THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION AND VOCATIONAL TRAINING

ADVANCED MATHEMATICS SYLLABUS FOR ADVANCED SECONDARY EDUCATION

FORM V - VI

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TABLE OF CONTENT

Pages

1.0 Introduction iv
2.0 Aims and Objectives of Education in Tanzania iv
3.0 Aims and Objectives of Secondary Education v
4.0 General Competences for Advanced Mathematics v
5.0 General Objectives for Advanced Mathematics v
6.0 Organization of the Advanced Mathematics syllabus vi
7.0 Instructional time vii
8.0 Assessment in the Subject vii
Form V 1
Form VI 41

1.0 Introduction

This is a revised Advanced Mathematics syllabus for Form V and VI students specializing in Mathematics. This syllabus is the result of recommendations made by teachers, school inspectors, examination officials, stakeholders, and other experts in Mathematics following a survey conducted by the Tanzania Institute of Education (TIE) in 2008. It replaces the syllabus issued in 1997 by the Ministry of Education and Culture. The changes that have been made are intended to improve the teaching and learning of Mathematics at Advanced level using the constructivist approach. Furthermore, this syllabus is intended to make the subject more relevant and responsive to scientific and technological national goals and the objectives of education.

1.2 Subject Descriptions

The Advanced Mathematics syllabus is made to serve students in their first and second years of Advanced Secondary Education specializing in Mathematics. The course will be a core one forming combinations with other subjects. It replaces the syllabus issued in 1997 by the Ministry of Education and Culture. The changes which have been made are intended to improve the teaching and learning of Mathematics at Advanced level using the learner-centred and constructivist approaches. Furthermore, this syllabus is intended to make the subject more relevant and responsive to the national education objectives in science and technology.

1.3 Rationale

The revision of the old version of Advanced Mathematics syllabus was made to make it more relevant, interesting and specific. Studies by TIE and other stakeholders revealed the overload nature of the subject that made it difficult to be covered under normal instructional time. However, it was inevitable to prune some contents of the old version syllabus and shift to higher levels to avoid repetitions and make the subject more relevant and exciting

2.0 Aims and Objectives of Education in Tanzania

The aims and objectives of education in Tanzania are to:

a) guide and promote the development and improvement of the personalities of the citizens of Tanzania, their human resources and effective utilization of those resources in bringing about individual and national development;

b) promote the acquisition and appreciation of culture, customs and traditions of the people of Tanzania;

c) promote the acquisition and appropriate use of literary, social, scientific, vocational, technological, professional and other forms of knowledge, skills and understanding for the development and improvement of the condition of man and society;

d) develop and promote self-confidence and an inquiring mind, an understanding and respect for human dignity and human rights and a readiness to work hard for personal self advancement and national improvement;

e) enable and expand the scope of acquisition, improvement and upgrading of mental, practical productive and other life skills needed to meet the changing needs of industry and the economy;

f) enable every citizens to understand the fundamentals of the national constitution as well as

the enshrined human and civic rights, obligations and responsibilities;

g) promote the love and respect for work, self and wage employment and improved performance in the production and service sectors;

h) inculcate principles of national ethics and integrity, national and international cooperation, peace and justice through the study, understanding and adherence to the provisions of the National Constitution and International basic Charters and;

i) enable a rational use, management and conservation of the environment.

3. The Aims and objectives of Secondary Education

The aims and objectives of secondary educations are to:

a) consolidate and broaden the scope of baseline ideas, knowledge, skills and principles acquired and developed at primary education levels;

b) enhance further development and appreciation of national unity, identity and ethnic personal integrity, respect for and readiness to work, human rights, cultural and moral values, customs, traditions and civic responsibilities and obligations;

c) promote the development of competency in linguistic ability and effective use of commu nication skills in Kiswahili and in at least one foreign language;

d) provide opportunities for the acquisition of knowledge, skills, attitudes and understand ing in prescribed or selected fields of study;

e) prepare students for tertiary and higher education; vocational, technical and professional training;

f) inculcate a sense and ability for self-study, self-confidence and self-advancement in new frontiers of science and technology, academic and occupational knowledge and skills and;

g) prepare the student to join the world of work.

4.0 General Competences for Advanced Mathematics

By the end of the two years course, students should have the ability to:

a) think critically and logically in interpreting and solving problems.

b) integrate and share mathematical skills to the community.

c) apply mathematical knowledge and techniques in other fields.

d) perform computations using scientific calculators and other electronic devices.

e) communicate mathematical knowledge by applying the ICT.

f) gain new knowledge appart from the already known mathematical concepts and;

g) appreciate the scope, usefulness, power and elegance of mathematics.

5.0 General Objectives for Advanced Mathematics

By the end of the two years course, students should be able to:

a) develop mathematical skills and knowledge to be used in the related subjects.

b) promote the development and application of mathematical skills in solving practical problems in their daily lives.

c) develop foundation and mathematical knowledge for studying mathematics in higher education.

d) use computer programs in learning and solving mathematical problems.

e) apply deductive and inductive reasoning in the construction of proofs in mathematics

arguments.

f) interpret solutions to mathematical problems and;

g) develop appreciation of the scope, usefulness, power and elegance of mathematics.

6.0 Organization of the Advanced Mathematics Syllabus

The syllabus starts by outlining the level competences and objectives. The contents are organized in matrix form using six columns i.e. Topic/ subtopics, specific objectives, teaching/learning strategies, teaching/learning resources, assessment and number of periods.

6.1 Class Level Competences

The general competences have been broken into two levels; those intend for Form V and those intended for Form VI.

6.2 Class Level Objectives

The general objectives have been split into two levels, those which will be achieved in Form V and those, which will be achieved in Form VI.

6.3 Content matrix

The content matrix consists of columns of topics/subtopics, specific objectives, teaching/ learning strategies, teaching/learning resources, assessment and estimated number of periods.

6.3.1 Topics and Subtopics

The first column contains the topics to be taught in each level. They have been selected according to their need and importance. The subtopics which appear below the topics in the first column are meant to provide content which will be sufficient for realising the competences.

6.3.2 Specific Objectives

The specific objectives for each subtopic have been prepared to build the relevant competences.

6.3.3 Teaching and Learning Strategies

These are suggested strategies which will enable the achievement of the specific objectives using participatory methods. The teacher is strongly advised to use participatory methods of teaching according to the nature of the topic including the ones suggested. The commonly used methods include, think-pair-share, group discussion, library search (use of books available and the internet), stories, question and answer, class activities and demonstration.

6.3.4 Teaching and Learning Resources

Each learning strategy is aligned with possible resources including books that will from time to time be used as references and teaching aids.

6.3.5 Assessment

This column is a check mechanism of finding out whether the objectives intended from the course has been achieved or not.

6.3.6 Number of Periods

The number of teaching days in a year is approximately 194 or an average of 40 weeks. The

Advanced Mathematics has been allocated a total of 400 periods according to the number of objectives it contains.

7.0 Instructional Time

The Ministry of Education and Vocational Training has allocated 10 periods per week to Advanced Mathematics. The teacher adviced to make maximum use of the allocated time. Lost instructional time should be compensated through teacher own arrangement with schools authority.

8.0 Assessment in the Subject

The table below shows the type of assessment and the accompanied assessment measures to be used. The assessment measures listed in the table contributes to the continuous and final assessments of the student achievement. The frequency for each assessment measure has been indicat ed with weight in percentage. Teachers are therefore strongly advised to apply a wide selection of assessment measures in order to develop students' ability for the mastery of the subject matter during the teaching and learning process.

Types of assessment	Assessment measure	frequency				Weight (%)
		F V		F VI		
		Term 1	Term 2	Term 1	Term 2	
	Test	2	2	2		10
	Individual assignments	5	5	5		5
	Project		1			10
	Quizzes	1	1	1		10
	Terminal examination	1	1	1		15
Final examination (FE)					1	50
Total Marks						100

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FORM V

Class Competences

By the end of Form V, the student should have ability to:

1. think critically and logically;
2. perform computations using scientific calculators and other electronic devices;
3. use computer to solve mathematical problems;
4. communicate mathematical knowledge using ICT;
5. create new knowledge from and already known mathematics concepts and;
6. integrate and share mathematical skills to the community.

Class Objectives

By the end of Form V, the student should be able to:

1. develop mathematical skills and knowledge to be used in other areas of mathematics;
2. promote the development and application of mathematical skills in solving practical problems and;
3. use computer packages in learning and to solve mathematical problems.

