REPUBLIC OF CAMEROON
Peace – Work - Fatherland

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTRY OF SECONDARY EDUCATION
MINISTERE DES ENSEIGNEMENTS SECONDAIRES

INSPECTORATE GENERAL OF EDUCATION
INSPECTION GENERALE DES ENSEIGNEMENTS

PURE MATHEMATICS WITH MECHANICS *TEACHING SYLLABUS*

SECOND CYCLE SECONDARY GENERAL EDUCATION

(Lower Sixth and Upper Sixth Forms)

Observing the environment in order to make informed choices on training options for a successful future

INSPECTORATE OF PEDAGOGY IN CHARGE OF SCIENCES

INSPECTION DE PEDAGOGIE CHARGEE DE L'ENSEIGNEMENT DES SCIENCES

2019

PURE MATHEMATICS WITH MECHANICS *TEACHING SYLLABUS*

SECOND CYCLE SECONDARY GENERAL EDUCATION

(LOWER SIXTH AND UPPER SIXTH FORMS)

LEARNING AREA:

SCIENCE AND TECHNOLOGY

SUBJECT: PURE MATHEMATICS WITH MECHANICS

Classes: Lower Sixth and Upper Sixth

TOTAL NUMBER OF TEACHING HOURS FOR EACH LEVEL A YEAR: 248hrs

NUMBER OF PERIODS A WEEK: 9 periods of 50mins each (450 minutes)

COEFFICIENT: 5

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INTRODUCTION

This syllabus for Further Mathematics is a statement of a defined coursework to educate young Cameroonians in the Second Cycle (sixth and seventh year) of Secondary General Education. At the end of upper sixth, students are well equipped to sit in for the General Certificate of Education (GCE) Advanced level and any other examination requiring knowledge and skills at this level. The topics are grouped into modules. While it is convenient to break them down into these smaller manageable units, it is important to remember that they do not stand in isolation from one another.

This syllabus is elaborated using the Competency – Based – Approach from a situated perspective (through real life situations and the promotion of mathematical thinking and problem solving skills). It is only in a situation that a person develops his/her competence. It is only by dealing effectively with this situation that a person can be declared competent. With this approach, Mathematical knowledge and skills learned in the classroom are made functional (act as tools (resources)), to solve problems in other related subjects and in real life situations. This syllabus therefore emphasizes application of Mathematics to real life situations, a practical approach to teaching and learning, a broad based critical mathematical thinking and problem solving skills. The course has been designed to enable the learner to acquire attitudes, knowledge and skills which will be relevant to his/her life after school as well as further studies in other related fields that require mathematics at the tertiary level.

This syllabus for the second cycle, also has a double goal which is:

- The intellectual training of the learner to progressively develop abilities for experimentation, creativity and critical analysis so as to be able to take up fully, his role as a citizen.
- The second goal is utilitarian; here it envisages the adaptation of scientific knowledge to international, economic and environmental context.

OUTCOMES OR PROFILES OF THE LEARNER

At the end of the second cycle, the learner who has successfully gone through this content should among others be able to use Mathematics with confidence to solve real life problems within the different domains of life, communicate concisely and unambiguously and develop power of mathematical reasoning (logical thinking, accuracy and spatial awareness). To be more specific they have to:

- Recognise, identify, write, communicate and use numbers in various ways;
- Use different operations to calculate values within different life situations;
- Extract, translate and use Mathematical information from tables, charts, graphs, diagrams, coded figures, or from any document and from the environment;
- Recognize, identify, describe and make geometrical shapes /forms, develop skills and accuracy as well as have confidence in the use of instruments for measuring and drawing and ability to visualize 3-dimensional figures;
- Acquire the methods and knowledge to understand and master the functioning of technical objects made by man to satisfy his needs;
- Meet up with the challenges of life through the use of scientific methods in solving real life problems;
- Appreciate the beauty of nature.

The Further Mathematics teaching syllabus for the second cycle is designed so that teaching/learning at this level will continue to develop in learners the three fundamental competencies which are:

- Solve a problem within a situation (solve problems encountered within real life situations, promote mathematical thinking and problem solving skills) so as to fully and autonomously assume one's role as a citizen as well as confidently engage in further studies in other related fields at the tertiary level that require mathematics;
- Display a logical reasoning (show a coherent logical reasoning, spirit of curiosity, spirit of critical thinking and initiative);
- Communicate using Mathematical language (communicate in an intelligent, clear and concise language orally or written).

These three competencies are developed progressively at all stages of Secondary Education through some real life activities.
The cognitive levels for second cycle are knowledge, comprehension, application and analysis/evaluation.

SERIES COMBINATIONS FOR THE SECOND CYCLE SCIENCES (Lower Sixth and Upper Sixth)

There are four different subjects' combinations for students wishing to study sciences in the second cycle of Secondary General Education. The first three subjects (in bold) make up one of the compulsory entry requirements for the various series. Students can take up one or two other subject(s) **(*)** within the series combination to make a maximum of 5 subjects.

In addition to the main subjects, students would have to do the enabling subjects, at least one period a week each, depending on their main subject total load.

N°/ **SERIES**	**S_1**	**S_2**	**S_3**	**S_4**
1	**MATHS WITH MECHANICS**	**PHYSICS**	**MATHS WITH STATISTICS**	**CHEMISTRY**
2	**CHEMISTRY**	**CHEMISTRY**	**BIOLOGY**	**BIOLOGY**
3	**PHYSICS**	**BIOLOGY**	**CHEMISTRY**	**GEOLOGY/GEOGRAPHY**
4	FURTHER MATHEMATICS.*	MATHS WITH MECHANICS*	FOOD SCIENCE AND NUTRITION*	FOOD SCIENCE AND NUTRITION *
5	ICT/COMPUTER SCIENCES*	FURTHER MATHEMATICS.*	ICT/COMPUTER SCIENCES*	MATHS WITH STATISTICS *
Enabling subjects				
1	Sports and physical Education	Sports and physical Education	Sports and physical Education	Sports and physical Education
2	Manual labour	Manual labour	Manual labour	Manual labour
3	Philosophy	Philosophy	Philosophy	Philosophy
4	General English	General English	General English	General English
5	General French	General French	General French	General French

Weekly allocation of teaching/learning hours per subject

The number of **hours per week** for the teaching/learning of Mathematics is outlined in the following table among other science subjects. The number of teaching/learning **periods per week** will depend on the duration of each period (number of minutes) for the institution concerned. Pure Mathematics with Mechanics shall have 8 or 9 periods per week in Lower Sixth and 8 or 9 periods in Upper Sixth

N°	**Subject/ Class**		**LSS_1**	**LSS_2**	**LSS_3**	**LSS_4**	**LSA_4**	**USS_1**	**USS_2**	**USS_3**	**USS_4**	**USA_4**
1	Mathematics with Mechanics /Statistics		8	8	8	8	8	8	8	8	8	8
2	Further Mathematics.		4	4				8	8			
3	Physics	Theory	6	6				6	6		6	
		Practical	2	2				2	2		2	
4	Chemistry	Theory	6	6	6	6		6	6	6	6	
		Practical	2	2	2	2		2	2	2	2	
5	Biology	Theory		6	6	6			6	6	6	
		Practical		2	2	2			2	2	2	
6	Geology	Theory				6					6	
		Practical				2					2	
7	Food Science and Nutrition	Theory			6	6				6	6	
		Practical			2	2				2	2	
8	Computer Science/ICT	Theory	4		4			6		6		
		Practical	2		2			2		2		

CAREER OPPORTUNITIES

The Table below shows some plausible career opportunities for each of the series or subject combinations. In choosing the series, the students should be orientated with these career opportunities.

SERIES	S_1	S_2	S_3	S_4
	✓ Aeronautics ✓ Aerospace engineering ✓ Agricultural engineering ✓ Biomedical engineering ✓ Chemical engineering ✓ Civil engineering ✓ Electrical engineering ✓ Electrical engineering ✓ Geotechnical engineering ✓ Industrial engineering ✓ Mechanical engineering ✓ Military ✓ Nuclear engineering ✓ Renewable energy technologies ✓ Software engineering ✓ Statisticians ✓ Teaching career ✓ Telecommunications	✓ Agricultural engineering ✓ Anesthetist ✓ Biomedical engineering ✓ Biotechnology ✓ Chemical engineering ✓ Epidemiologist ✓ Forestry ✓ Geotechnical engineering ✓ Laboratory technicians ✓ Medicine ✓ Midwifery ✓ Nursing ✓ Pharmacist ✓ Radiologist ✓ Statisticians ✓ Teaching career ✓ Telecommunications ✓ Veterinary medicine	✓ Agricultural engineering ✓ Anesthetist ✓ Biotechnology ✓ Chemical engineering ✓ Food processing ✓ Forestry ✓ Laboratory technicians ✓ Medicine ✓ Midwifery ✓ Nursing ✓ Pharmacist ✓ Radiologist ✓ Statisticians ✓ Teaching career ✓ Veterinary medicine	✓ Agricultural engineering ✓ Biotechnology ✓ Chemical engineering ✓ Food processing ✓ Forestry ✓ Geotechnical engineering ✓ Laboratory technicians ✓ Midwifery ✓ Mining ✓ Nursing ✓ Teaching career

THE PLACE OF MATHEMATICS IN THE CURRICULUM AND ITS CONTRIBUTION TO THE LEARNING AREAS.

