown coefficients in polynomials • solve cubic equations using Factor Theorem	• Definition of identity • Unknown coefficients • Equations	• Discussing the difference between an identity and an equation • Finding unknown coefficients using identities • Using the Factor Theorem to solve cubic equations	• ICT tools • Relevant texts
Inequalities	• factorise quadratic expressions • solve quadratic inequalities • solve cubic inequalities with the use of Factor Theorem	• Quadratic inequalities • Cubic inequalities	• Factorising quadratic expressions • Finding solutions of quadratic inequalities • Exploring ways of solving cubic inequalities • Using the Factor Theorem to solve cubic inequalities	• Relevant texts • ICT tools

TOPIC 4: GRAPHS AND COORDINATE GEOMETRY

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Graphs	• sketch straight lines • find the gradient of a line segment • find the equation of a straight line • identify parallel and perpendicular lines • solve problems involving straight line graphs	• Straight line graphs • Gradient of a line segment	• Sketching straight lines given sufficient information • Exploring how to find equation of a straight line given two points or the gradient and a point • Distinguishing between parallel and perpendicular lines • Solving problems involving straight line graphs • Identifying examples in life where linear relationships occur • Carrying out experiments involving linear relationships	• Geo-board • ICT tools • Environment
Coordinate geometry	• calculate the distance between two points given in coordinate form • solve practical problems involving distance between two points • find the coordinates of the mid-point of a straight line	• Distance between two points • Coordinates of the mid-point	• Exploring ways to find distance between two points • Calculating coordinates of the mid-point of a straight line • Conducting field work to solve problems involving distance between two points	• Geo-board • ICT tools • Environment

TOPIC 5: VECTORS

SUB TOPIC	OBJECTIVES **Learners should be able to:**	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Vectors in three dimensions	• use standard notation of vectors $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$, xi+yj+zk, $\underset{AB}{\rightarrow}$, **a** • determineposition and free vectors • identify parallel vectors and co-linear points • calculate the modulus of a vector • add and subtract vectors • multiply a vector by a scalar	• Types of vectors • Vector operations	• Using standard notation of vectors $\begin{pmatrix} x \\ y \\ z \end{pmatrix}$, xi+yj+zk, $\underset{AB}{\rightarrow}$, a • Distinguishing between positionand free vectors • Interpreting operations in geometrical terms • Computing the magnitude of vectors in three dimensions • Adding and subtracting vectors • Finding a product of a vector by a scalar • Solving problems involving vector operations	• ICT tools • Mathematical models • Environment • Geo-board • Relevant texts

TOPIC 6: FUNCTIONS

SUB TOPIC	OBJECTIVES **Learners should be able to:**	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Functions	• define a function • define domain and range of a function • use functional notation • simplify a composite function	• Definition of a function • Domain and range • Composite function	• Identifying and defining functions • Discussing the domain and the range • Using functional notations • Simplifying composite functions	• ICT tools • Relevant texts

TOPIC 7: SEQUENCES

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Sequences	• define a sequence • list the elements of a sequence	• Definition of a sequence • Examples of sequences	• Discussing sequences • Outlining elements of sequences	• ICT tools • Relevant texts

TOPIC 8: BINOMIAL EXPANSION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Binomial expansion		*To be covered in form 4*		

TOPIC 9: TRIGONOMETRY

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Plane Trigonometry	• use sine and cosine rules to solve problems • use the formula $A = \frac{1}{2}\ ab\sin C$ to find the area of a triangle	• Sine and cosine rules • Area of a triangle	• Deriving formulae for the sine and cosine rules • Solving problems using the sine and cosine rules • Deriving the formula for finding area of a triangle • Solving problems involving area of a triangle	• ICT tools • Relevant texts
Trigonometrical functions	• find the trigonometrical ratios of angles of any size • use the exact values of the trigonometrical ratios of special angles in a variety of situations	• Trigonometrical functions for angles of any size • Exact values of sine, cosine and tangent of special angles	• Computing the trigonometrical ratios of angles of any size • Calculating the exact values of the sine, cosine and tangent of 0°, 30°, 45° ,60°, 90° in a variety of situations	• ICT tools • Relevant texts

TOPIC 10: LOGARITHMIC AND EXPONENTIAL FUNCTIONS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Logarithms	• state the laws of logarithms • use the laws of logarithms in solving problems • identify the relationships between	• Laws of logarithms • Logarithms and indices	• Exploring the laws of logarithms • Applying laws of logarithms in solving problems • Expressing logarithms in index form	• ICT tools • Relevant texts