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
1.0 CALCULATING DEVICES 1.1 Scientific calculators	By the end of this subtopic the student should be able to: use scientific calculators to perform mathematical computations	i) Students in pairs to familiarise themselves with the functional keys of a scientific calculator under the guidance of the teacher ii) Students in groups to use scientific calculators to perform mathematical computations.	Scientific calculators	Is the student able to use scientific calculators to perform mathematical computations?	3
1.2 Computer packages	By the end of this subtopic student should be able to: a) identify the appropriate computer package for solving specific problems	i) The teacher to guide students in identifying appropriate package for solving specific mathematical problems. ii) The teacher to demonstrate on how to solve mathematical problems using computer packages	i) Computers ii) Mathematical computer packages such as • Maple, Matlab, • Mathematica, Derive • 5 SPSS.	Is the student able to identify the appropriate computer package for solving specific problems?	6
	b) use computer package to solve related mathematical problems.	Students in groups of two to use computer packages to solve mathematical problems.	i) Mathematical computer ii) Computers	Is the student able to use computer package to solve related mathematical problems?	
2.0 SETS 2.1 Basic operations of sets	By the end of this subtopic student should be able to: a) perform operations of union, intersection and complement of to three related sets.	i) The teacher through questions and answers to remind students the concept of union and intersection of two sets ii) Students through group discussion find union and intersection of two as well as three sets.	i) Real objects ii) Pictures iii) Playing cards iv) Manila paper v) Marker pen vi) Coloured chalks	Is the student able to perform operations of union, intersection and complement of sets?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) solve set problems involving inequalities	i) The teacher to demonstrate how to solve problems involving the number line and inequality. ii) Students in pairs to solve set problems on union and intersection involving inequalities.	Number line and graphs	Is the student able to solve set problems involving inequalities?	
2.2 Simplification of set expression	By the end of this subtopic student should be able to: a) state the laws of algebra of sets	Students to brainstorm on the laws of algebra of sets. finally state them.	Real objects cards with set expressions	Is the student able to state the laws of algebra of sets?	6
	b) prove identities and simplify set expressions	i) The teacher through question and answer to guide students in the simplification and proofs of the laws of algebra of sets ii) Students individually to simplify expressions by using laws of algebra of sets.	Internet	Is the student able to prove identities and simplify set expressions?	
2.3 Number of elements of a set	By the end of this subtopic student should be able to: a) derive a formula for finding number of elements of up to three related sets	i) The teacher through question and answer to guide students in the derivation of the formula $n(A \cup B \cup C)$ ii) Students individually to apply the formula to solve real life problems.	Chart showing sets with elements	Is the student able to derive the formula for finding number of elements of up to three related sets?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) use Venn diagrams to find number of elements of up to three related sets.	i) The teacher to guide students to discuss on the importance of Venn diagrams to represent sets. ii) Students in groups to practice on the representation of information using Venn diagrams. iii) Students individually to use Venn diagrams to find number of elements of up to three related sets.	i) Venn diagram chart ii) mathematical set	Is the student able to use Venn diagrams to find number of elements of up to three related sets?	
3.0 LOGIC 3.1 Statements	By the end of this subtopic student should be able to: a) define a mathematical statement and meaning of a sentence in mathematics	i) Students to brainstorm on the meaning of mathematical statement. ii) The teacher to guide students in groups to discuss the meaning of a *sentence* in mathematics.	i) Charts ii) Switches iii) Dry cells iv) Water pipes	Is the student able to define a mathematical statements and meaning of a sentense in mathematics ?	6
	b) distinguish between statements and sentences.	The teacher to guide students to distinguish between mathematical statements and sentences.		Is the student able to distinguish between mathematical sentences and statements?	
3.2 Logical connectives	By the end of this subtopic the student should be able to: a) distinguish logical connectives in a compound statement.	i) Students to do library search on logical connectives of statements and present the findings in class. ii) The teacher to lead students the discussion of the basic logical connectives	Chart with logical connectives in a compound statement	Is the student able to distinguish connectives in a compound statement?	16

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iii) Students individually to use logical connectives to write a mathematical sentence.			
	b) represent the logical connectives in symbolic form	i) The teacher to guide students to identify symbols used to represent logical connectives. ii) Students in groups to write statements in symbolic form	Chart showing truth tables	Is the student able to represent the logical connectives in symbolic form?	
	c) construct truth tables for simple and compound statements.	i) Students to brainstorm on the idea of a truth table ii) The teacher to guide students in the construction of truth tables involving one or two propositions. iii) Students to solve problems involving construction of truth tables. iv) Student to construct truth table in which the column of the conclusion contains only *T* v) The teacher through questions and answers to guide students to the definition of tautologies by making use of truth tables vi) Students to identify tautologies from a collection of compound statements	Internet	Is the student able to construct truth tables for simple and compound statements? Solve problems involving construction of truth tables?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		vii) Student to construct truth table in which the column of the conclusion contains only F viii) Students in groups to interpret the truth table which the column for the conclusion contains only F			
	d) distinguish between tautologies, contradictions and equivalent statements	The teacher through questions and answers to guide students to the definition of contradiction and equivalent statements by making use of truth tables ii) The teacher through questions and answers to guide students to deduce the standard definition of a tautology, contradiction and equivalent statements. iii) Students to identify contradiction and equivalent statements from a collection of compound statements. iv) Students individually to give examples of conditional statements	Charts with contradictions and equivalent statements	Is the student able to distinguisbetween tautologies, contradictions and equivalent statements?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	e) find the converse and contra positive of a given statement	i) The teacher to demonstrate on how to write the converse and contra positive of a statement. ii) Students in pairs to write contra positive and converse of a given statement. iii) Students in pairs to discuss the meaning of converse and contra positive as well as their application in daily life	Cards with converse and contra positive statement	Is the student able to find the converse and contra positive of a given statement?	
3.3 Laws of algebra of proposition	By the end of this subtopic the student should be able to: a) state laws of algebra of proposition	i) Students to do a library search on the laws of algebra of propositions ii) The teacher to guide students in presenting laws of algebra of propositions found through library search.	Cards with laws of algebra	Is the student able to state laws of algebra of proposition?	6
	b) use laws of algebra of proposition to simplify compound statements.	i) The teacher to demonstrate the application of laws of algebra of proposition to simplify compound statements ii) Students in small groups to apply laws of algebra of propositions to simplify compound statements.	Cards with laws of algebra	Is the student able to use laws of algebra of proposition to simplify compound statements?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
3.4 Validity of argument	By the end of this subtopic the student should be able to: a) explain the meaning of valid argument.	i) Students to perform a short debate on controversial issue e.g. all cylinders are prisms. ii) The teacher to guide students to discuss the features of valid argument. iii) Students individually to state the meaning of an argument and valid argument	Chart with valid and non valid arguments	Is the student able to explain the meaning of valid argument?	9
	b) distinguish between a valid and non-valid argument	i) The teacher to lead students with reference to the debate to distinguish between a valid and non-valid arguments. ii) Students in pairs to discuss the distinction between valid and non-valid arguments.		Is the student able to distinguish between a valid and non-valid argument?	
	c) prove/test the validity of an argument.	i) Students in groups to determine the valid arguments ii) The teacher to demonstrate the proof/test of the validity of an argument. iii) The teacher to guide students in groups to prove/test validity of an argument.		Is the student able to prove/test the validity of an argument?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
3.5 Electrical networks	By the end of this subtopic the student should be able to: a) relate electrical switches to statements	i) The teacher to demonstrate on how to establish a relationship between electrical switches and statements. ii) Students in pairs to solve problems related to electrical switches which are related to statements.	Electrical networks cards with logical connectives	Is the student able to relate electrical switches to statements?	12
	b) relate parallel and series connected switches to logical connective	i) The teacher to demonstrate on how to relate parallel and series connected switches to logical connectives. ii) Students in pairs to practice on how to relate parallel and series connected switches to logical connectives.		Is the student able to relate parallel and series connected switches to logical connective?	
	c) represent compound statement with an electrical network	i) The teacher to demonstrate the presentation of compound statements using electrical networks. ii) Students through think pair-share to represent compound statement with an electrical network		Is the student able to represent compound statement with an electrical network?	
	d) simplify an electrical network	i) The teacher to lead students in group to discuss how to simplify an electrical network.		Is the student able to simplify an electrical network?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
3.5 Electrical networks	By the end of this subtopic the student should be able to: a) relate electrical switches to statements	i) The teacher to demonstrate on how to establish a relationship between electrical switches and statements. ii) Students in pairs to solve problems related to electrical switches which are related to statements.	Electrical networks cards with logical connectives	Is the student able to relate electrical switches to statements?	12
	b) relate parallel and series connected switches to logical connective	i) The teacher to demonstrate on how to relate parallel and series connected switches to logical connectives. ii) Students in pairs to practice on how to relate parallel and series connected switches to logical connectives.		Is the student able to relate parallel and series connected switches to logical connective?	
	c) represent compound statement with an electrical network	i) The teacher to demonstrate the presentation of compound statements using electrical networks. ii) Students through think pair-share to represent compound statement with an electrical network		Is the student able to represent compound statement with an electrical network?	
	d) simplify an electrical network	i) The teacher to lead students in group to discuss how to simplify an electrical network.		Is the student able to simplify an electrical network?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		ii) Students individually to simplify a given electrical network and write the simpler compound statement which represents it.			
4.0 COORDINATE GEOMETRY I 4.1 Rectangular Cartesian coordinate	By the end of this subtopic the student should be able to: a) find area of a rectangle in terms of the coordinates of vertices	i) Students to sketch the coordinates and then find width and length of a rectangle using distance formula. ii) Students individually to find area of a rectangle.	i) Geometrical figures ii) Marker pens iii) Ruler iv) Flip chart v) Mathematical set	Is the student able to find area of a rectangle in terms of the coordinates of vertices?	19
	b) prove properties of parallelogram	i) Through discussion in groups. tudents to name properties of parallelograms ii) Through group discussions the teacher to guide students to prove properties of parallelograms.	Internet	Is the student able to prove properties of parallelogram?	
	c) find angle between two lines	Using compound angle expansion for the tangent and through discussions. students to find expression for an angle between two lines.		Is the student able to find angle between two lines?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	(d) compute the perpendicular distance of a point from a line.	(i) Students through group discussion to identify a perpendicular distance of a point from a line. (ii) The teacher to guide students to derive the formula for the perpendicular distance of a point to a line. (iii) Students individually to find the perpendicular distance from a point to a line.		Is the student able to compute the perpendicular distance of a point	
	(e) derive an equation of an angle bisector.	(i) The teacher to use brainstorming to guide students in deriving an equation of an angle bisector. (ii) Students in pair to discuss how to derive the equation of an angle bisector.		Is the student able to derive an equation of an angle bisector?	
	(f) solve locus problems	(i) The teacher to guide students in describing loci algebraically and by sketching them. (ii) Students individually to find loci algebraically and by sketching them.		Is the student able to solve locus problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
4.2 Ratio theorem	By the end of this subtopic the student should be able to: (a) prove the ratio theorem.	(i) Students to use think-pair- share technique to discuss addition of geometrical vectors. (ii) The teacher to guide pupils through question and answer method to prove the ratio theorem	(i). Ruler (ii). Coloured chalk (iii). Mathematical set	Is the student able to prove the ratio theorem?	6
	(b) apply the ratio theorem to solve related problems	i) Teacher to guide students on how to determine the coordinates of a point dividing a line segment in a given ratio internally and externally. ii) Students in pairs to find coordinates of a point dividing a line segment in a given ratio internally and externally.		Is the student able to apply the ratio theorem to solve related problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
4.3 Circle	By the end of this subtopic the student should be able to: a) derive the general equation of a circle.	i) Students to use distance formula to derive equation of a circle with radius r and centre (a, b) ii) The teacher to guide students in deriving general equation of a circle.	i) Flip charts ii) Ruler iii) Marker pens iv) Mathematical set	Is the student able to derive the general equation of a circle?	12
	b) find the equation of a tangent and normal to a circle.	i) The teacher to use questions and answers to explain the terms tangent and normal to a circle. ii) The teacher to guide students in groups to find equation of tangent and normal to a circle using the concept of gradient		Is the student able to find the equation of a tangent and normal to a circle?	
	c) find the point of intersection of circles	i) The teacher to use brainstorming to lead the students to use the system of simultaneous equation to find point of intersection of circles. ii) Students to use the knowledge of simultaneous equations to determine the points of intersection of circles including orthogonal circles.		Is the student able to find the point of intersection of circles?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) calculate length of a tangent from a point.	i) The teacher to guide students on how to calculate length of a tangent from a point. ii) Students to calculate length of a tangent from a point.		Is the student able to calculate length of a tangent from a point?	
5.0 FUNCTIONS **5.1** Graph of functions	By the end of this subtopic the student should be able to: a) draw graphs of polynomial functions up to 4^{th} degree	i) The teacher to use question s and answers to remind students on how to draw graphs of linear and quadratic functions. ii) The teacher to lead students to construct the table of values for a given polynomial function. iii) The teacher through brainstorming to guide students to draw the graphs of polynomial functions up to 4^{th} degree.	i) Flip charts ii) Marker pens iii) Graph papers iv) Coloured charts	Is the student able to draw graphs of polynomials of functions up to 4 degree?	25