Mathematics, offers different models and structures that constitute the framework of service tools in the Sciences and Technology learning area as well as in other learning areas through its own language. Mathematics in itself, contributes to the development of rigorous and logical reasoning, spirit of creativity and critical thinking. All these contribute to create, manage and exploit learning situations which help us to understand and master nature and laws of nature. Mathematics is at the root of all technological evolution of today's world and as such, it contributes significantly towards the modification of our environment, our life style and our thinking process. Mathematical concepts form the bases of the evolution of the computer that has considerably improved our work habits and communication.

DOMAINS OF LIFE AND CONTRIBUTION OF SYLLABUS TO DOMAINS OF LIFE:

The teaching/learning are constructed within five domains of life which are: Family and social life, Economic life; the environment, well- being and health; Media and communication and Citizenship. Mathematical skills help in developing competencies in commercial transactions, games, planning expenditure, energy consumption, decision making, environmental protection, health, politics etc. As earlier mentioned, Mathematics is at the root of all technological evolution of today's world as it contributes significantly towards the modification of our environment, our life style and our thinking process. Some application of Mathematics can be seen in business, trades, politics, census, family planning, arts and music etc. Thus, be it in the domain of family and social life, economic life, the environment, well-being and health, media and communication and even citizenship, Mathematics plays a significant role.

FAMILIES OF SITUATIONS COVERED IN THIS PROGRAM OF STUDY

A family of situations refers to a group of life situations that share at least a common property.

For these years of secondary education, five families of situations have been identified which are:

- Representation, determination of quantities and identification of objects by numbers;
- Organization of information, estimation of quantities and making choices in the consumption of goods and services;
- Representations and transformations of points and plane shapes within the environment;
- Usage of technical objects in everyday life;
- Description of patterns and relationships between quantities and ideas using symbols.

These five families of situations expose the learners to experience all possible daily life activities at this level such as Commercial transactions, games, planning expenditure, energy consumption, just to name a few. These are the areas to develop the envisaged competencies. The different modules for this level are:

COMPREHENSIVE TABLE SHOWING THE DIFFERENT MODULES FOR EACH CLASS

Level	Module N°	Title of module	Family of situations	Duration
Lower Sixth	1	Algebra and Logic	Description of patterns and relationships between quantities and ideas using symbols	**105 hrs**
	2	Numbers, Fundamental Operations and Relationships in the sets of numbers and between elements in a set	Representation, determination of quantities and identification of objects by numbers Organization of information, estimation of quantities and making choices in the consumption of goods and services	**65 hrs**
	3	Plane Geometry	Representations and transformations of points and plane shapes within the environment	**78 hrs**
Upper Sixth	4	Plane Geometry and Solid figures	Representations and transformations of points and plane shapes within the environment Usage of technical objects in everyday life	**83 hrs**
	5	Statics	Description of patterns and relationships between quantities and ideas using symbols	**43 hrs**
	6	Kinematics	Description of patterns and relationships between quantities and ideas using symbols	**60 hrs**
	7	Dynamics	Description of patterns and relationships between quantities and ideas using symbols	**43 hrs**
	8	Probability	Organization of information, estimation of quantities and making choices in the consumption of goods and services	**19 hrs**

PRESENTATION OF MODULES.

Each module has two main parts: the introduction of the module and the table.

The introduction has the presentation of the module; the contribution of the module to outcome and curriculum goals, contribution of module to learning area and contribution of module to areas of living.

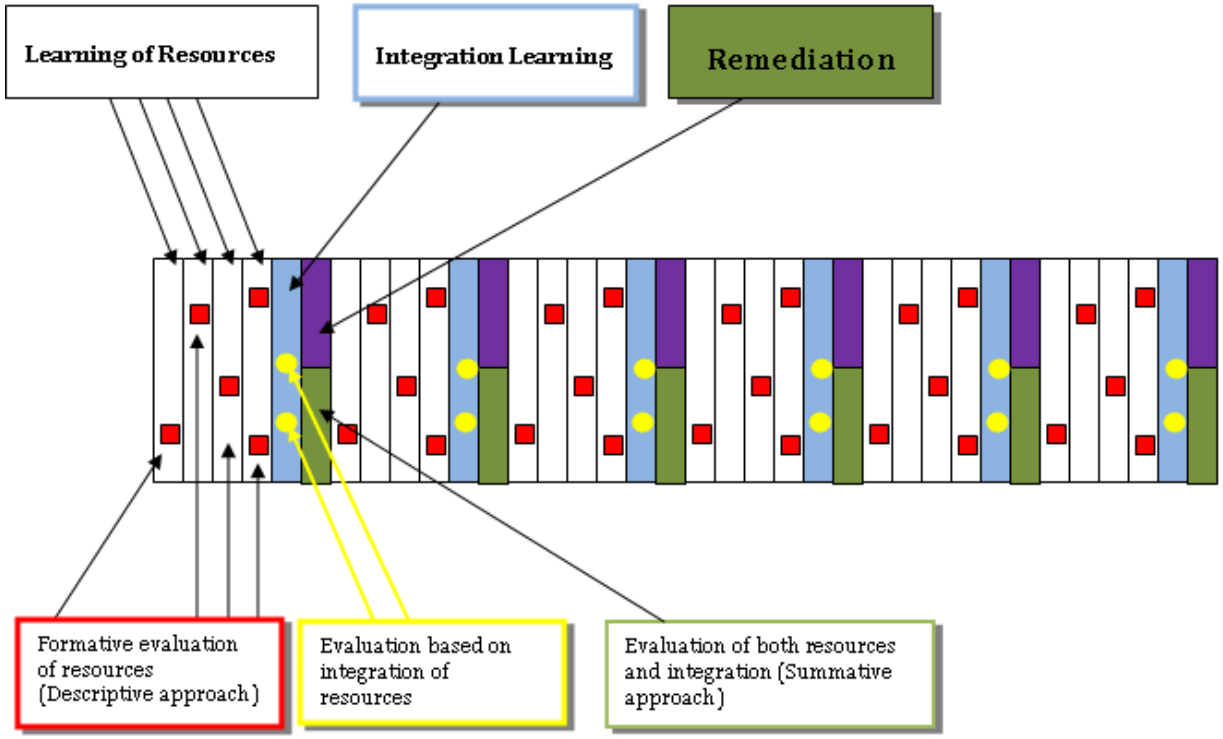
The table on the other hand, is made up of three main columns which are subdivided into eight columns:

- The contextual framework embodies the families of situations and some examples of real life situations where the knowledge and skills (competencies) can be applied. Teachers are expected to come out with more real life situations within their environment.
- The Competencies (competent actions) is divided into categories of actions and examples of actions: These are groups of some actions which are related to the mastery of the competencies expected for the module.
- The Resources have the essential or core knowledge which give all the set of cognitive and affective resources which the learner needs to mobilise to successfully treat a family of situations. It is divided into four components: the mathematical notions, the skills or know-how, attitudes to be disposed or to be acquired as well as other resources (material) necessary for the acquisition of these competencies.

Planning of Teaching/Learning and Evaluation

In Cameroon, the academic (school) year is subdivided into three terms of twelve (12) weeks each. Teaching/Learning and Evaluation take place after every six weeks and comprises *Learning of Resources*, *Integration Learning* and *Remediation*, followed by summative Evaluation. In each of the three stages of the Teaching/Learning process, formative evaluation is involved.

The diagram below is an example of how Teaching/Learning and evaluation can be planned over a period of one school year.



The first four weeks could be consecrated to the teaching/learning of resources (knowledge and know-how), interspersed by formative evaluation. That is, during this period of teaching/learning, we ought to develop oral questions, written application exercises for practice, homework, which may or may are not be scored.

The fifth week could be consecrated to the integration of learning activities, which can take the form of tutorials accompanied by appropriate remedial actions. This should be after a set of lessons that constitutes one or more topics or a significant part of a topic.

The sixth week could be consecrated to remediation or revision to surmount possible difficulties or misunderstanding of learners, followed by graded evaluation of resources and competencies and then retake the procedure for the next six weeks of the term. It should be noted that this evaluation at the end of the sixth week should be essentially formative in nature, which implies that it should also be used to diagnose the lapses in learning with the view of providing appropriate remediation.

PEDAGOGIC ORIENTATIONS.

a. Recommended Methodology:

The Competency–Based–Approach is based on the Socio-Constructivist view of learning which postulates that learners actively construct new learning onto old learning through an action in a given situation. In this light, the Mathematics lesson should have teaching/ learning activities and the teaching method being centered on the learner. Each teaching/learning sequence or lesson should include:

- An introduction with motivation that will captivate and sustain the interest of the learners ;
- A problem situation that provokes critical thinking in the quest of a solution to the problem.
- Learning activity(ies) that will facilitate the acquisition of new knowledge and new skills. An activity that will consolidate old knowledge with new knowledge;
- The essential knowledge is given as notion or methods;
- Application exercises;

b. Integration activities whenever it is possible should be well planned so that it allows students to mobilise many skills learned to competently solve a real life problem. These integration activities are aimed at making the students to employ and use the learned mathematical skills necessary to competently handle life situations related to the family of situations for the module.

c. Evaluation.