TOPIC 11: DIFFERENTIATION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Differentiation	• find the gradient of a curve at a point using the tangent • differentiate linear and quadratic expressions from first principles • find the derivative of functions of the form ax^n where *n* is a rational number • differentiate a polynomial	• Gradient of a curve at a point • Derived function of the form ax^n • Derivative of a sum	• Calculating the gradient of a curve at a given point using tangents • Discussing situations in life where gradients of curves are important • Differentiating linear and quadratic expressions from first principles • Differentiating functions of the form ax^n using the formula	• ICT tools • Relevant texts • Environment

TOPIC 12: INTEGRATION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Integration	• recognise indefinite integration as the reverse process of differentiation • integrate functions of the form ax^n where n is rational • integrate polynomials	• Indefinite integration as the reverse process of differentiation • Integration of functions of the form ax^n • Integration of a polynomial	• Discussing indefinite integration as the reverse process of differentiation • Performing integration of functions of the form ax^n where n is rational • Computing indefinite integrals of polynomials	• ICT tools • Relevant texts • Environment

TOPIC 13: NUMERICAL METHODS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Iterative methods		*To be covered in form 4*		

8.2 FORM 4COMPETENCY MATRIX

TOPIC 1: INDICES AND IRRATIONAL NUMBERS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Indices		*Covered in form 3*		
Irrational numbers				

TOPIC 2: POLYNOMIALS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Polynomials	• multiply polynomials • divide one polynomial by another • use the Factor Theorem to factorise polynomials • solve cubic equations using the Factor Theorem • use Factor Theorem to evaluate unknown coefficients	• Multiplication • Division • Factor Theorem • Solving equations	• Determining the product of polynomials • Usinglong division to find the quotient and remainder • Deriving the Factor theorem • Using the Factor Theorem to factorise polynomials • Solving cubic equations using the Factor Theorem • Evaluating unknown coefficients using the Factor Theorem	• ICT tools • Relevant texts

TOPIC 3: IDENTITIES, EQUATIONS AND INEQUALITIES

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Identities and equations	• express $ax^2 + bx + c$ in the form $d(x+e)^2+f$ • derive the quadratic formula • solve quadratic equations by completing the square • solve simultaneous equations by substitution	• Completing the square • Simultaneous equations	• Exploring ways of expressing $ax^2 + bx + c$ in the form $d(x+e)^2+f$ • Completing the square to derive the quadratic formula • Solving quadratic equations by completing the square • Solving simultaneous equations (one linear and one implicit) by substitution	• ICT tools • Relevant texts

TOPIC 4: GRAPHS AND COORDINATE GEOMETRY

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Graphs	• sketch graphs of the form $y = kx^n$ • explain the geometrical effect of the value of *k* on the shape of the graph of $y = kx^n$	• Graphs of $y = kx^n$	• Sketching the standard curves where n and k are rational • Discussing the geometrical effect of the value of *k* on the shape of the graph for a given value of *n*	• ICT tools • Relevant texts • Geo-board

TOPIC 5: VECTORS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Vectors in three dimensions	• calculate unit vectors • define the scalar product • use the scalar product to determine the angle between vectors • identify vector properties of quadrilaterals • solve problems involving perpendicular vectors • calculate areas of triangles and parallelograms	• Unit vectors • Scalar product • Vector properties of plane shapes • Areas of triangles and parallelograms	• Computing unit vectors • Discussing the scalar product • Determining the angle between vectors • Exploring vector properties of quadrilaterals • Solving problems involving perpendicular vectors • Computing areas of triangles and parallelograms	• ICT tools • Mathematical models • Environment

TOPIC 6: FUNCTIONS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Functions	• define a one-one function • restrict the domain to get a one-one function • sketch the graph of a function for a given domain • define the inverse of a function • find the inverse of a given function • illustrate graphically the relationship between a function and its inverse	• One-one function • Inverse of a function • Graphs of functions	• Discussing one-one functions • Sketching graphs of functions for a given domain • Discussing the inverse of a function • Determining the range of functions • Determining the inverse of a given function excluding inverses of quadratic functions • Illustrating graphically the relationship between a function and its inverse	• ICT tools • Relevant texts • Geo-board