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) draw graphs of rational functions	i) The teacher to use brainstorming to guide students to find asymptotes for graphs of rational functions by investigating the domain and range ii) Students in groups to draw graphs of rational functions iii) Students individually to draw graphs of rational functions as an exercise.	i) Computers ii) Flip charts	Is the student able to draw graphs of rational functions?	
	c) draw graphs of composite functions	i) The teacher to demonstrate how to draw graphs of composite functions. ii) Students in pairs to draw graphs of composite functions		Is the student able to draw a graph of composite function?	
	d) draw graphs of exponential functions	i) Students to brainstorm in groups when the index in zero. ii) Students to prepare a table of values and plot the graph of the exponential function. iii) The teacher to lead students in discussing the behaviour of the graph.		Is the student able to draw the graph of an exponential function?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	e) draw graphs of logarithmic functions	i) The teacher to lead the students' discussion on the relationship between exponential and logarithmic functions. ii) The teacher to guide the students how to use the graph of an exponential function to obtain the graph of logarithmic function iii) Students in group to discuss the behaviour as well as interpretation of the graph		Is the student able to draw the graph of a logarithmic function?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
6.0 ALGEBRA 6.1 Indices and Logarithms	By the end of this subtopic the student should be able to: a) prove laws of logarithms.	i) The teacher to guide students on how to prove laws of indices and logarithms ii) Students individually to prove laws of indices and logarithms. iii) Students individually to use laws of indices to solve related daily life problems.	i) Flip charts ii) Number charts iii) Coloured chalks iv) Log tables v) Marker pens	Is the student able to prove laws of logarithms?	9
	b) solve equations of logarithms and indices.	i) The teacher to demonstrate On how to solve equations of logarithms and indices. ii) Student in groups to solve equations of logarithms and indices.		Is the student able to solve equations of logarithms and indices?	
	c) convert logarithms from one base to another.	i) Students to brainstorm on how to convert logarithms from one base to another. ii) Students individually to convert logarithms from one base to another.		Is the student able to convert logarithms from one base to another?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
6.2 Series	By the end of this subtopic the student should be able to: a) define finite and infinite series.	Through questions and Answers the teacher to explain the definition of finite and infinite series. ii) Students in groups to give examples of finite and infinite series.	i) Number cards ii) Coloured chalks iii) Number patterns	Is the student able to define finite and infinite series?	9
	b) use sigma notation in writing series	i) The teacher to demonstrate onm how to use sigma notation in writing series. ii) Students to use sigma notation in writing series.		Is the student able to use sigma notation in writing series?	
	c) find the sum of the 1^{st} n squares and cubic natural numbers.	i) The teacher to guide students on how to find the sum of 1^{st} n square and cubic natural numbers. ii) Students in groups to find the sum of the 1^{st} n square and Cubic natural numbers.		Is the student able to find the sum of the 1^{st} n natural numbers. their squares and cubes?	
6.3 Proof mathematical induction	By the end of this subtopic the student should be able to: a) state the principle of mathematical induction.	i) Students in pairs to brainstorm on the meaning of logical reasoning ii) The teacher through questions and answers to guide students on how to state the principle of mathematical induction.	Dominoes and tables $\lvert n \rvert n^2 - n + 41$ prime.	Is the student able to state the principle of mathematical induction?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) use the principle of mathematical induction to prove mathematical statements.	i) The teacher to demonstrate on how to prove mathematical statements using the principle of mathematical induction. ii) Students individually to use principle of mathematical induction to prove mathematical statements.		Is the student able to use the principle of mathematical induction to prove mathematical statements?	
6.4 Roots of a polynomial function	By the end of this subtopic the student should be able to: a) determine the roots of a polynomial function.	i) The teacher to demonstrate on how to determine roots of a polynomial function. ii) Students individually to find roots of polynomial functions.	Figures of graph	Is the student able to determine the roots of a polynomial function?	9
	b) establish the relationship between roots and coefficients of a cubic equation.	i) The teacher and students to discuss on how to establish relationship between the roots of quadratic and cubic equations. ii) Students in pairs to solve problems related to the roots and coefficient of a cubic equation.		Is the student able to establish the relationship between roots and coefficients of a cubic equation?	
	c) form equations from known roots.	i) The teacher to use questions and answers to lead students in forming equation from known roots. ii) Students in groups to form equations from known roots.		Is the student able to form equations from known roots?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
6.5 Remainder theorem	By the end of this subtopic the student should be able to: a) determine the remainder of a polynomial function by using remainder theorem and Synthetic method.	i) Students to do a library search on how to state Remainder theorem and synthetic method. ii) The teacher to guide students on how to find remainder of a given polynomial function using Remainder theorem and synthetic method. iii) Students in pairs to find the remainder of a given polynomial function	i) Flip charts ii) Marker pens	Is the student able to determine the remainder of polynomial/function? using remainder theorem and Synthetic method?	3
6.6 Inequalities	By the end of this subtopic the student should be able to: a) solve quadratic inequalities.	i) Teacher and students to discuss on how to solve quadratic inequalities. both graphically and algebraically. ii) Students in groups to solve quadratic inequalities. both graphically and algebraically.		Is the student able to solve quadratic inequalities?	9
	b) solve inequalities involving rational functions.	i) The teacher to lead students' discussion on how to solve inequalities involving rational function. both graphically and algebraically. ii) Students in groups to solve inequalities involving the rational functions. both graphically and algebraically.		Is the student able to solve inequalities involving rational functions?	
	c) solve absolute value inequalities.	i) The students in groups to discuss the meaning of absolute value inequalities.		Is the student able to solve absolute value inequalities?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		ii) The teacher and students to discuss on how to solve absolute value inequalities. both graphically and algebraically. iii) Students in groups to solve absolute value inequalities, both graphically and algebraically.			
6.7 Matrices	By the end of this subtopic the student should be able to: a) calculate the determinant of a 3 x 3 matrix.	i) The teacher to demonstrate how to calculate the determinant of a 3x 3 matrix. ii) Students in groups to calculate determinant of a 3 x 3 matrix. iii) Students individually to calculate determinants of 3x 3 matrices.	i) Flip charts ii) Chart of matrices iii) Coloured chalks iv) Marker pens	Is the student able to calculate the determinant of a 3x 3 matrix?	12
	b) use Cramer's rule to solve three equations with three unknowns.	i) The teacher to lead students in discussing how to solve three equations with three unknowns using Cramer's rule. ii) Students individually to solve three equations with three unknowns using Cramer's Rule.		Is the student able to use Cramer's rule to solve three equations with three unknowns?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) find the inverse of a 3 x3 matrix	i) The teacher to guide students in finding adjoint of a 3x3 matrix ii) The teacher and students to discuss on how to find the inverse of a matrix using adjoint matrix. iii) Students individually to use adjoint of a matrix to find the inverse of a matrix.		Is the student able to find the inverse of a 3x3 matrix?	
	d) apply the knowledge of the inverse of a matrix to solve three linear equations with three unknowns simultaneously.	i) The teacher and students to discuss on how to solve three equations in three unknown variables using inverse matrix ii) Students in groups to solve three linear equations in three unknown variables using inverse matrix		Is the student able to apply the knowledge of the inverse of a matrix to solve three linear equations with three unknowns?	
6.8 Binomial theorem	By the end of this subtopic the student should be able to: a) develop Pascal's triangle.	i) The teacher to guidestudents in small groups to expand varieties of expressions of the form $(a+b)^n$ ii) The teacher to guide students in developing Pascal's triangle.		Is the student able to develop Pascal's triangle?	12