In order to determine the learner's progress in the learning process, the teacher must regularly carry out assessment of learning. Knowledge and skills are evaluated as with objective based while the criterion referenced assessment is used to evaluate development of competencies. **At the end of Upper Sixth, students will sit in and write the General Certificate of Education examination, Advanced level, in Further Mathematics and any other examinations at this level. The nature and structure of the examination will be defined by the Cameroon General Certificate of Education (CGCE) Board.**

d. Notations and symbols

Teachers should teach for accuracy and should at each time ensure that students use notations and symbols encountered at this level, accurately. No misuse of words, notations and symbols by learners should be tolerated.

The teacher uses and introduces whenever necessary, the corresponding symbol for each set of numbers such as $\mathbb{N}$, $\mathbb{R}$, $\mathbb{Z}$, $\mathbb{Q}$ and $\mathbb{C}$.

e. Calculators

A calculator is a tool that is now very common among students. It fascinates and exercises an attraction that no other instrument seems to have had. Students use it even for the simplest operations. It is only a tool, and, is no substitute for the knowledge of its user. It is for the teacher to take note of this and encourage or discourage its use, as the case may be. The learners are expected to master the following keys (functions) of the calculator: +, −, ×, ÷, π, x^2, $\sqrt[n]{x}$ $\sqrt{x}$, $\frac{1}{x}$, x^y, e^x,$logx$, lnx,n_{P_r} n_{C_r} $a\ b/c$, sine, cosine and tangent and their inverses in radians, degrees and in decimals of a degree.

Some symbols and notations.

Learners will meet and use among others, the following symbols and notations:

$\{\}$ $\mathbb{N} = \{0,\ 1,\ 2,\ 3, \ldots\}$	the set of The set of natural numbers	$\in$	is an element of
$n(A)$	the number of elements in the set A	$\notin$	is not an element of
$\{x:\ \}$	the set of all x such that	$\subseteq$	is a subset of
A'	the complement of the set A	$f(x)$	the image of x under the function f
$f: A \to B$	f is a function under which each element of set A has an image in set B	f^{-1}	the inverse relation of the function f
$f: x \mapsto y$	f is a function under which x is mapped onto y	fg	the function f composed with g
] [	open interval on the number line	$\overrightarrow{AB}$	the vector $\overrightarrow{AB}$
[ ]	closed interval on the number line	$\lvert\overrightarrow{AB}\rvert$	Magnitude of vector $\overrightarrow{AB}$
$[a, b]$	$\{x: a \leq x \leq b\}$	**a, or** $\vec{a}$	the vector **a**
$(a, b]$ or $]a, b]$	$\{x: a < x \leq b\}$	$\sum_{r=a}^{b} u_r$	Summation
$[a, b)$ or $[a, b[$	$\{x: a \leq x < b\}$	$\sim p$	not p
(a, b) or $]a, b[$	$\{x: a < x < b\}$	$p \Rightarrow q$	p implies q
[AB] AB	Line segment from A to B. Length of [AB]	$p \Leftrightarrow q$	p implies and is implied by q *or* (p is equivalent to q) or p iff q or p implies q and q implies p
f' *or* y' *or* $\frac{dy}{dx}$	The derived function of or derivative of the function f	$\lim_{x \to a} f(x)$	The limit of $f(x)$ as x tends to a
f'' *or* y'' *or* $\frac{d^2y}{dx^2}$	The second derivative of the function f	$\int f(x)dx$	The integral or the primitive of the function f

PURE MATHEMATICS WITH MECHANICS TEACHING SYLLABUS FOR LOWER SIXTH

MODULE 1: ALGEBRA AND LOGIC.

CREDIT: **105 hours** / 9 periods of 50 minutes each per week

GENERAL PRESENTATION

Algebra focuses on describing pattern and relationships between variables through the use of symbolic expressions, graphs and tables. This module is the extension of basic algebra and starts here with transposition of formulae then to introducing relations and functions. Functions, relations, equations, inequalities, systems of equations and graphs are examples of models. This module is made up of the families of situations: **Describing patterns and relationships between quantities using symbols**. There are three categories of action namely: Interpretation of algebraic models; determination of quantities from algebraic models; representation of quantities and relationships.

CONTRIBUTION OF MODULE TO OUTCOME AND CURRICULUM GOALS

The mastery of this module will help the learner to solve problems using algebraic language and skills and also to examine and study relationships between real life situations. Through the use of symbolic expressions, graphs and tables, learners will be able to recognize, describe and represent patterns and relationship as well as translate real life problems into different forms of equations to enable the solution to the problem. Logic being Mathematical reasoning will help learners develop the skill of logical reasoning (deductive and inductive), spirit of critical thinking for proper decision taking.

CONTRIBUTION OF MODULE TO LEARNING AREA

Algebra is the language for investigating and communicating most of Mathematics, sciences and technological work. Formulae are highly used in physical sciences (calculating air pressure, resistance, voltage), and in economic growth such as calculating pension for those on retirement etc. Learners will achieve efficient manipulative skills in the use of algebra, and a thorough understanding of these is essential for understanding any field of mathematics and many technical areas where mathematics is applied. This module is a foundation for more advanced mathematics, science and technology in general.

CONTRIBUTION OF MODULE TO AREAS OF LIVING

The areas of living where this module is employed are: Family and Social life, Economic life, Environment, Welfare and health; Citizenship, Media and Communication. Learners develop the competences of translating phrases and sentences in real life into variable expressions and equations to find solutions. They will use algebraic language and skills to describe patterns and relationships in a way that builds awareness of other learning areas as well as issues related to human rights, social economic and cultural life, political and environmental issues. Many real-world phenomena can be modeled by relations such as: the time a satellite takes to complete a revolution around the earth in terms of its speed and altitude; with finances to find simple interest (I) earned on an investment (P) after a period of time (t) at a rate (r), is given as $I = Ptr$. Therefore, in other subject areas, as well as in real life, connections are made between algebraic representations and the problem situations so as to provide better understanding about Mathematical concepts and the different problem situations. Learners will be able to manipulate graphs in media to represent trends and pattern, represent relationships within an ecosystem, exploit and design geometrical patterns in art and architecture and appreciate symmetrical patterns that occur in nature.

MODULE 1 : ALGEBRA AND LOGIC

CREDIT: 105 hrs/9 periods of 50 minutes each per week

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols	-Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties Travelling -Marketing	Interpretation of algebraic models Determination of quantities from algebraic models Representing quantities and relationships	Determine the relationship between the dimensions of a plane figure and its area; -Find expenses or cost for a event; -Find profit on a given sale; -Find income for a given enterprise; -Determine the number of articles bought from the total cost; -Find change in prices; -Express the cost of renting a car in terms of the number of days and caution; -Write total amount spent in terms of unit cost	**1.1 THEORY OF QUADRATIC FUNCTIONS AND QUADRATIC EQUATIONS:** - Quadratic expressions - Quadratic equations - The quadratic formula	- State and identify the general form of: i) Quadratic functions: $f(x)=ax^2+bx+c,\ a\neq 0$ ii) quadratic expressions: $ax^2+bx+c,\ \ a\neq 0$ iii) quadratic equations: $ax^2+bx+c=0,\ \ a\neq 0$ -Solve quadratic equations (i) by factorization (ii) by completing the squares -Derive and use the quadratic formula $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ to solve quadratic equations - Use the discriminant $\Delta=b^2-4ac$ to determine the nature of roots of the equations - Solve quadratic equations given in other forms different from the general form.	-Accurate and rapid writing of very large and very small numbers ; -Good sense of numbers; -Confidence;	Calculators, graph papers, mathematical drawing sets Parabolic shapes like mini satellite dishes

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols	- Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties	Interpretation of algebraic model Determination of quantities from algebraic models Representing quantities and relationships Designing arcs on buildings	and number of articles; -Indicate the distance covered by a car in terms of speed and time; -Justify a result-Determine the relationship between the area of a rectangular garden and its sides; Designing curved objects such as parabolic mirrors and satellites dishes. Maximize volume of a box Maximum area	- Relationship between roots and coefficients of a quadratic equation - Symmetric properties of the roots of a quadratic equation - Graphs and properties of quadratic Functions - Maxima and Minima - Line of symmetry of the graph of $y = f(x)$ - Simple transformations - Applications of	- Deduce the relationship between coefficients and the sum of and product of roots ($\alpha+\beta$ and $\alpha\beta$) of a quadratic equation -Make use of symmetric properties of roots without solving the equation -Find new quadratic equations using information on symmetric properties of roots of a given quadratic equation -State and identify a quadratic function -Sketch graphs of quadratic functions and their reciprocals - Deduce maximum/minimum points/values of the functions. - Obtain the equation of the line (axis) of symmetry of the curve $y = f(x)$ -Determine the coordinates of the vertex of the curve $y = f(x)$ - Deduce from the graph of $y = f(x)$, the graphs of: $(\text{i}) y = f(x+a)$ $(\text{ii}) y = f(x)+a$ (iii) $y = af(x)$ etc where $a \in \mathbb{R}$ -Determine the range of values of expressions such as: $\frac{ax^2+b}{cx+d}$, $\frac{ax+b}{cx^2+d}$ etc where it exists - Determine, without solving, the number of points in which a straight	-Good sense measurement in constructions -Confidence; - Recognise and link relationships in structures	Calculators, graph papers, mathematical drawing sets Parabolic shapes like mini satellite dishes