TOPIC 7: SEQUENCES

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Sequences	• derive the formulas for the general terms of the AP and GP • use the formula for the n^{th} term of an AP and GP • derive the formula for the sum of the first n terms of an AP and GP and use it to solve problems • distinguish between APs and GPs	• Arithmetic progression • Geometric progression	• Exploring ways of finding the formula for the general term of an AP and a GP • Solving problems using the formula for the n^{th} term of an AP and a GP • Exploring ways of finding the formulae of the sum of the first n terms of an AP and a GP and solving problems • Differentiating APs from GPs • Discussing applications of APs and GPs in life	• ICT tools • Relevant texts

TOPIC 8: BINOMIAL EXPANSION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
	Learners should be able to:	**Knowledge, Attitudes}**	**ACTIVITIES**	**RESOURCES**
Binomial expansion	• construct a Pascal's Triangle • expand $(a+b)^n$ using Pascal's Triangle • solve problems involving expansion of $(a+b)^n$	• Pascal's Triangle • Expansion of $(a+b)^n$ where n is a positive integer	• Constructing Pascal's Triangle • Making use of the Pascal's Triangle to expand $(a+b)^n$ where n is a positive integer • Solving problems involving expansion of $(a+b)^n$	• Relevant texts • ICT tools

TOPIC 9: TRIGONOMETRY

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Plane Trigonometry	• define a radian • use the correct radian notation • convert degrees to radians and radians to degrees • find the length of an arc • find area of a sector and a segment • solve problems involving length of arcs, areas of sectors and segments	• Radians • Length of an arc • Area of a sector • Area of a segment	• Discussing radians and degrees and their relationship • Using the correct radian notation • Converting degrees to radians and radians to degrees • Deriving and using the formulae for length of an arc • Deriving and using the formulae for the area of a sector and segment • Solving problems involving length of arcs, areas of sectors and segments	• ICT tools • Relevant texts • Environment • Geo-board • Geometrical instruments
Trigonometrical functions	• use the notation $\sin^{-1}x$, $\tan^{-1}x$ and $\cos^{-1}x$ to solve problems • Solve trigonometrical equations	• Equations	• Discussing the notation $\sin^{-1}x$, $\tan^{-1}x$ and $\cos^{-1}x$ • Finding all the solutions, within a specified interval of the equations sin(kx)=c, cos(kx)=c and tan(kx)=c • Applying trigonometrical equations in solving life problems	• ICT tools • Relevant texts • Environment

TOPIC 10: LOGARITHMIC AND EXPONENTIAL FUNCTIONS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Logarithms	• define the natural logarithm • sketch the graph of the form y=ln(ax+b) • use logarithms to solve equations of the form $a^x = b$	• Natural logarithms • Equations of the form $a^x = b$	• Discussing the natural logarithms in relation to logarithms in general • Sketching the graphs of the form y=ln(ax+b) • Solving equations of the form $a^x = b$ using logarithms	• ICT tools • Relevant texts • Geo-board
Exponential functions	• explain the concept of exponential growth and decay • sketch the graph of the exponential function • solve equations involving exponential growth and decay • formulate equations involving exponential growth and decay	• Exponential growth and decay	• Discussing the concept of exponential growth and decay • Sketching the graph of the exponential function and compare with the logarithmic function • Formulating equations involving exponential growth and decay • Solving equations involving exponential growth and decay	• ICT tools • Relevant texts • Geo-board

TOPIC 11: DIFFERENTIATION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Differentiation	• find the equation of a tangent and a normal to quadratic and cubic curves • determine stationary points and their nature • find the rate of change of one variable with respect to another • solve problems involving rates of change	• Application of differentiation to gradients, tangents and normals, stationary points, rates of change, velocity and acceleration	• Determining equations of tangents and normals to quadratic and cubic curves • Discussing the nature of, and solving problems involving, stationary points • Calculating the rate of change of one variable with respect to another • Solving problems involving rates of change in life	• ICT tools • Relevant texts • Environment

TOPIC 12: INTEGRATION

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Integration	• compute area bounded by acurveand a lineparallel to the coordinate axes • calculatethe volume of revolution about one of the axes	• Area • Volume	• Exploring ways of finding area bounded by a curve and a line parallel to the coordinate axes • Exploring ways of finding the volume of revolution about one of the axes • Solving problems involving use of integration in determining areas and volumes	• ICT tools • Relevant texts • Environment