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) use Pascal's triangle to expand a Binomial expression.	i) Teacher to guide students in using Pascal's triangle to expand Binomial theorem. ii) Students individually to use Pascal's triangle to expand expressions.		Is the student able to use Pascal's triangle to expand Binomial expression?	
	c) apply Binomial theorem to solve problems	i) The teacher to demonstrate how to apply Binomial theorem to solve problems including $(1+a)^n$ where $-1<x<1$. ii) Students individually to solve mathematical problems using Binomial theorem.		Is the student able to apply Binomial theorem to solve problems?	
	d) use factorial notation to express Binomial theorem	The teacher to demonstrate on how to use the factorial notation to express the binomial theorem		Is the student able to use factorial notation to express Binomial theorem?	
6.9 Partial fractions	By the end of this subtopic the student should be able to use partial fraction to decompose a rational function.	i) The teacher to demonstrate on how to use partial fraction to decompose a rational function ii) Students in groups to demonstrate on how to use partial fraction to decompose a rational function iii) The teacher to guide students in applying the knowledge of partial fractions to find sum of some series		Is the student able to use partial fraction to decompose a rational function?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iv) Students in groups to apply the knowledge of partial fractions to find sum of some series.			
7.0 TRIGONOMETRY 7.1 Trigonometric ratios	By the end of this subtopic the student should be able to define secant, cosecant and cotangent	i) Students to do library search on the definitions of secant, cotangent and cosecant. ii) Teacher through questions and answers to confirm definitions of secant, cotangent and cosecant.		Is the student able to define secant, cosecant and cotangent?	3
7.2 Trigonometric identities	By the end of this subtopic the student should be able to: a) derive trigonometric identities.	i) Teacher to demonstrate the derivation of the identity $Cos^2 A + Sin^2 = 1$ ii) Teacher using question and answers to guide students in deducing the identities $1 + Tan^2 A = Sec^2 A$ and $1 + Cot^2 A = Co\sec^2$ from the identity $Cos^2 A + Sin^2 = 1$. iii) Students in groups to derive trigonometric identities.	i) Mathematical set ii) Chart with trigonometric identities	Is the student able to derive trigonometric identities?	12
	b) simplify trigonometric identities.	i) The teacher to guide students to simplify trigonometric expressions using trigonometric identities. ii) Students individually to simplify trigonometric expressions using trigonometric identities.		Is the student able to simply trigonometric expressions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) solve trigonometric equations.	i) The teacher to demonstrate On how to solve trigonometric equations. ii) Students in groups to discuss how to solve trigonometric equations. iii) Students individually to solve trigonometric equations.		Is the student able to solve trigonometric equations?	
	d) prove trigonometric identities	By demonstration, teacher to lead students to prove trigonometric identities.		Is the student able toprove trigonometric identities?	
7.3 Compound angle formula	By the end of this subtopic the student should be able to: a) Derive the compound angle formula.	The teacher to demonstrate on how to derive compound angle formulae for $Sin(A \pm B)$ and $Cos(A \pm B)$ using diametrical approach.	Chart with expressions on compound angle	Is the student able to derive the compound angle?	9
	b) prove identities involving compound angles.	i) The teacher to demonstrate on how to prove identities involving compound angles. ii) Students individually to prove mathematical identities involving compound angle formulae.		Is the student able to prove identities involving compound angles?	
	c) simplify expressions involving compound angles.	i) The teacher to guide students in groups in applying compound angles to solve mathematical problems.		Is the student able to simplify expressions involving compound angle?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
7.5 Trigonometric equation of the form $a\cos\theta + b\sin\theta = c$	By the end of the subtopic the student should be able to: a) use t -formula to solve equations of the form $a\cos\theta + b\sin\theta = c$	i) The teacher to guide students in deriving t-formulae. ii) The teacher to demonstrate the use of t-formula to solve equations of the form $a\cos\theta + b\sin\theta = c$ iii) Students to apply t-formulae to find the solution of the equation of the form $a\cos\theta + b\sin\theta = c$	Chart with trigonometric equation of the form $a\cos\theta + b\sin\theta = c$	Is the student able to use t-formula to solve equations of the form $a\cos\theta + b\sin\theta = c$	9
	b) express $a\cos\theta + b\sin\theta = c$ as a single trigonometric function.	Teacher to guide students in the discussion of how to express $a\cos\theta + b\sin\theta = c$ as a single trigonometric function by considering a and b as sides of a right angled triangle.		Is the student able to express a $a\cos\theta + b\sin\theta = c$ as a single trigonometric function?	
	c) find the general solution to the equation $a\cos\theta + b\sin\theta = c$ by considering a and b as sides of a right angled triangle.	Students in groups to find the general solution to the equation $a\cos\theta + b\sin\theta = c$		Is the student able to find the general solution to the equation $a\cos\theta + b\sin\theta = c$ by considering a and b as sides of a right angled triangle?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
7.6 Factor formulae	By the end of this subtopic the student should be able to: a) derive the factor formulae.	The teacher to demonstrate on how to derive the factor formulae.	Cards with factor formulae	Is the student able to derive the factor formula?	12
	b) prove identities involving factor formulae	i) The teacher to demonstrate the use of factor to prove trigonometric identities. ii) Students individually to prove identities involving the factor formulae	Chart with trigonometric problem	Is the student able to prove identities involving factor formulae?	
	c) simplify expressions involving factor formulae	i) The teacher to guide students to discuss on how to simplify expression involving factor formulae. ii) Students individually to simplify trigonometric expressions involving factor formulae.		Is the student able to simplify expressions involving factor formulae?	
	d) solve trigonometric problems involving factor formula	i) The teacher to guide students to discuss on how to solve trigonometric problems involving factor formulae. ii) Students in groups to solve trigonometric problems involving factor formulae.		Is the student able to solve trigonometric problems involving factor formula?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
7.7 Radians and small angles	By the end of this subtopic the student should be able to: a) convert degrees into radians.	i) The teacher to guide students to use the formulae for converting degrees into radians. ii) Students in groups to convert degrees into radians.	Chart with small angles	Is the student able to convert degrees into radians?	3
	b) approximate small angles $\sin x = x, \tan x = x$	i) The teacher to lead students to discuss how to approximate small angles ($\sin x = x, \tan x = x$) ii) Students in pairs to use approximated small angles in simplifying trigonometric expressions and solving equations.		Is the student able to approximate small angles?	
7.8 Trigonometrically function	By the end of this subtopic the student should be able to: determine domain and range of trigonometric functions	i) The teacher to lead students to discuss how to determine domain and range of trigonometric functions. ii) Students individually to determine domain and range of trigonometric functions.	Chart with trigonometric functions	Is the student able to able to determine domain and range of trigonometric functions?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
7.9 Inverse trigonometrically functions	By the end of this subtopic the student should be able to: a) find the inverse of a trigonometric function	i) Teacher to demonstrate the inverse of the trigonometric functions as a reflection of their relative graphs on the line $y = x$. ii) Students in groups to discuss how to find inverse of specific trigonometric functions.	Chart showing trigonometric functions and their corresponding inverses	Is the student able to find the inverse of a trigonometric function?	12
	b) sketch graph of the inverse of trigonometric functions.	i) The teacher to demonstrate on how to sketch the graph of the inverse of trigonometric functions. ii) Students individually to sketch graph of inverse trigonometric functions		Is the student able to sketch graph of the inverse of trigonometric functions?	
	c) prove expressions involving inverse trigonometric functions	i) Teacher to guide students on how to prove expressions involving inverse trigonometric functions. ii) Students individually to prove expressions involving inverse trigonometric functions.		Is the student able to expressions involving inverse trigonometric functions?	
	d) solve problems involving inverses trigonometric functions	The teacher to guide students to discuss on how to solve problems involving inverses trigonometric functions		Is the student able to solve problems involving inverse trigonometric functions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
8.0 LINEAR PROGRAMMING 8.1 Linear programming problems formulation	By the end of this subtopic the student should be able to transform word problem into a mathematical model (constraints. objective function)	i) The teacher to demonstrate on how to formulate objective and constraints and hence a mathematical model from a word problem. ii) Students in pairs to transform word problem into a mathematical model	Chart with mathematical models	Is the student able to transform word problem into a mathematical model?	3
8.2 Graphical solution	By the end of this subtopic the student should be able to: (a) solve linear programming problems graphically	i) Students individually to draw graphs of constraints. ii) The teacher to guide students on how to identify corner points in a feasible region. iii) Students in groups to discuss the interpretation of corner points and feasible region.	i) Graph paper ii) Graph board iii) Geometric instruments Graphs on flip chats Marker pen	Is the student able to solve linear programming problems graphically?	6
	b) find the minimum and maximum values using the objective function	i) The teacher to lead students in discussing on how to find the maximum and minimum values by substituting the corner points of a feasible region to the objective function. ii) Students to find maximum and minimum values using objective function graphically		Is the student able to find the minimum and maximum values using the objective function?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
8.3 Transportation problems	By the end of this subtopic the student should be able to: a) transform transportation problem into a mathematical model	i) Students in groups to transform a transportation problem into a mathematical model. ii) Students individually to transform a transportation problem into a mathematical model.	i) Flip charts ii) Marker pen	Is the student able to transform transportation problem into a mathematical model?	6
	b) solve transportation problems graphically	i) Students to draw graphs of constraints. ii) The teacher to guide students on how to identify corner points in a feasible region. iii) The teacher to apply question and answer to guide students in finding maximum and minimum values of a transportation problem.		Is the student able to solve transportation problems graphically?	
9.0 DIFFERENTIATION 9.1 Derivatives	By the end of this subtopic the student should be able to differentiate a function from first principles.	i) The teacher to introduce the concept of differentiation from first principles through brainstorming using the knowledge of gradient.	i) Flip charts ii) Graph papers iii) Graph boards iv) Ruler v) Maker pen	Is the student able to differentiate a function from first principles?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		ii) The teacher to demonstrate how to differentiate a function from first principles iii) Students in small groups to differentiate simple functions from first principles.			
9.2 Differentiation of a function	By the end of this subtopic the student should be able to: a) find derivative of a polynomial function	i) The teacher to guide studentsm through questions and answers to develop a general formula for the derivative of a function. ii) The teacher to demonstrate how to use formula to differentiate polynomials term by term. iii) Students in groups to differentiate polynomials.		Is the student able to find derivative of a polynomial function?	12
	b) find the derivative of product of polynomials product formula to differentiate product of a polynomial function.	i) The teacher to guide students in developing formulae for differentiating products and quotients of polynomial functions. ii) The teacher to demonstrate how to use the product and chair rules to find derivatives of products of functions. iii) Students individually to use		Is the student able to differentiate trigonometric functions and their inverses?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) find the derivative of a quotient.	i) The teacher to demonstrate ii) how to use the quotient rule of differentiation iii) Students in groups to review too many strategies quotients. iv) Students individually to differentiate products and quotients of functions.		Is the student able to find derivative of a logarithmic function?	
	d) differentiate trigonometric functions and their inverses	(i) The teacher to lead students to find derivatives of sine and cosine functions from first principles. ii) The teacher to guide students through group discussion to find derivative of trigonometric functions and their inverses. iii) Students do individual assignment to find derivatives of trigonometric functions and their		Is the student able to differentiate a trigonometric function and its inverse?	
	e) use computer package to differentiate polynomial and trigonometric functions	Students practise with computer package to differentiate polynomial and trigonometric functions.		Is the student use the computer package to differentiate polynomial and trigonometric functions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	f) find the derivative of logarithmic function	i) The teacher to guide students through question and answers on how to differentiate logarithmic functions ii) Students individually to find derivatives of a given logarithmic functions.	Is the student able to	find the derivative of a logarithmic function?	
	g) differentiate an exponential function	i) The teacher to demonstrate on the expansion of e^x and its derivative with respect to x. ii) The teacher to guide students through group discussion to apply the knowledge of differentiating logarithmic function to exponential functions a^x			
9.3 Application of differentiation	By the end of this subtopic the student should be able to: a) solve problems involving rates of change	i) The teacher to lead students to solve problems involving rates of change. ii) Students in groups to solve problems involving rates of change.	Chart with rates of change	Is the student able to solve problems involving rates of change?	9
	b) sketch graphs	i) The teacher through questions and answers to guide students to find turning points and point of inflexion ii) The teacher to demonstrate how to sketch a curve using intercepts and turning points.	i) Graph board ii) Graph paper iii) Flip chart iv) Marker pen	Is the student able to sketch graphs?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iii) Students individually to sketch of functions using intercepts and turning points			
	c) solve real life problems involving maximum and minimum values	Students to discuss on how to solve problems involving real life problems involving maximum and minimum values.		Is the student able to solve real life problems involving maximum and minimum values?	
9.4 Taylor's series and Maclaurin's series	By the end of this subtopic the student should be able to: a) Derive Taylor's theorem	The teacher to demonstrate on how to derive Taylor's theorem from power series expansion.	Chart showing Taylor's series	Is the student able to derive Taylor's theorem?	9
	b) deduce Maclaurin's theorem as a special case of Taylor's theorem	The teacher to demonstrate to show on how to deduce Maclaurin's theorem as a special case of Taylor's theorem.	Chart showing Taylor' series	Is the student able to deduce Maclaurin's theorem as a special case of Taylor's theorem?	
	c) apply Taylor's and Maclaurin's series to expand expressions	i) The teacher through group discussion to guide students to find the Taylor's and Maclaurin's series of a given function. ii) Students individually to find the Taylor's of a given function.	Chart showing maclaurin's series	Is the student able to apply Taylor's and Maclaurin's series to expand expressions?	