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
				nature of roots - System of equations with 3 unknowns	line will intersect a quadratic curve - Solve a system of three simultaneous linear equations with 3 unknowns		
Describing patterns and relationships between quantities using symbols	Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties	Interpretation of algebraic model Determination of quantities from algebraic models Representing quantities and relationships	Decide on the best cell phone plan to use -Determine price of commodity and quantity of commodity -Find the job for you to make more money -Determine better deal when renting a car or a house; -Find average daily demand for a commodity -Mixing compounds to form products -Find maximum performance -Justify a result - Determine the optimum profit margin of a business venture	**1.2 INEQUALITIES AND INEQUATIONS** - Basic Rules on solving Inequalities - Linear Inequalities - Quadratic inequalities - Inequalities Involving rational functions - Inequalities involving the modulus or absolute value	- Apply basic rules of solving inequalities - Interpret interval notations in various forms: $a \le x \le b, [a, b]$ -Deduce and apply $a^2 + b^2 \ge 2ab$ -Solve inequalities of the form: $(\mathrm{i}) ax+b \le \lambda(cx+d)\ (\mathrm{ii}) ax^2+bx+c \ge 0$ $(\mathrm{iii})\ f(x) \le g(x) \le h(x)$ - Express inequalities in factor form to deduce solution i.e $(x+a)(x+b)(x+c) \le 0$ - Solve inequalities of the form: $(\mathrm{i}) \frac{ax+b}{x+c} > d\ (\mathrm{ii}) \frac{ax}{x+b} < \frac{c}{x+d}$ $(iii)\ p < \frac{ax-b}{(x-c)(x-d)} \le q$ - State and identify an absolute value function - Sketch graphs of absolute value functions	; -Good sense of numbers; -Confidence; - Meticulous	Calculators, graph papers, mathematical drawing sets Different tariff options for services (telephones, car rentals etc)

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
				functions - System of inequalities	 - Graph system of inequalities -Solve system of inequalities -Linear programming		
Describing patterns and relationships between quantities using symbols	-Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties -Travelling -Marketing -Construction	Interpretation of algebraic model Determination of quantities from algebraic models Representing quantities and relationships Interpretation of algebraic model	-Determine the relationship between the area of a rectangular garden and its sides; -Find expenses or cost for a event; -Find profit on a given sale; -Find income for a given enterprise; -Determine the number of articles bought from the total cost; -Find change in prices; -Express the cost of renting a car in terms of the number of days and caution; -Write total amount spent in terms of unit cost and number of articles; -Indicate the	**1.3 Graphs of absolute value functions and inequalities** **1.4 POLYNOMIALS** -Algebra of polynomials -The Remainder and factor theorems -Applications of the Remainder and Factor Theorems -Factorisation of polynomials	- Use graphs of absolute value functions to solve inequalities involving absolute value -Solve inequalities of the form: $(\mathrm{i})\lvert x+a\rvert \le bx+c\ (\mathrm{ii})\lvert x+a\rvert < \lambda\lvert x-b\rvert$ $(\mathrm{iv})\ x^2-p\lvert x\rvert+q<0$ $(\mathrm{v})\left\lvert\frac{x-a}{x-b}\right\rvert < c$ -Solve equations of the form $\left\lvert\frac{x-a}{x+b}\right\rvert = \frac{a-x}{x+b}$ - Represent solution sets on the real number line. -Identify polynomial expression and state its degree $P(x)=a_n x^n+a_{n-1}x^{n-1}+\ldots+a_0$ - Find sum and product of polynomials -Find the quotient of two polynomials using long division method -Deduce that for any polynomial $P(x)$, $P(x)=(x-a)Q(x)+R(x)$ -State and use the remainder and factor theorems Express a polynomial as a product of its linear factors -Determine some constants from the	- choose wisely -Good sense of numbers; -Confidence; -Good sense of numbers; -Confidence;	Calculators, graph papers, mathematical drawing sets Different tariff options for services (telephones, car rentals etc)

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols	-Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties -Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal	Determination of quantities from algebraic models Representing quantities and relationships Interpretation of algebraic model Determination of quantities from algebraic models Representing	distance covered by a car in terms of speed and time; -Justify a result -Determine the relationship between the area of a rectangular garden and its sides; -Find expenses or cost for an event; -Find profit on a given sale; -Find income for a given enterprise; -Determine the number of articles bought from the total cost; - Proving formulas and conjectures -Make conclusion on an argument	**1.5 Rational polynomial functions:** $\frac{f(x)}{g(x)}$ -Decomposition when degree of $f(x)$ is less than degree of $g(x)$ -Decomposition when degree of $f(x)$ is greater than or equal to $g(x)$ **1.6 MATHEMATICAL STATEMENTS, LOGIC AND PROOFS** **Logic** -Basic concepts in logic -a Statement and its negation -Propositions, Composite statements - Conjunction and	relationship: $(\mathrm{i})P(x)=g(x)Q(x)+R(x)$ $(\mathrm{ii})P(x)=(x-a)Q(x)+bx+c$ -Decompose proper fractions with (i) linear factors (ii) repeated factors (iii)quadratic factors in the denominator -Decompose improper fractions with degree of denominator not greater than 3 -Define a statement - Represent statements using symbols and draw truth tables -Distinguish between closed and open statements -State the relationship between a statement and its negation: $p,\ \sim p \text{ or } \bar{p}$	-Good sense of numbers; -Confidence; - Meticulous Sense of good judgment. Logical presentation	Documentation Tables and charts

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols	-Agriculture -Politics -Family ties -Social ties -Politics -Family ties -Social ties -Travelling -Marketing -Construction	quantities and relationships Disputes Verification of facts. Logical conclusions	-Justify a result - Proving formulas and conjectures -Make conclusion on an argument -Justify a result	disjunction -"If- then" statements: $p \Rightarrow q$ Biconditional statements: $p \Leftrightarrow q$ -The converse of a conditional statement -The inverse of a conditional statement **Mathematical Proofs** - Direct proofs -Proof by Counter example -Proof by Contradiction -Proof by Mathematical Induction	-Use connectives to form composite statements -Determine the truth value of a proposition -Construct truth tables for propositions -Express and interpret conditional statements -Identify the hypothesis and conclusion of a conditional statement -State the converse of a conditional statement -State the inverse of a conditional statement -Use direct proof to verify the truthfulness of a statement - use counter examples to disprove statements. -Use proof by contradiction to prove a theorem -Use Mathematical Induction to prove the validity of formulas and statements	of facts Critical thinking Sense of good judgment. Logical presentation of facts Critical thinking Make right choice from multiple choices Make correct decisions using incomplete information	Documentation Tables and charts
Organisation of information and estimation of quantities in the	-Census of a population by some characteristics such as sex, age group, profession,	Organisation, presentation and exploitation of information	-Record yearly rainfall -Record production of crude oil by some countries -Compile results (exams, elections	**1.7 BINOMIAL EXPANSION** Binomial theorem for expansion of $(a+bx)^n$, for positive integral indices n;	-Generate the Pascal's triangle for $n \leq 10$; and apply it for expansions for $n \in \mathbb{N}$ and $n \leq 10$; -Deduce and interpret the general term	-Sense of organization; -Precision	-Calculator -Graph board -Data from environment -Charts

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
consumption of goods and services Describing patterns and relationships between quantities using symbols	religion etc. -Demographic growth -Classification of football teams -Opinion polls on a new product or new policy -Evolution of the budget of a country due to economic growth	Interpretation of results Taking chances	etc) -Make a choice -Results of football matches -Display month's sales by a shop -Count the number of cells in a dilute solution Count the number of cells in a dilute solution -Compare production or events -Forecast weather or election result -Record number of accidents by motor cars -Choose a career Find the distribution on answers on true-false tests -Find possible sequences of boys and girls in the family	-Pascal's triangle for n ≤ 10; -Binomial coefficients, general term for n > 0, r> 0 and r$\leq n$; -Binomial theorem for $n \epsilon \mathbb{Q}$ - The binomial expansion of $(a+bx)^n$ for $n \in \mathbb{Q}$ The validity of the expansion $(a+bx)^n$ for $\left\|\frac{b}{a}x\right\|<1$ - Application to approximations	$\binom{n}{r}a^{n-r}(bx)^r$ or $\binom{n}{r-1}a^{n-r+1}(bx)^{r-1}$ of $(a+bx)^n$ -Use the general term of the expansion in determining the term in x^r or the constant term -Make use of $(a+bx)^n = a^n\left(1+\frac{b}{a}x\right)^n$ to simplify expansions -Use $\left\|\frac{b}{a}x\right\|<1$ and determine the range of values of x for which an expansion is valid -Calculate the first few terms as an approximation to $(a+bx)^n$ when n is rational and $\left\|\frac{b}{a}x\right\|<1$ -Apply expansion to find approximate values of expressions such as a^k, $\sqrt{a}$, $\frac{1}{\sqrt{a}}$ where a is a positive integer or rational etc	-Sense of good judgment -Critical thinking -Vigilant -Patient -Politeness	illustrating various presentation of data -News paper -Computer Statistics from National department of statistics -Data archive -Students -Formulae booklet