TOPIC 13: NUMERICAL METHODS

SUB TOPIC	OBJECTIVES Learners should be able to:	CONTENT: {Skills, Knowledge, Attitudes}	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
Numerical methods	• locate the position of roots by sign change • solve equations by the bisection method • use simple iterative procedures and the Newton-Raphson method to solve equations • estimate areas under curves using the Trapezium Rule	• Simple iterative procedures • Newton-Raphson method • Trapezium Rule	• Determining the existence of roots within an interval • Using the bisection method to solve equations to a specific degree of accuracy • Solving equations using simple iterative procedures and the Newton-Raphson method • Determining estimates of area under curves and related areas in life by the Trapezium Rule	• ICT tools • Relevant texts • Environment

9.0 ASSESSMENT

(a) ASSESSMENT OBJECTIVES

The assessment will test candidate's ability to:-

- use Mathematical symbols, terms and definitions correctly in problem solving
- sketch graphs accurately
- use appropriate formulae,algorithms and strategies, to solve routine and non-routine problems in Pure Mathematics
- demonstrate the appropriate and accurate use of ICT tools in problem solving
- translate Mathematical information from one form to another accurately
- demonstrate an appreciation of Mathematical concepts and processes
- demonstrate an ability to solve problems systematically
- apply Mathematical reasoning and communicate mathematical ideas clearly
- model information from other forms to Mathematical form and vice versa
- conduct research projects including those related to enterprise

(b) SCHEME OF ASSESSMENT

The Form 3 - 4Pure Mathematics assessment will be based on 30% Continuous Assessment and 70% Summative

Assessment.

The syllabus' scheme of assessment caters for all learners and does not condone direct or indirect discrimination. Arrangements, accommodations and modifications must be visible in both continuous and summative assessments to enable candidates with special needs to access assessments and receive accurate performance measurement of their abilities. Access arrangements must neither give these candidates an undue advantage over others nor compromise the standards being assessed.
Candidates who are unable to access the assessments of any component or part of component due to disability (transitory or permanent) may be eligible to receive an award based on the assessment they would have taken

Continuous Assessment
Continuous assessment will consists of topic tasks, written tests and end of term examinations:
i) Topic Tasks
These are activities that teachers use in their day to day teaching. These may include projects, assignments and team work activities.

ii) Written Tests

These are tests set by the teacher to assess the concepts covered during a given period of up to a month. The tests should consist of short structured questions as well as long structured questions.

iii) End of term examinations
These are comprehensive tests of the whole term's or year's work. These can be set at school/district/provincial level.

Summary of Continuous Assessment Tasks
From term one to five, candidates are expected to have done at least the following recorded tasks per term:
- 1 Topic task
- 1 Written test
- 1 End of term test

Detailed Continuous Assessment Tasks Table

Term	Number of Topic Tasks	Number of Written Tests	Number of End Of Term Tests	Total
1	1	1	1	
2	1	1	1	
3	1	1	1	
4	1	1	1	
5	1	1	1	
Weighting	25%	25%	50%	**100%**
Actual Weight	7.5%	7.5%	15%	**30%**

Comment: Term 6 is for the National Examination

c) Specification Grid

Specification grid for continuous assessment

Component Skills	Topic Tasks	Written Tests	End of Term
Skill 1 Knowledge Comprehension	30%	30%	30%
Skill 2 Application Analysis	50%	50%	50%
Skill 3 Synthesis Evaluation	20%	20%	20%
Total	**100%**	**100%**	**100%**
Actual weighting	**7.5%**	**7.5%**	**15%**

Summative Assessment

The examination will consist of 2 papers: paper 1 and paper 2, each to be written in 2½ hours

	P1	P2	Total
Weighting	**50%**	**50%**	**100%**
Actual weighting	**35%**	**35%**	**70%**
Type of paper	Approximately 15 Short Answer Questions, where candidates anwer all questions	16 Questions where candidates answer any 10, each question carrying 10 marks	
Marks	**100**		**100**

Specification Grid for Summative Assessment

	P1	P2	Total
Skill 1 Knowledge & Comprehension	50%	30%	80%
Skill 2 Application & Analysis	40%	50%	90%
Skill 3 Synthesis & Evaluation	10%	20%	30%
Total	100%	100%	200%
Weighting	**50%**	**50%**	**100%**

d) Assessment Model