TOPICS/SUB TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
9.5 Introduction to partial derivatives	By the end of this subtopic the student should be able to: a) identify functions of two variables	The teacher to guide students through discussion to identify functions of two variables.	Chart with partial derivatives	Is the student able to identify functions of two variables?	6
	b) find partial derivatives of functions of two variables	i) The teacher to demonstrate how to find partial derivatives of functions of two variables ii) Students individually to find partial derivatives of functions of two variables.		Is the student able to find partial derivativesof functions of two variables?	
10.0 INTEGRATION 10.1 Inverse of differentiation	By the end of this subtopic the student should be able to: a) write anti-derivative in integral notation	i) Students to perform the inverse operation of differentiation individually. ii) The teacher through question and answers to guide students to write anti- derivative in integral notation iii) The teacher to demonstrate on how to realise the inverse operation of differentiation	i) Card with integral notation ii) Chart with anti-derivatives	Is the student able to write anti-derivatives in integral notation?	6
	b) integrate simple expressions	i) The teacher through questions and answers to guide students in integrating simple functions. ii) Students individually to integrate simple functions		Is the student able to integrate simple expressions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
10.2 Integration of function	By the end of this subtopic the student should be able to: a) apply techniques of integration	i) The teacher to demonstrate on how to integrate by parts. Students in groups to use integration by parts to find integral of product of functions ii) The teacher through question and answers to lead students in using substitution method iii) The teacher through question and answers to guide students in using partial fraction method.	Chart with integrals of trigonometric functions	Is the student able to apply techniques of integration?	19
	b) integrate trigonometric functions and their inverses	i) The teacher through group discussion to guide students in groups in finding integral of trigonometric functions and their inverses. ii) Students individually to integrate trigonometric functions and their inverses.	Chart with integrals of exponential functions	Is the student able to integrate trigonometric functions and their inverses?	
	c) find integral of - exponential functions	i) The teacher through group discussion to guide students in groups in finding integral of exponential functions. ii) Students individually to integrate exponential functions	Chart with integrals of logarithmic function	Is the student able to find integral of exponential functions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) integrate logarithmic functions	i) The teacher through group discussion to guide students in groups in finding integral of logarithmic functions. ii) Students individually to integrate logarithmic functions	Chart with integrals of logarithmic function	Is the student able to integrate logarithmic functions?	
	e) integrate rational function	i) The teacher through group discussion to guide students in groups in finding integral of rational functions. ii) Students individually to integrate rational functions.	Chart with integrals of rational functions	Is the student able to integrate rational function?	
	f) evaluate definite integrals of polynomial trigonometric, exponential and rational functions	i) The teacher through short lecture to explain to students the concept of definite integrals and its notation. ii) The teacher to demonstrate on how to evaluate definite integrals. iii) Students individually to evaluate definite integral of polynomials, trigonometric, exponential, logarithmic and rational functions	Chart with definite integrals	Is the student able to evaluate defi nite integrals of polynomial, trigonometric, exponential and rational functions?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
10.3 Application of integration	By the end of this subtopic the student should be able to: a) find the area under a curve and the area between two curves	i) Students in groups to find area under a simple curve in given intervals by integration. ii) The teacher by group discussion technique to lead students in discussing how to obtain the area bounded by two curves. iii) Students individually to find area under a curve and between curves of given functions.		Is the student able to find the area under a curve and the area between two curves?	12
	b) find the volume of solid of revolution about x-axis, about y-axis, and about any line	i) Teacher to demonstrate on how a volume of solids obtained after a revolution as the sum of small cylinders of a simple curve along the x-axis, or y-axis using a diagram. ii) Teacher through group discussion to guide students in discussing on how to find volume of solids obtained after revolving simple curves about the x-axis, or y-axis iii) Students individually to calculate volume of solids obtained after revolving simple curves about the x- axis, or y-axis		Is the student able to find the volume of solid of revolution about x - axis, about y -axis, and about any line?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) find length of an arc	i) Teacher to guide students through group discussion in using geometrical approach to find length of an arc ii) Students to find length of an arc.	Geometrical set graph paper	Is the student able to find length of an arc	
	d) determine area of a sector	i) Teacher through group discussion to lead students in discussing on how to use the idea of length of an arc to establish the area of a sector. ii) Students in pairs to find area of a sector.	Geometrical set paper	Is the student able to find area of a sector	

FORM VI

Class Competences

By the end of Form VI, the student should be able to

1. think critically and logically in interpreting and solving problems.
2. integrate and share mathematical skills to the community.
3. apply mathematical knowledge and techniques in other fields.
4. perform computations using scientific calculators and other electronic devices.
5. use computer to solve mathematical problems.
6. communicate mathematical knowledge using ICT and
7. create new knowledge from and already known mathematics concepts.

Class Objectives

By the end of Form VI the student should be able to:

1. develop mathematical skills and knowledge to be used in other areas and related subjects.
2. promote the development and application of mathematical skills in solving practical problems in daily life.
3. develop foundation and mathematical knowledge for studying mathematics in higher education.
4. use computer packages in learning and to solve mathematical problems.