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols Describing patterns and relationships between quantities using symbols	-Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties	Representing quantities and relationships Interpretation of algebraic models Determination of quantities from algebraic models Representing quantities and relationships	Determine the relationship between the area of a rectangular garden and its sides; -Find expenses or cost for a event; -Find profit on a given sale; -Find income for a given enterprise; -Determine the number of articles bought from the total cost; -Find change in prices; -Express the cost of renting a car in terms of the number of days and caution; -Write total amount spent in terms of unit cost and number of articles;	**1.8 Relations and Functions** **Functions** -Domain, codomain and range (image set) of a function -Parity of a function -Investigation of simple odd and even functions -Composition of functions -Identity mapping -The inverse of a one-one function -Graphical and other representations of a function -Graphical illustration of the relationship between a function and its inverse	-Draw pappy graphs representing mappings -State the domain, codomain and range of a function - identify the different types of mappings - Recognize mappings that are functions. -Show that a function is odd, even or neither -Find the composite of functions -Solve equations involving composite functions -Find the inverse of a composite function -Find the inverse of an invertible function -Sketch graphs of functions in simple cases -Interpret piecewise defined functions and sketch their graphs -Use graphs to illustrate the relationships between simple algebraic functions and their inverses -Define and show mastery of the definition $f(x+ka)=f(x)$, $k \in \mathbb{Z}$ of a periodic function of period a, where	Interpret relationships Make good judgments	Documentation Tables and charts Patterns

Table 1: MODULE 1: ALGEBRA AND LOGIC: LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Describing patterns and relationships between quantities using symbols		Interpretation of algebraic model	-Indicate the distance covered by a car in terms of speed and time; -Justify a result	-Periodicity of a function -Continuous Functions - Discontinuity -Surjective, Injective and Bijective mappings	a is the smallest positive constant having this property -Deduce the period of some periodic functions from standard (natural) periodic functions such as $\sin x$, $\cos x$, $\tan x$ -Sketch graphs of periodic functions -Sketch curves of functions within extended range and calculate the area under the curve -State the condition for a function to be continuous in an interval -Use definition of continuous function to find values of some constants -State the point of discontinuity on the graph of a function -State the properties to show that a function is injective, surjective or bijective -Prove that a function is injective, surjective, bijective	Interpret relationships Make good judgments	Documentation Tables and charts Patterns

MODULE 2: NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIPS IN THE SETS OF NUMBERS AND BETWEEN ELEMENTS OF A SET.

CREDIT: **65hrs /** *9* periods of 50minutes each per week

PRESENTATION OF MODULE

This module is aimed at making the learner competent within the families of situations '**Representation, determination of quantities and identification of objects by numbers'**. It has the following as categories of action: Determination of a number, reading and writing information using numbers, verbal interaction on information containing numbers and estimation and treatment of quantities.

This module will permit the learner to apply all what was acquired in first cycle under numbers and sets of numbers and extend it to evaluate measures involving large numbers arising in branches of science, recognize and represent these large numbers using indices.

This module is introduced by indices and logarithms, then sets of numbers ($\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, $\mathbb{R}$ and $\mathbb{C}$), set theory and ends with arrangement of information into rectangular arrays called matrices. In this module learners get to discover very exciting number patterns and properties.

CONTRIBUTION OF MODULE TO OUTCOME AND CURRICULUM GOALS

This module contributes to a good mental structure that will permit the learner to react competently in different life situations as well as be able to communicate concisely and precisely using numbers. Learners will be able to recognize, describe and represent numbers and their relationships and to count, estimate, calculate and check with competence and confidence in solving problems. Translate set language into ordinary English and vice versa, describe and extend pattern to solving problems.

CONTRIBUTION OF MODULE TO LEARNING AREA

The mastery of this module equips the learner with basic knowledge and skills (know -how) on which further learning in Mathematics and the pure sciences will be based. It will also equip learners with basic know-how needed in other school subjects such as the human sciences, commercial education etc. Indices, logarithms and their graphs for example, are used in other subjects such as calculation of growth rate of seedlings or bacteria in biology, population growth in geography, pH of a solution in chemistry, rate of decay with radioactive substances in Physics etc. Matrices are used in treating networks and eventually for the solution of simultaneous equations.

CONTRIBUTION OF MODULE TO AREAS OF LIVING

This module provides the opportunities for the learners to represent very large numbers in index form thus gaining time and space and also for easy understanding or appreciation of its value. Graphs of logarithmic and/or exponential functions are used for economic applications such as simple and compound interest, annuities etc. Record inventory or data in matrix form will help for easy calculation of stock. The learner with a good sense of number and operations with numbers has the mathematical confidence to make sense and meaning in various contexts. These knowledge and skills will contribute in the management of family finances; implication in different monetary transactions, etc justifies its importance in consumption and production of goods and services, social, economic and environmental issues,

MODULE 2

NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET.

CREDIT: 65hrs/ 9 periods of 50 minutes each per week

TABLE 2: MODULE 2: NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET. LOWERSIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation, determination of quantities and identification of objects by numbers	-Find the number of bacteria in a certain bacteria culture; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment; -Daily movements -Use of public and private services;	Numerical methods The language of sets Verbal interaction on information containing numbers Representation and treatment of	-Find the pH of substances; -Record population growth; -Find the interest on an amount invested; -Evaluate the number of points obtained in a football league Calculate concentration of Hydrogen ions in a tomato juice of given pH by a Chemistry teacher or nutritionist	**2.1 INDICES, SURD AND LOGARITHMS** **Indices** - Index Notation - Laws of Indices -Applications of laws of Indices - Exponential equations -The graph of $(\mathrm{i})\ y = e^x$ $(ii)\ y = a^x, where\ a \epsilon \mathbb{R}$ **Surds** -Rational and irrational numbers -Simplification of surds - Rationalisation of denominators **Logarithms** - Common logarithms	- Establish and apply the laws of indices: $a^m \times a^n = a^{m+n}$, $a^m \div a^n = a^{m-n}$, $(a^m)^n = a^{m \times n}$, $a^0 = 1\ (a \neq 0)$, $a^{-m} = \frac{1}{a^m}$, $a^{\frac{1}{n}} = \sqrt[n]{a}$ - Solve simple exponential equations in one or two unknowns. -Sketch/identify graphs of exponential functions -Define and identify rational and irrational numbers -Simplify expressions with surds -Rationalise denominators expressed in surd form - Relate the powers of 10 to common logarithm	-Accurate and rapid writing of very large and very small numbers using indices ; -Good sense of numbers; -Using laws with Confidence; Mathematical precision and generalisation.	Calculator Graph paper Mathematical set of instruments

TABLE 2: MODULE 2: NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET. LOWERSIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation, determination of quantities and identification of objects by numbers	-Communicate using numbers; -Read bills (Water, electricity, communication bundles); -Calculate bills.	information and quantities	-Find the intensity of earthquake by geologist -Calculate the annual sales of a product after a given number of years -Determine the future value of an object	- Laws of Logarithms - Logarithmic equations **Natural Logarithms** Graphs of (i) $y = a^x$, $y = \log_a x$, where *a* is any base (ii) $y = \ln x$, $y = e^x$ - Logarithmic equations - Applications of laws of logarithms	-Derive logarithmic relations from index form and vice versa -State the laws of logarithm -Apply logarithmic laws to simplify logarithmic expressions and solve logarithmic equations in one or two unknowns. -Apply laws of logarithm for further computations -Sketch graphs/identify graphs of logarithmic functions	-Good sense of numbers; -Using laws with Confidence;	Documentation, calculator
Representation, determination of quantities and identification of objects by numbers	-Find the number of bacteria in a certain bacteria culture; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment; -Daily movements -Use of public and private services; -Communicate using numbers; -Read bills (Water, electricity,	Numerical methods The language of set Verbal interaction on information containing numbers	-Find number of bags of farm products; -Record and store results -Give test results in some subjects over a period of time;	**2.2 SEQUENCES AND SERIES** - Sequences - Series -Arithmetic Progression (AP) -The n^{th} term of an Arithmetic Progression -Arithmetic Mean (AM) -Sum of an A.P.	-Define a sequence -Identify the pattern for a given set of numbers and deduce the general rule -Determine a term in a sequence -Define a series - Distinguish between a sequence and a series. -Determine whether a sequence/series is an AP or not. Derive and use formula for the nth term of an arithmetic progression : $U_n = a + (n-1)d$ -Define and apply the arithmetic mean - Derive the formula for the partial sum of an arithmetic	-Good sense of use of numbers/summation symbol; -Using laws with Confidence; Mathematical precision and generalisation.	Calculator Documentation Beads/corks etc

TABLE 2: MODULE 2: NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET. LOWERSIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation, determination of quantities and identification of objects by numbers	communication bundles); -Calculate bills. -Find the number of bacteria in a certain bacteria culture; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment; -Daily movements -Use of public and private services; -Communicate using numbers;	Representation and treatment of information and quantities The language of set Verbal interaction on information containing numbers	Represent information and interpretation Mathematical Modelling Calculate compound interest on an investment for a given period -Find value of an investment or a car or a house at the end of a given period -Vertical distance travel by a tennis balldropped from a given height and with a give rate of bouncing	- Limit of a sequence - Geometric Progression(G.P) - The n^{th} term of a G.P - The geometric mean (G.M) - Sum of a G.P. - Geometric Series.	progression : $S_n = \frac{n}{2}[2a+(n-1)d]$ $S_n = \frac{n}{2}(a+l)$ where the last term $l = a + (n-1)d,$ - Use the above formulae for $n \in \mathbb{N}$ and $n \in \mathbb{N}^*$ - Calculate sum of finite number of terms - Determine U_n from $U_n = S_n - S_{n-1}$ - Calculate sum of limited number of terms - Identify bounded and monotone sequences - Recognise and define geometric sequence and geometric series - Derive and use formulas for the nth term of a geometric progression : $u_n = ar^{n-1}$ $U_{n+1} = rU_n$ or $r = \frac{U_{n+1}}{U_n}$ Define and apply the geometric mean GM - Calculate sum of finite number of terms - Derive and use formulas for the partial sum of a geometric progression: $S_n = \frac{a(1-r^n)}{1-r}$, $\lvert r \rvert < 1$	Good in banking transactions, local savings schemes, packing of items Mathematical precision and generalisation.	Calculator Documentation Beads/corks etc

TABLE 2: MODULE 2: NUMBERS, FUNDAMENTAL OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET. LOWERSIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation, determination of quantities and identification of objects by numbers	-Find the number of bacteria in a certain bacteria culture; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment; -Daily movements -Use of public and private services; -Communicate using numbers;	The language of set Verbal interaction on information containing numbers	-Determine which payment plan is advantageous. -Calculate total amount to be paid in refunding loan and interest over a given period -Find number of bacteria that would exist after a given duration when rate of growth of bacteria is given	-Convergence of geometric sequence -Limit of a sequence -Sequences diverging to $\pm\infty$ -Convergence of geometric series Summation of simple finite series The sigma notation $\sum_{r=a}^{b} u_r, a, b \in \mathbb{N}$ -Summation of some Standard Series -Use of partial fractions in summation of series	$S_n = \frac{a(r^n - 1)}{r - 1}, \ \lvert r \rvert > 1$ - Use the above formulas for $n \in \mathbb{N}$ and $n \in \mathbb{N}^*$ - Determine U_n from $U_n = S_n - S_{n-1}$ - Calculate sum of limited number of terms - Calculate the sum to infinity of a geometric sequence - Interpret the inequality $\lvert r \rvert < 1$ - Derive and use formula for the sum to infinity of a converging geometric series : $S_\infty = \frac{a}{1 - r}$ - determine the monotonicity of a series - Apply arithmetic and geometric series to real life situations - Use the demonstration of $\sum_{r=1}^{n} u_r = u_1 + u_2 + \ldots + u_n$ to interpret $\sum_{0}^{n} r, \ \sum_{1}^{n} r^2, \ \sum_{1}^{n} r(r+1)$, etc - Manipulate with standard series in simple cases - carry out summation using method of difference in simple cases	Mathematical precision and generalisation. Good in banking transactions, local savings schemes, packing of items	Calculator Documentation Beads/corks etc

Representation, determination of quantities and identification of objects by numbers	-Find the number of committees that can be formed; -Calculate the values -Use of public and private services; -Communicate using numbers; -arrange/select under given conditions for a purpose	The language of set Verbal interaction on information containing numbers Representation and treatment of information and quantities	-Find number of bags of farm products; -Record and store results -Predictions Represent information and interpretation Mathematical Modelling	**2.3 SETS AND THEIR REPRESENTATION** -Equality of sets -Comparability of sets -Cardinality of a set -Power set -Universal set -Set operations -De Morgan's law -Sets of numbers commonly used in Mathematics	-Define/state: proper subsets, power set, De Morgan's law -Define and list members of a power set of a given set. (State the number of elements in the power set of a given set: 2^n) -Carry out operations on sets such as: intersections, union -Make appropriate use of Venn Diagrams -Differentiate between, identify the properties of, and establish the relationship between the members of the following sets: $\mathbb{N}, \mathbb{Z}., \mathbb{Q}, \mathbb{R}, \mathbb{C}$ -Properties of prime numbers, even numbers and odd numbers	-Accurate and rapid selection of items -Good sense of use of numbers/summation symbol; -Using laws with Confidence; Mathematical precision and generalisation.	Beads/ corks etc Calculator
Representation, determination of quantities and identification of objects by numbers	-List the elements/items under a given relation -Communicate in Ordinary English/Mathematically; -Calculate the values -Use of public and private services;	Numerical methods The language of set Verbal interaction on information containing numbers	Countries and their geographical location Pairing up according to age and class -Matching names of people and phone numbers -Comparing heights and masses of some individuals	**2.4 BINARY RELATIONS** -The notation of binary Relations -Ordered Pairs -Cartesian product of two sets **-**Properties of relations -Equivalence Relations -Equivalence classes **-**Venn Diagram Illustration - Partitions	-Define binary relation in terms of ordered pairs -Analyse the reflexive, symmetric , anti-symmetric and transitive property of a relation -Verify that a given relation is reflexive, symmetric , anti-symmetric or transitive -Define equivalence relation listing its properties -Prove that a relation R is an equivalence relation -Define and construct	-Accurate and rapid calculations ; -Good sense of relating elements of a set/ under given conditions; Mathematical Confidence;	Objects with given characteristics

	-Communicate using numbers; -arrange/select under given conditions for a purpose	Representation and treatment of information and quantities	-Record and store results Represent information and interpretation Mathematical Modelling	-Fundamental theorem on equivalence Relation -Ordered Relations -Partial order -Total Order -Strict Order - Inclusion Diagram	equivalence classes of the set A relative to a relation R -Apply the fundamental theorem on equivalence relations -Define a partial order, total order and strict order listing their respective properties -Construct inclusion diagram for a given relation		
Organisation of information and estimation of quantities in the consumption of goods and services	-Census of a population by some characteristics such as sex, age group, profession, religion etc. -Demographic growth -Classification of football teams -Opinion polls on a new product or new policy -Evolution of the budget of a country due to economic growth -Census of a population by some characteristics such as sex, age group, profession, religion etc.	Organisation, presentation and exploitation of information Interpretation of results Taking chances Organisation	-Record yearly rainfall -Record production of crude oil by some countries -Compile results (exams, elections etc) -Make a choice -Results of football matches -Display month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor cars -Choose a career - Find the number of possible line ups from a squad of players -Find the number of ways	**2.5 PERMUTATIONS AND COMBINATIONS** - Fundamental Counting Principles -Factorial Notation **Permutations** -Successive operations in a row and in circular arrangements (independent situations) -Mutually exclusive situations -Ordered arrangements -Permutations of objects selected from a group ${}^{n}P_{r} = \frac{n!}{(n-r)!}$ $n \geq r,\ r \geq 0,\ n, r \in \mathbb{N}$	- State and demonstrate the Fundamental counting principle -Define $n!$, and determine its numerical value where $n \in \mathbb{N}$. - Establish that the conjunction "and" implies multiplication of possibilities - Establish that the conjunction "or" implies addition of possibilities - Find the number of arrangements of n different objects taken r at a time. -Define permutations as ordered arrangements -Apply intuitive approach to establish results in each situation. -Deduce eventually standard results -Make use of standard results -Calculate number of arrangements for like and unlike objects in a row and in a circle -Distinguish between	-Sense of organization; -Precision -Sense of good judgment -Critical thinking -Vigilant -Patient -Politeness -Sense of organization;	-Calculator -Graph board -Data from environment -Charts illustrating various presentation of data -News paper -Computer

Organisation of information and estimation of quantities in the consumption of goods and services	-Demographic growth -Classification of football teams -Opinion polls on a new product or new policy -Evolution of the budget of a country due to economic growth	, presentation and exploitation of information Interpretation of results Taking chances	medals be awarded to winners of a sporting activity. -Determine the number of possible roads to take to get to a destination	-Arrangement of like and unlike objects $\frac{n!}{p!q!r!}$ - Circular arrangements: $\frac{(n-1)!}{2}$ Consider arrangement in a circle and in a ring (like on beads) -Simple problems involving arrangements **Combinations** -Selection of objects from a group: ${}^nC_r$ or $\binom{n}{r} = \frac{n!}{r!(n-r)!}$ $n \geq r,\ r \geq 0,\ n, r \in \mathbb{N}$ -Simple problems involving selections Partition theory in permutations and combinations.	arrangement in a ring (like on beads) and in a circle -Use the formula for ${}^nP_r$ to solve simple problems involving arrangements -Apply permutations in real life situations -Defined combination as selection -Use intuitive approach to establish results in simple cases -Deduce eventually standard results. -Distinguish between permutation and combination -Establish relationship between ${}^nP_r$ and ${}^nC_r$ -Determine how many selections of r different objects taken from n objects. -Use the formula for ${}^nC_r$ to solve simple problems of selections - Demonstrate appropriate interpretation of terminology like "at least, at most" in combinations. -Apply combinations to real life situations -The partition of the N elements of a set into A groups consisting of $n_1, n_2, n_3, \ldots, n \in \mathbb{N}$, is $\frac{N!}{n_1!n_2!\ldots n_n!}$	-Precision -Sense of good judgment -Critical thinking -Vigilant -Patient -Politeness	Statistics from National department of statistics -Data archive -Students -Formulae booklet -Calculator -Graph board -

MODULE 3: PLANE GEOMETRY.