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
11.0 COORDINATE GEOMETRY II 11.1 Conic section	By the end of this subtopic the student should be able to: a) define a conic section	i) The teacher to guide students through group discussion to explain the concept of a conic. ii) Student individually to define a conic	i) Graph papers ii) Geometrical models iii) Rubber band iv) Flip chart v) Marker	Is the student able to define a conic section?	9
	b) locate conicb sections in a cone	i) The teacher through question and answers to lead students to locate a conic section ii) Student individually to locate a conic section in a cone		Is the student able to locate conic sections in a cone?	
	c) list conic sections	The teacher through brainstorming to lead students to list conic section		Is the student able to list conic sections?	
11.2 The parabola	By the end of this subtopic the student should be able to: a) derive an equation of a parabola	i) The teacher to guide students by demonstration to derive an equation of a parabola ii) Students in groups to derive an equation of a parabola.	i) Graph paper ii) Flip chart iii) Marker pen iv) pencil	Is the student able to derive an equation of a parabola	12
	b) sketch the graph of a parabola	The teacher to demonstrate how to sketch graph of a parabola		Is the student able to sketch the graph of a parabola?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) find equation of a tangent and normal to a parabola	i) The teacher to demonstrate on How to find equation of a tangent and normal to a parabola ii) Students individually to find equation of a tangent and normal to a parabola		Is the student able to find equation of a tangent and normal to a parabola?	
	d) write parametric equation of a parabola	i) The teacher to demonstrate on how to write parametric equation of a parabola ii) Students individually to write parametric equation of a parabola		Is the student able to write parametric equation of a parabola?	
11.3 The ellipse	By the end of this subtopic the student should be able to: a) derive an equation of an ellipse	i) The teacher to guide students through question and answers to derive an equation of ellipse. ii) Students in groups to derive equation of ellipse.	i) Graph paper ii) Flip chart iii) Marker pen iv) Pencil	Is the student able to derive an equation of an ellipse?	12
	b) sketch the graph of an ellipse	The teacher to guide students in groups to sketch graph of ellipse.		Is the student able to sketch the graph of an ellipse?	
	c) find equation of a tangent and normal to an ellipse	i) The teacher to demonstrate to students on how to find equations of a tangent and normal to ellipse. ii) Students individually to find equation of a tangent and normal to an ellipse.		Is the student able to find equation of a tangent and normal to an ellipse?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) write parametric equation of an ellipse	i) The teacher to demonstrate to students on how to write parametric equation of ellipse ii)Students individually to write parametric equation of ellipse.		Is the student able to write parametric equation of an ellipse?	
11.4 The hyperbola	By the end of the subtopic the student should be able to: a) derive an equation of a hyperbola	i) The teacher to guide students to derive an equation of hyperbola. ii)Students in groups	i) Graph paper ii)Flip chart iii)Marker pen iv)Chart with equations of a symbols to hyperbola	Is the student able to derive an equation of a hyperbola?	15
	b) sketch graph of a hyperbola	The teacher to demonstrate how to sketch graph of a hyperbola.		Is the student able to sketch graph of a hyperbola?	
	c) find equation of the tangent and normal to a hyperbola	i) The teacher to guide students on how to find equation of a tangent and normal to a hyperbola. ii)Students individually to find equation of a tangent and normal to a hyperbola.		Is the student able to find equation of the tangent and normal to the hyperbola?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) write parametric equation of a hyperbola	i) The teacher to demonstrate on how to write parametric equation of a hyperbola. ii) Students individually to write parametric equation of a hyperbola.		Is the student able to write parametric equation of a hyperbola?	
	e) find equations of asymptotes to hyperbola	i) The teacher to demonstrate on how to find equations of asymptotes to hyperbola. ii) Students in groups to find equations of asymptotes to a hyperbola		Is the student able to find equations of asymptotes to the hyperbola?	
11.5 Polar Coordinates	By the end of the subtopic the student should be able to: a) describe polar coordinates of a point	i) The teacher through questions and answers to guide students to describe polar coordinates ii) Students through discussion to describe polar coordinates	i) Graph paper ii) Flip chart iii). Drawing board iv) Marker pen v) pencil	Is the student able to describe polar coordinates of a point?	12
	b) find relationship between polar and rectangular coordinates	i) The teacher to guide group discussion on relationship between polar and rectangular coordinates ii) Students individually to find relationship between polar and rectangular coordinates		Is the student able to find relationship between polar and rectangular coordinates?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) change polar equations into rectangular equations	The teacher through brainstorm to guide students to change polar equations into rectangular equations.		Is the student able to change polar equations into rectangular equations?	
	d) draw graphs of polar equations	i) The teacher demonstrates to ii) draw graphs of polar equations. Students individually to draw graphs of polar equations.		Is the student able to draw graphs of polar equations?	
12 VECTORS 12.1 Vectors representation	By the end of the subtopic the student should be able to: a) represent a vector in 3 dimensional space	i) Students to use think pair share to recall representation of vectors in a 2-dimensional space ii) The teacher to demonstrate on how to represent a vector in 3- dimensional space.	i) Graph board ii) Ruler iii) Set square iv) Graph paper v) Marker pens vi) Manila paper	Is the student able to represent a vector in 3 dimensional space?	9
	b) find unit vector in given direction in a 3-dimensional space	i) The teacher to guide students to discuss on how to find magnitude of a vector in 3- dimensional space ii) Students to use the idea of magnitude of a vector to find a unit vector in 3-dimensional space.		Is the student able to find unit vector in given direction in a 3-dimensional space?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) derive ratio theorem	i) The teacher to guide students to derive ratio theorem by using position vector. ii) Students to apply ratio theorem to solve problems.		Is the student able to derive ratio theorem?	
12.2 Dot product	By the end of the subtopic the student should be able to: a) calculate dot product of vectors	i) Students to do a library search on definition of dot product. ii) The teacher through questions and answers to guide students to define the dot product using the information obtained from	Chart showing vectors Flip chart Marker pen	Is the student able to calculate dot product of vectors?	15
	b) find angle between two vectors	Students individually to use definition of dot product to find angle between two vectors.		Is the student able to find angle between two vectors?	
	c) find projection of a vector onto another vector	i) The teacher through group discussion to guide students to discuss on how to find projection of a vector onto another vector ii) Students individually to use definition of dot product to find projection of a vector onto another vector.		Is the student able find projection of a vector onto another vector?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) find work done by a force	Students individually to use the definition of dot product to find work done by a force		Is the student able to find work done by a force?	
	e) prove cosine rule using dot product of vectors	The teacher through questions and answers to demonstrate on how to prove cosine rule using dot product of vectors.		Is the student able to prove cosine rule using dot product of vectors?	
12.3 Cross product	At the end of the subtopic the student should be able to: a) define a cross product of two vectors	The teacher through brainstorming to guide students to define cross product and explain right hand screw rule.	i) Flip chart ii) Marker	Is the student able to define a cross product of two vectors?	15
	b) calculate cross products of vectors	i) The teacher through brainstorming to lead students to find cross product of two vectors ii) students individually to find cross product of two vectors.		Is the student able to calculate cross products of vectors?	
	c) determine the angle between two vectors	i) The teacher to demonstrate how to determine angle between two vectors using cross product of vectors. ii) Students individually to determine angle between two vectors.		Is the student able to determine the angle between two vectors?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) use cross product of vectors to calculate the areas of a triangle and a parallelogram	i) Teacher to demonstrate how to determine area of a parallelogram using cross product of vector ii) Students individually to use the idea of area of a parallelogram to determine area of a triangle.		Is the student able to use cross product of vectors to calculate the areas of a triangle and a parallelogram?	
	e) prove sine rule using cross product of two vectors	The teacher through question and answers to demonstrate on how to prove sine rule using cross product of vectors.	i) Chart Showing ii) Vector Differentiate and integration	Is the student able to differentiate and integrate a vector?	
12.4 Vector Differentiation and Integration	By the end of the subtopic the student should be able to: (a) differentiate and integrate a vector	The teacher through group discussion to lead students to discuss on how to differentiate and integrate a vector which is in parametric form.	(i). Chart Showing (ii). Vector Differentiate and	Is the student able to differentiate and integrate a vector?	6
	(b) express velocity and acceleration as derivatives of displacement	Students in groups to use knowledge of differentiation to determine velocity and acceleration.	Is the student able to express velocity and acceleration as derivatives of displacement?		
13.0 HYPERBOLIC FUNCTION 13.1 Hyperbolic cosine and sine	By the end of the subtopic the student should be able to: a) define hyperbolic cosine and sine	i) Students to discuss on exponential functions e^x and e^{-x} ii) he teacher by short lecture to give definitions of cosh x and sinh x.	Computer Computer package	Is the student able to define hyperbolic cosine and sine?	12