CREDIT: **78hrs** / 9 periods of 50minutes each per week

GENERAL PRESENTATION

All what was done from points, lines, plane figures, angles, metric system form basic knowledge and skills necessary to continue this module on geometry. This module is within the families of situations: **Representations and transformation of plane shapes within the environment.** Three categories of actions are involved namely: Perception of the physical environment, production of plane shapes and transformation of the physical environment and determination of measures.

CONTRIBUTION OF MODULE TO OUTCOME AND CURRICULUM GOALS

This module will help learners to understand the conditions for congruency in plane figures and similarity in plane figures. It will continue to improve upon learners' understanding and appreciation of pattern, precision and beauty in natural and cultural forms. Learners will also develop the ability to visualize, measure, represent, describe and compare plane figures in the environment, use vector methods to solve problems and associate vectors to people and things in motion, use sine, cosine or tangent in right-angled triangles to determine distances. In addition, learners will develop the sense of order, rigour in working, ability to represent, accuracy and sense of precision and initiation to scientific method in handling life situations. The ability to construct will help learners to be able to represent and interpret the physical environment and also be able to investigate and model situations in the environment. As a result, they will be able to make sensible estimates, verify results, measure accurately, locate positions in real life as well as be alert to the reasonableness of measurements and calculation results.

Critical thinking, creativity and sense of initiative that learners will also develop are attitudes that will contribute to make a citizen autonomous and responsible in carrying out his social roles.

CONTRIBUTION OF MODULE TO LEARNING AREA

Plane geometry is one of the main parts of the Mathematics syllabus in line with the expected learning outcome. Measuring in general relates directly to the scientific, technological and economic world of the learner. Accurate measuring and calculations involving lengths, angles and areas, representations and descriptions are an integral part of chemistry, Biology, Physics and other parts of Mathematics. Situations of congruency and similarity are seen in Biology, Chemistry and also in the cultural environment of the learners. The learning of plane geometry provides the basic knowledge and skills needed to study 3-dimensional geometry. The third category of actions shows interaction between numerical activities and geometrical activities.

CONTRIBUTION OF MODULE TO AREAS OF LIVING

The study of the module enables the learners to:

- Develop the ability to visualize, reason and justify,
- Interpret, understand, classify, appreciate and describe the world through 3-dimensional shapes, their locations, movement and relationships.

By these, they should be able for example to use national flags to demonstrate transformations and symmetry in designs; investigate and recognize the geometrical properties and patterns existing in traditional and modern architecture; use maps in geography as specific forms of grid and also investigate geometric patterns in art.

The areas of living for which knowledge and skills from this module are directly applied are: Family and social life, Economic life, Environment, welfare and health, citizenship, media and communication. Each learner uses or comes across objects from which geometrical shapes can be identified. The outline of figures which are the lines, angles, planes and their intersections are what constitute the physical environment for they are the bases for which real life subjects are constructed.
The study of size, distances, and position of objects in the environment is important since it will provide a language for describing and representing the physical environment and methods for analyzing and drawing conclusions about real life phenomena.
Symmetry contributes in the study of the rules and principles of art and the appreciation of the beauty and taste.

MODULE 3: PLANE GEOMETRY

CREDIT: 78hrs/9 periods of 50 minutes each per week

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes Determination of measures	-Constructing houses of same size and type; Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a	**3.1 CIRCULAR FUNCTIONS** -The six Trigonometric. Ratios -Trigonometric. Ratios for special angles -Trigonometric ratios of complementary angles -The Radian and degree as units for measuring angles **Mensuration of the Circle** -Length of arcs $= r\theta$ -Area of sector $= \frac{1}{2}r^2\theta$ -Area of segment $= \frac{1}{2}r^2(\theta - \sin\theta)$, where $\theta \; is \; in \; radians$ -Sine and cosine formulae	- Define the trigonometric ratios: sine, cosine, tangent, cosecant, secant and cotangent. - Deduce the exact values of the trigonometric ratios for: $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{5\pi}{6}, \ldots \pi, 2\pi$ (special angles) - Deduce other trigonometric ratios given one - Convert from radian to degree and vice versa: $radians = 180^0$. -Solve equations involving the six trigonometric ratios - Calculate circumference, area of circle, length of arc, area of sector and area of segment.	-Accurate and rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Calculator Mathematical set of Instruments Documentation

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
	-Building -Surveying		radio aerial; -Find distance/area of model shapes	-The General Angle	- Derive and use formulae to calculate lengths of sides and angles of a triangle - Determine trigonometric ratios of general angle - Determine trigonometric ratios of negative angles: $\sin(-\theta) = -\sin\theta$ $\cos(-\theta) = \cos\theta$, $\tan(-\theta) = -\tan\theta$		
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes -Determination of measures	-Constructing houses of same size and type; -Locating points on the earth by cartographers Cut out into similar shapes; -Carpeting and putting a ceiling; - -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a	**Trigonometric Functions** - Angles and their measures -Graphs of Trigonometric Functions -Simple Transformations of graphs of Trigonometric function -Amplitude -Period -Phase shift -Pythagorean Identities -Compound angles formulae	-Draw graphs of simple trigonometric functions -Determine effect of simple transformation on graphs of simple trigonometric functions -Make use of the period of a trigonometric function -Obtain Maximum/minimum values of trigonometric functions and their rational forms. -Derive and use the Pythagorean identities $(\mathrm{i})\cos^2\theta + \sin^2\theta = 1$ $(\mathrm{ii})\sec^2\theta = 1 + \tan^2\theta$ $(\mathrm{iii})\operatorname{cosec}^2\theta = 1 + \cot^2\theta$ -Apply the identities in proving other identities and solving trigonometric equations -State and apply Compound angle formulae -Use compound angle formulae to deduce: i)double angle and half angle	-Accurate and rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Calculator Mathematical set of Instruments

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
	-Building -Surveying		house; -Find height of a building or of a flag pole or of a radio aerial;	-Double angle and half angle Identities -Multiple Angles -Factor formulae (addition formulae)	identities ii) multiple angles formulae iii) addition and product formulae		
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial;	-The expression $a\cos\theta+b\sin\theta$ **Solving trigonometric Equations** -Solution of trigonometric equations -Small Angles Inverse Trigonometric Functions	-Express $p\cos\theta\pm q\sin\theta$ in the form: $(\mathrm{i})\, r\cos(\theta\pm\alpha)$ $(\mathrm{ii})\, r\sin(\theta\pm\alpha)$ for $r>0$ and α an acute angle -Use the above two forms to determine minimum and maximum values of trigonometric functions and general solutions of trigonometric equations -Determine general solution of trigonometric equations which may require application of any of the identities or formulae mentioned so far -Determine particular solutions within given intervals of trigonometric equations which may require application of any of the identities or formulae mentioned so far -Make use of the approximations: $\sin x\approx x$, $\tan x\approx x$, $\cos x\approx 1-\frac{1}{2}x^2$ -Apply the limiting values of $\sin x,\ \cos x,\ \tan x$ for small angles	Accurate and rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Graph paper Mathematical set Documentation

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Surveying	Scale drawing Production of plane shapes Determination of measures	-Find distance/area of model shapes	- Graphs of inverse trigonometric functions -Application to real life situations	x in radians to solve problems Differentiate between $\sin^{-1} x$ and $(\sin x)^{-1}$ -define and use $\arcsin x,\ \arccos x, \arctan x$ defined over suitable domain - Deduce the graphs of inverse trigonometric functions from the graphs of the corresponding trigonometric functions. - Calculate bearings in 3 dimensions - Solving problems involving angles of elevation and depression	Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Graph paper Mathematical set Documentation
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage;	**3.2 COORDINATE GEOMETRY** -Point and line Geometry Internal and external division of a line segment -The Equations of a Straight Line: -Pair of lines	-Determine: (i) the distance between two points (ii) the coordinates of the midpoint of a line segment joining two given points (iii) the coordinates of a point which divides a line segment internally/externally in a given ratio (iv) the gradient of a straight line passing through two given points v) if 3 or more given points are collinear - Express and interpret the equation of the straight line in the following forms: i) Gradient-Intercept form, ii) Double Intercept form, iii) General form. -Identify parallel and perpendicular	-Accurate and rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation -Accurate and	Calculator Mathematical set of Instruments