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) sketch graphs of hyperbolic cosine and sine functions and their inverses	Students to use computer package to plot cosh x and sinh x .		Is the student able to sketch graphs of hyperbolic cosine and sine functions and their inverses?	
	c) define tanh x coth x , cos echx and sec hx .	Students in groups to use analogy of trigonometry to define tanh x coth x , cosechx		Is the student able to define tanh x coth x , cosechx and sec hx ?	
	d) convert hyperbolic functions into logarithmic functions	i) students in groups to use analogy of trigonometry to deduce inverse of hyperbolic functions ii) The teacher to demonstrate on how to convert the inverse hyperbolic functions into logarithmic functions		Is the student able to convert hyperbolic functions into logarithmic functions?	
13.2 Derivative of hyperbolic function	By the end of the subtopic the student should be able to: a) differentiate hyperbolic functions	The teacher through questions and Answers to guide students to use the knowledge of differentiation to differentiate hyperbolic functions and their inverses.	Chart with hyperbolic function and their inverses	Is the student able to differentiate hyperbolic functions?	6
	b) use differentiation to define series for cosh x and sinh x .	The teacher through discussion to lead students in defining series for cosh x and sinh x	Chart with hyperbolic functions and their inverses	Is the student able to use differentiation to define series for cosh x and sinh x ?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
13.3 Integration of hyperbolic functions	By the end of the subtopic the student should be able to: a) integrate hyperbolic function	i) The teacher to guide students to use the knowledge of integration to integrate hyperbolic functions and their inverses. ii) students to integrate hyperbolic functions	Chart with hyperbolic function	Is the student able to integrate hyperbolic function?	6
	b) apply integration of hyperbolic functions to solve problems	Students through group works to apply integration of hyperbolic function to solve problem		Is the student able to apply integration of hyperbolic functions to solve problems?	
14.0 STATISTICS 14.1 Measure of central tendency	By the end of the subtopic the student should be able to: a) calculate arithmetic mean using coding method.	i) Students in groups to generate data and group them using class intervals. ii) The teacher to guide students to discuss on how to use the collected data to calculate arithmetic mean using coding method. iii) Students in groups to calculate arithmetic mean of given grouped data using coding method.	i) Collected data ii) Graph paper iii) Histogram Pie charts iv) Flip chart v) Computer packages	Is the student able to calculate arithmetic mean using coding method?	6
	b) find median and mode of grouped data	i) tudents individually to do a library search assignment for the formulae of the median and mode of the grouped data ii) The teacher through questions and answers to guide students to discuss on how to calculate the median and mode of the grouped data.		Is the student able to find median and mode of grouped data?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iii) Students individually to calculate the median and mode of grouped data.			
14.2 Measure of Dispersion	By the end of the subtopic the student should be able to: a) calculate quartiles and percentiles	i) Students individually to do a library search assignment for the formulae of the quartiles and percentiles of the grouped data ii) Teacher through questions and answers to guide students to discuss on how to calculate the quartiles and percentiles of the grouped data. iii) Students individually to calculate the quartiles and percentiles of grouped data.			9
	b) derive the formulae for variance and standard deviation	i) Students in groups to find the sum of the squares of the deviations of outcomes from their mean in order to come up with the definition of the variance and hence standard deviation. ii) Students in groups to develop formula for the variance and standard deviation		Is the student able to derive the formulae for variance and standard deviation?	
	c) apply the formula for standard deviation to solve practical problems	i) Students individually to use the formula to calculate variance and standard deviation of both ungrouped and grouped data. ii) Students in groups to use computer package find variance and standard deviation		Is the student able to apply the formula for standard deviation to solve practical problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iii) Students in groups to apply the formula for standard deviation to solve practical problems			
15.0 PROBABILITY 15.1 Counting techniques for the sample space	By the end of the subtopic the student should be able to: a) state fundamental principle of counting	i) Students in groups of two to perform simple experiment. ii) The teacher through group discussion to guide students to discuss the number of ways of listing outcomes of compound event. iii) The teacher to use questions and answers to explain fundamental principle of counting.	i) Coins ii) Die iii) Coloured objects iv) Games v) Marbles vi) Playing cards	Is the student able to state fundamental principle of counting?	25
	b) apply the fundamental principle of counting to solve related problems	i) Students in groups to apply the fundamental principle of counting in solving related problems ii) Students in groups to perform simple experiments on permutation		Is the student able to apply the fundamental principle of counting to solve related problems?	
	c) state principle of permutation	The teacher through short lecture to lead students to use the idea of arrangement to explain the concept of permutation		Is the student able to state principle of permutation?	
	d) write the formula for permutation of n objects taken r at a time	i) Students individually to do a library search assignment for the formula of permutation. ii) The teacher through demonstration to guide students in writing down the formula of permutation.		Is the student able to write the formula for permutation of n objects taken r at a time?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	e) apply principle of permutation to solve related problems	Students individually to apply the principle of permutation to in solving related problems		Is the student to apply principle of permutation to solve related problems?	
	f) state principle of combination	i) Students to perform a simple experiment on combination. ii) The teacher through short lectures to lead students to use the idea of arrangement to explain the concept of combination.		Is the student able to state principle of combination?	
	g) write formula for combination of n objects taken r at a time	i) Students individually to do a library search assignment for the formula of combination. ii) The teacher through demonstration to guide students to write down the formula of combination.		Is the student able to write formula for combination of n objects taken r at a time?	
	h) apply principle of combination to solve related problems	Students to apply the formula of combination in solving related problems		Is the student able to apply principle of combination to solve related problems?	
15.2 Probability Axioms and Theorems	By the end of the subtopic the student should be able to: (a) state probability axioms	i) The teacher through question and answers to guide students to state probability axioms. ii) Students individually to state probability axioms	i) Dice ii) Games iii) Marbles iv) Playing cards	Is the student able to state probability axioms?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) use axioms to prove theorems.	i) The teacher through demonstration to guide students to use axioms to prove theorems. ii) Students individually to use axioms to prove theorems	i) Playing cards ii) Marbles	Is the student able to use axioms to prove theorems?	
15.3 Properties of Probability	By the end of the subtopic the student should be able to: a) prove the probability of a complement of an event	i) The teacher through demonstration to guide students to prove the probability of a complement of an event ii) Students individually to prove the probability of a complement of an event	i) Playing cards ii) Marbles	Is the student able to prove the probability of a complement of an event?	12
	b) prove addition law of probability	i) The teacher through demonstration to show how to prove addition law of probability. ii) Students in groups to prove the addition law of probability		Is the student able to prove addition law of probability?	
	c) prove the probability of the complement of union and intersection of two events	i) The teacher through question and answers to guide students to prove the probability of the complement of union and intersection of two events. ii) Students individually to prove the probability of the complement of union and intersection of two events.		Is the student able to prove the probability of the complement of union and intersection of two events?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) use the properties of probabilities to solve related problems	i) The teacher to guide students to use the properties of probabilities to solve related problems ii) Students individually to use the properties of probabilities to solve related problems.		Is the student able to use the properties of probabilities to solve related problems?	
15.4 Conditional Probability	By the end of the subtopic the student should be able to: a) define the concept of the conditional probability.	i) The teacher through questions and answers to guide students to define the concept of the conditional probability. ii) Students individually to define the concept of the conditional probability.	i) Playing cards ii) Marbles iii) Games	Is the student able to define the concept of the conditional probability?	12
	b) calculate the conditional probability of some events	i) The teacher through questions and answers to guide students to calculate the conditional probability of some events ii) Students individually to calculate the conditional probability of some events		Is the student able to calculate the conditional probability of some events?	
	c) state the condition for statistical independence of two events and solve the related problems	The teacher through questions and answers to guide students to state the condition for statistical independence of two events and solve the real life problems.		Is the student able to state the condition for statistical independence of two events and solve the related problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) apply conditional probability to solve problems	Students individually to state the condition for statistical independence of two events and solve the real life problems.		Is the student able to apply conditional probability to solve problems from real life situation?	
15.5 Probability Distributions	By the end of the subtopic the student should be able to: a) define a random variable	i) The teacher through questions and answers to guide students in defining a random variable ii) Students individually to define a random variable	i) Marbles ii) Playing cards	Is the student able to define a random variable?	19
	b) construct a probability distribution for a discrete random variable	i) The teacher to demonstrate on how to construct a probability distribution for a discrete random variable ii) Students individually to construct a probability distribution for a discrete random variable		Is the student able to construct a probability distribution for a discrete random variable?	
	c) calculate expected mean, variance and standard deviation of a discrete random variable	i) The teacher through demonstrations to guide students on how to calculate expected mean, variance and standard deviation of a discrete random variable. ii) Students individually to calculate expected mean. variance and standard deviation of a discrete random variable.		Is the student able to calculate expected mean. variance and standard deviation of a discrete random variable?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) construct a probability distribution for a continuous random variable	i) The teacher through question and answers to guide students to construct a probability distribution for a continuous random variable ii) Students individually to construct a probability distribution for a continuous random variable		Is the student able to construct a probability distribution for a continuous random variable	
	e) calculate expected mean and standard deviation of a continuous random variable	i) The teacher through demonstration to lead students to calculate expected mean and standard deviation of a continuous random variable. ii) Students in groups to discuss how to calculate the mean and standard deviation of continuous random variable.		Is the student able to calculate expected mean and standard deviation of a continuous random variable?	
	f) define density function and its properties	i) The teacher through questions and answers to guide students to define density function and its properties ii) Students individually to define density function and its properties		Is the student able to define density function and its properties?	
15.6 Some special probability Distribution	By the end of the subtopic the student should be able to: a) construct the binomial distribution	i) The teachers through demonstration to lead students in constructing the binomial distribution. ii) Students individually to construct the binomial distribution.	i) Graph paper ii) Geometrical instruments iii) Flip chart iv) Marker pen v) Pencil	Is the student able to construct the binomial distribution?	19

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) use binomial distribution to solve the related problems	i) The teacher through questions and answers to guide students to use binomial distribution to solve the related problems. ii) Students individually to use binomial distribution to solve the related problems.		Is the student able to use binomial distribution to solve the related problems?	
	c) problems state the Poisson distribution	i) The teacher through questions and answers to guide students to state the Poisson distribution. ii) Students individually to state the Poisson distribution.		Is the student able state the Poisson distribution?	
	d) use Poisson distribution to solve the related problems	Students in groups to use Poisson distribution to solve the related problems.		Is the student able to use Poisson distribution to solve the related problems?	
	e) state the Normal distribution	The teacher through questions and answers to guide the students in stating the Normal distribution		Is the student able to state the Normal distribution?	
	f) apply normal distribution to solve the related problems	Students under guidance of the teacher to apply normal distribution to solve the related problems		Is the student able to apply normal distribution to solve the related problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
16.0 COMPLEX NUMBERS 16.1 Complex number and their operations	By the end of the subtopic the student should be able to: a) define a complex number	i) Students to discuss on the square root of a negative number. ii) The teacher through discussion to introduce the notation of a complex number. iii) The teacher to explain the concept of a complex number.	i) Flip chart ii) Marker pens iii) Charts	Is the student able to define a complex number?	
	b) represent a complex number algebraically	i) The teacher to demonstrate the argand diagram on x - y plane ii) Students individually to represent numbers in x - y plane, hence the argued diagram.		Is the student able to represent a complex number algebraically?	
	c) calculate modulus and argument of a complex number.	i) Students to do a library search on the formulae of modulus and argument of a complex number. ii) The teacher to guide students to explain the term modulus and argument of a complex number iii) Students individually to apply formulae to calculate modulus and argument of a complex number.		Is the student able to calculate modulus and argument of a complex number?	
	d) find the complex conjugate of a complex number	i) The teacher to lead the students to explain the meaning of the term conjugate. ii) Students individually to find conjugate of complex numbers		Is the student able to find the complex conjugate of a complex number?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	e) perform operations on complex number	i) Students in small groups to perform operations on complex numbers such as addition, subtraction, multiplication and division. ii) The teacher to lead a brainstorming session on operation on complex numbers		perform operations on complex numbers?	
	f) solve equations with complex number solutions	i) The teacher to demonstrate on how to solve equations which have complex number roots. ii) Students individually to solve equations which have complex solutions		solve equations with complex number solutions?	
16.2 Polar form of complex number	By the end of the subtopic the student should be able to: a) write a complex number in a polar form	i) Students to do library search on the meaning of polar form in connection with polar coordinates. ii) The teacher to guide students on how to write a complex number in polar form by using the rectangular coordinates. iii) Students individually to write complex numbers in polar form.		Is the student able to write a complex number in a polar form?	9
	b) represent a complex number in polar form on the Argand diagram	i) The teacher to demonstrate on how to represent a number in polar form on the Argand diagram ii) Students individually to represent a complex number in polar form on the Argand diagram	i) Graph paper ii) Mathematical table	Is the student able to represent a complex number in polar form on the Argand diagram?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	c) describe loci of the complex number expression	i) The teacher to guide students to describe loci of some complex number expressions algebraically and by sketching them. ii) Students individually to find loci of some complex number expressions algebraically and by sketching them.		Is the student able to describe loci of complex number expression?	
16.3 De Moivre's theorem	By the end of the subtopic the student should be able to: a) state and prove De Moivre's theorem	i) Students to do library search on De Moivre's theorem. ii) The teacher to guide students on the discussion of De Moivre's theorem and to prove it by mathematical induction.	i) Flip chart ii) Marker pens	Is the student able to state and prove De Moivre's theorem?	9
	b) apply the theorem to find *nth* roots of a complex number	i) The teacher to display the formula for finding *nth* roots of complex number on the wall. ii) The teacher to guide students on how to apply the theorem in finding *nth* roots of complex numbers. iii) Students in groups to apply De Moivre's theorem		Is the student able to apply the theorem to find *nth* roots of a complex number?	
	c) prove identities and simplify expressions using the theorem	i) The teacher to demonstrate the application of De Moivre's theorem in proving identities and simplifying expressions. ii) The teacher to guide the students through questions and answers to simplify expressions using the De Moivre's theorem		Is the student able to prove identities and simplify expressions using the theorem?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
		iii) students individually to De Movre's theorem to simplify expressions.			
16.4 Euler's formula	By the end of the subtopic the student should be able to: a) deduce Euler's formula	i) The teacher to guide students in discussing Euler's formula. ii) Students in pairs to recall iT the expansion of e and e iT by through discussion iii) The teacher to use that expansion to introduce Euler's formula. iv) The teacher to guide students in deducing Euler' formula.	i) Flip chart ii) Marker pens	Is the student able to deduce Euler's formula?	9
	b) apply the formula to prove identities, simplify expressions	i) The teacher to guide students to apply the formula to prove identities and solve mathematical equations. ii) Students individually to apply the formula to prove identities.		Is the student able to apply the formula to prove identities, simplify expressions?	
17.0 **DIFFERENTIAL EQUATIONS** 17.1 Introduction to differential equations	By the end of the subtopic the student should be able to: a) formulate a differential equation	i) The teacher and students to discuss on how formulate a differential equation. ii) Students in pairs to formulate differential equations.	i) Flip chart ii) Marker pens	Is the student able to formulate a differential equation?	12

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) state the order of a differential equation	i) The teacher and students to discuss on how to identify the degree of a differential equation. ii) Students individually to identify the degree of differential equations.		Is the student able to state the order of a differential equation?	
	c) state the degree of a differential equation	i) The teacher to guide students to state the degree of a given differential equation. ii)) Students individually to state of degree of differential equations.		Is the student able to state the degree of a differential equation?	
	d) distinguish between a linear and non- linear differential equation	i) The teacher to lead discussion to students to state the characteristics of linear and non-linear differential equations. ii) The teacher to guide student on how to distinguish between a linear and non-linear differential equation.		Is the student able to distinguish between a linear and non-linear differential equation	
17.2 Solution to a Differential Equation	By the end of the subtopic the student should be able to a) verify a solution to a given differential equation	i) The teacher to guide students on how to verify a solution to a given differential equation. ii) Students in groups to verify a solution to a given differential equation	i) Computer package ii) Paper	Is the student able to verify a solution to a given differential equation?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	b) solve simple differential equations by direct integration.	i) The teacher and students to discuss on how to solve simple differential equations by direct integration. ii) Students in small groups to solve simple differential equations by direct integration.		Is the student able to solve simple differential equations by direct integration?	
17.3 First Order Differential Equations	By the end of the subtopic the student should be able to: a) write the differential equation in standard differential form.	i) The teacher to introduce the standard differential forms of writing by differential equations as $\frac{dy}{dx} = f(x, y)$ and $M(x, y)\,dx + N(x, y)\,dy = 0$ ii) Students in pairs to write various differential equations in standard differential forms.		Is the student able to write the differential equation in standard differential form?	28
	b) write the form of first order differential equation with separable variables	i) The teacher to explain the forms of first order differential equations with separable variables. ii) Students individually to write the forms of first order differential equations with separable variables.		Is the student able to write the form of first order differential equation with separable variables?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	(c) solve first order differential equations with separable variables	i) The teacher to demonstrate on how to solve first order differential equations with separable variables ii) Students individually to solve first order differential equations with separable variables		Is the student able to solve first order differential equation with separable variable?	
	d) solve first order homogeneous differential equations	i) The teacher to guide students to define a homogeneous differential equation. ii) The teacher and students to discuss how to solve homogeneous differential equations. iii) Students individually to solve homogeneous differential equations.		Is the student able to solve first order homogeneous differential equations?	
	e) define an exact differential equation	i) Students to do a library search for the definition of an exact differential equation.		Is the student able to define an exact differential equation?	
	(f) solve an exact differential equation	(i) The teacher and students to discuss on the definition and characteristics of an exact differential equation.		Is the student able to solve an exact differential equation?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	g) find integrating factors	i) The teacher to guide students on how to solve how to find integrating Factor. ii) Students individually to find exact differential equations.		Is the student able to find integrating factors?	
	h) solve non-exact differential equation using integrating factors	i) The teacher to guide students on how to solve non-exact differential equation using integrating factor. ii) Students in small groups to solve non-exact differential equation using integrating factor.		Is the student able to solve non-exact differential equation using integrating factors?	
	i) apply differential equations in solving simple real life problems	i) The teacher to guide students on how to apply differential equations to solve real life problems on exponential growth and decay, falling bodies in resistive media, cooling and dilution. iii) Students to brainstorm other applications and find their solutions.		Is the student able to apply differential equations in solving simple real life problem?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
17.4 Second order differential equations	By the end of the subtopic the student should be able to: (a) distinguish between homogeneous and non-homogeneous 2nd order differential equations	The teacher to guide students on how to distinguish between homogeneous and no homogeneous 2nd order differential equations		Is the student able to distinguish between homogeneous and non-homogeneous 2nd order differentia equations?	28
	(b) find the characteristic (auxiliary) equation for a homogeneous D.E.	(i) The teacher to demonstrate on how to find the characteristic (auxiliary) equation for a homogeneous differential equation. (ii) Students individually to find the characteristic (auxiliary) equation for a homogeneous		Is the student able to find the characteristic equation for a homogeneous D.E.?	
	(c) find roots of the characteristic equation for a homogeneous D.E. and use the roots to determine the solutions to a homogeneous D.E.	(i) Students individually to use the roots of the characteristic equation to determine solutions of homogeneous differential equation. (ii) The teacher to demonstrate on how to solve second order differential equation reducible to first order.		Is the student able to find roots of the characteristic equation for a homogeneous D.E. and use the roots to determine the solutions to a homogeneous D.E.?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
	d) solve second order differential equation reducible to first order	i) Students individually to use th roots of the characteristic equation to determine solutions of homogeneous differential equation. ii) The teacher to demonstrate on how to solve second order differential equation reducible to first order.		Is the student able to find roots of the characteristic equation for a homogeneous D.E. and use the roots to determine the solutions to a homogeneous D.E.?	
	e) solve non-homogeneous second order differential equation	i) The teacher to discuss the three cases of the roots of the characteristic equation: real and distinct: real and equal: imaginary; and determine the respective solutions. ii) Students individually to solve second order D.E. reducible to first order		Is the student able to solve second order differential equation reducible to first order?	
	f) apply second order differential equation to solve real life problems	i) The teacher and students to discuss on how to apply second order differential equation to solve real life problems ii) Students individually to apply second order differential equations in		Is the student able to apply second order differential equation to solve real life problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
18.0 NUMERICAL METHODS 18.1 Errors	By the end of the subtopic the student should be able to: a) describe types of errors and their sources	(i) Students to discuss in groups types of errors and their sources. (ii) The teacher to through questions and answers to describing types of errors and their sources		Is the student able to describe types of errors and their sources?	9
	b) distinguish between absolute and relative errors	The teacher to guide students to discuss the difference between absolute and relative error.		Is the student able to distinguish between absolute and relative errors?	
	c) relate effect of absolute and relative errors on basic operations	(i) The teacher to demonstrate on how to relate effect of absolute and relative errors on basic operations. (ii) Students in pairs to discuss relative errors.		Is the student able to relate effect of absolute and relative errors on basic operations?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
18.2 Roots by iterative methods	By the end of the subtopic the student should be able to: a) derive Newton Raphson formula.	i) The teacher to explain the meaning of iteration. ii) The teacher to demonstrate the derivation of Newton- Raphson method.	i) Computer packages	Is the student able to derive Newton Raphson formula?	12
	b) use Newton Raphson to approximate root of a function. nth root of a number and reciprocal of a number	i) Students individually to use scientific calculators and computer packages to find roots by Newton-Raphson method. ii) The teacher to guide students through questions and answers on how to use Newton Raphson to approximate root of a function. nth root of a number and reciprocal of a number		Is the student able to use Newton Raphson to approximate root of a function, nth root of a number and reciprocal of a number?	
	c) derive Secant formula	The teacher to demonstrate the derivation of Secant Method		Is the student able to derive Secant formula?	
	d) use Secant formula to approximate a root of a function.	Students individually to find roots using Secant method.		Is the student able to use Secant formula to approximate a root of a function?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NUMBER OF PERIODS
18.3 Numerical Integration	At the end of the subtopic the student should be able to: a) Derive trapezium rule.	i) Students in groups to recall area of trapezium ii) Students to draw s curve and divide it into several trapeziums. iii) The teacher to guide students in groups to derive trapezoidal rule	i) Graph paper ii) Ruler iii) Pencil	Is the student able to derive trapezium rule?	12
	b) apply trapezium rule to evaluate definite integrals.	Students individually to apply trapezoidal rule to evaluate areas of a curve.		Is the student able to apply trapezium rule to evaluate definite integrals?	
	c) derive Simpson's rule.	The teacher to demonstrate how to derive Simpson's rule.		Is the student able to derive Simpson's rule?	
	d) apply Simpson's rule to evaluate definite integrals	Students individually to apply Simpson's rule to evaluate area of a curve.		Is the student able to apply Simpson's rule to evaluate definite integrals?	

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