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Organisation of information and estimation of quantities in the consumption of goods and services	-Designing a sport complex -Mapping a town -Building -Surveying	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes Determination of measures	-Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes Mathematical models of objects -Positioning elements on a page by computer programmer -Producing the exact image of a selected picture by a scanner -Planning a town -Building a market	-Perpendicular distance of a point from a line -Reduction to Linear form -Loci using Cartesian or parametric forms.	lines -Apply the conditions for parallel and perpendicular lines -Find the coordinates of the point of intersection of two lines -Find the angle between two intersecting straight lines -Calculate distance from a given point to a line -Make use of the formula for the distance from a point to a line in other situations - Reduce equations of experimental data to linear forms which may (or may not) involve logarithm -Reduce equations of the relationships of the form: $y = ax^2 + b,\ y = ax^n,\ y = ab^x,$ $\frac{1}{x} + \frac{1}{y} = \frac{1}{a}$ etc into linear forms -Draw straight line graphs for the linear forms and use the graphs to find values of the constants a, b, n -Define the locus of a point -Derive equations of loci in a plane in various forms	rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Graph paper Mathematical set Documentation

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	**3.3 MATRICES** -Definition of a matrix -Algebra of matrices -Transpose of a matrix -Determinant of a square matrix -Properties of determinant -Singular matrices -Multiplicative Inverse of a 3×3 matrix -Applications of matrix	-Define basic notions in Matrices: element, row, column, order, square matrix (leading diagonal), row matrix, -Add matrices of the same order -Pre- and/or post-multiply matrices -Multiply a matrix by a scalar -Carry out elementary row and column operations -State the transpose of a matrix -Use the property $(AB)^T = B^T A^T$ Evaluate determinant of square matrices of order 2×2 and 3× 3 -Factorise determinants -Apply the following properties of determinant: $(i)\|A^T\| = \|A\|^T$, $(ii)\|AB\| = \|A\|\|B\|$ $(iii)\|\lambda A\| = \lambda^n \|A\|$, n being the order of the matrix A. etc -Find the adjugate M^* of a matrix M -Find the inverse of a square matrix of order 3: $M^{-1} = \frac{1}{\|M\|} M^*$ -Use the condition $A^{-1}B^{-1} = (BA)^{-1}$ -Solve equations in three unknowns and interpret results	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Calculators Documentation Graph board/graph paper

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	products to a system of equations -Applications of matrix products to transformations in space/in a plane -Applications of inverse matrix -Applications of matrices in calculating areas and volumes	-State conditions for existence of a unique solution, no solution and infinite number of solutions -Transform one point to another -Transform one line to another -Find the image of a point or line under a given transformation -Determine points or lines which are invariant under given transformations -Find a point or line whose image under a given transformation is given -Calculate area and volume scale factors for transformations in 2 and 3 dimensions - Carry out operations with enlargement	-Accurate and rapid calculations ; -Good sense of choice of method/suitability to obtain result; -correct extrapolation/ manipulation	Documentation Graph board/graph paper
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling - Demarcation of land boundaries	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for	**3.4 VECTORS** **-** Geometric vectors and basic properties -Algebraic operations of the addition of two vectors and the multiplication of a vector by a scalar, and their geometric significance -The orthogonal unit vectors **i, j, k** and the Cartesian components of a vector.	-Differentiate between a vector quantity and a scalar -Add two or more vectors -Multiply a vector by a scalar -Identify parallel vectors -State the direction ratios and calculate direction cosines of vectors -Determine a unit vector in a specified direction in terms of the orthogonal unit vectors **i, j, k** -Calculate the magnitude and direction of a given vector -Use the notion of equality of two vectors	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Documentation Calculators

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes The velocity of plane relative to the velocity of the wind.	Orthogonal and parallel vectors -Position vector and displacement vector - Scalar product of two vectors, its geometrical significance and algebraic properties - Application of scalar product -The equation of a line (i) through a point and parallel to a given vector (ii) through two given points -Pair of lines -Parallel and perpendicular lines -Intersecting Lines	-Distinguish between position vector $\overrightarrow{OB}$ and displacement vector $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OB}$ -Calculate scalar (dot) product of two vectors -Interpret the meaning of resolved parts of one vector on another -Determine the angle between two vectors -State and use the condition for two vectors to be (i)perpendicular (ii) parallel -State and/ or determine the direction vector of a line -Derive the equation of a line in any of the following forms: Vector: $\mathbf{r} = \mathbf{m} + \lambda\mathbf{a}$ Parametric: $x = x_1 + \lambda a$, $y = y_1 + \lambda b$, $z = z_1 + \lambda c$. Cartesian: $\frac{x - x_1}{a} = \frac{y - y_1}{b} = \frac{z - z_1}{c}$ - Convert from one form of equation to another -State and use the condition for two lines to be (i)perpendicular (ii) parallel -Calculate the coordinates of the point of intersection of two lines -State the coordinates of the point of intersection of a line with the	Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts	Graph board/graph paper

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	-Skew Lines -Perpendicular distance from a point to a given Line -Vector product of two vectors -Triple product	xy, yz, xz planes -Calculate the angle between two lines as the angle between their direction vectors (include the case of skew lines) - Define skew lines and determine if two given lines are skew or not. - Calculate the perpendicular distance of a given point from a line. - Calculate vector product of two vectors and state its geometrical significance: $\mathbf{a}\times\mathbf{b} = \lvert\mathbf{a}\rvert\lvert\mathbf{b}\rvert\sin\theta\mathbf{n}$ -Bring out the relationship between vector product and its factor(s) (vector(s)) -Calculate the sine of angle between two vectors using vector product method -Calculate the scalar triple and vector triple product	Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts	Graph board/graph paper
	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood	**CALCULUS I** **3.5 LIMITS AND DIFFERENTIATION** ***Limits of functions*** - Intuitive definition of limits - General definition of a limit using $\mathcal{E}$ and δ -Uniqueness of limit	- State the intuitive definition of limits. - state the general definition of limits using $\mathcal{E}$ and δ. (Restricted to polynomials to degree 2) -Evaluate the limit of a function, sums, product and quotient as	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in	Calculators

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	Determination of measures -Recognition of plane shapes and transformation within the environment -Scale drawing	using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	-Limit of sum, product and quotient $e=\lim_{h\to 0}\left(\frac{e^{h+1}-1}{h}\right)$ **Derivatives** -The derivative defined as a limit -Differentiation from first principles -The gradient of a tangent as the limit of the gradient of a chord - The differentiability of a function -Differentiation of standard functions	$x\to a,\ x\to\infty$ etc $a\in\mathbb{R}$ - Evaluate left and right hand limit -Make use of: $(\text{i})\lim_{x\to\infty}\left(1+\frac{x}{n}\right)^n=e^x$ $(\text{ii})\lim_{n\to\infty}\left(\frac{x^n}{n!}\right)=0$ $(\text{iii})\lim_{n\to\infty}\left(n^\alpha x^n\right)=0$ for all α, $\lvert x\rvert<1$ (iv) As $x\to\infty, xe^{-\alpha x}\to 0$ and $x^\alpha e^{-x}\to 0$ for all $\alpha>0$ to evaluate limits of similar functions -Find derivatives of functions from first principles: $\lim_{\delta x\to 0}\frac{f(x+\delta x)-f(x)}{\delta x}=\frac{dy}{dx}=f'(x)$ For simple algebraic expressions (2nd degree), trigonometric functions (sine and cosine functions) -Determine an interval within which a function is differentiable - Show that a function is differentiable or not at a given point or interval -Differentiate expressions involving standard functions:	manipulating mathematical concepts; Perception of suitable concepts Accuracy and rapid calculation; -Good sense of geometry and applications;	Graph board/graph paper

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house;	(Polynomial, Trigonometric logarithmic, exponential functions) -Differentiation of composite functions -Differentiation of sums, products and quotients -Second derivative -Differentiation of inverse functions (restricted to inverse trigonometric functions)	$f(x)=x^n$, , $f(x)=(ax+b)^n$, $f(x)=\sin[g(x)]$, $f(x)=\cos[g(x)]$, $f(x)=\tan[g(x)]$, $f(x)=\ln[g(x)]$, $f(x)=e^{g(x)}$ $f(x)=a^x$, $f(x)=\log_a x$ -Use chain rule to differentiate composite functions (function of a function) - using the sum, product and quotient rules -Use any of the rules of differentiation to find second derivative - $\frac{d^2y}{dx^2}$ *or* $f''(x)$ *or* y'' where $y=f(x)$ -Differentiate inverse trigonometric functions such as $f(x)=\arcsin x$, $f(x)=\arccos x$, $f(x)=\arctan x$ -Find the derivatives and the second derivatives of functions	Accuracy and rapid calculation; -Good sense of geometry and applications;	Calculators Graph board/graph paper

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment				- Differentiation of functions expressed parametrically (two dimensions only) -Differentiation of functions expressed implicitly (two dimensions only)	expressed parametrically -Differentiate polynomial, trigonometric and exponential functions expressed implicitly		
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling - Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area	**3.6 Applications of differentiation** - rates of change, -Small Change - percentage change - tangents, normal, - local maxima and minima and points of inflexion. Monotonicity of a function (Decreasing and increasing functions)	-State and use De L'hôpital rule to evaluate limits. - Find rate of change of one variable with respect to another or time -Find the change in one quantity as a result of change in a related quantity. -Percentage change in one quantity as a result of change in a related quantity. -Calculate gradient and determine equations of tangents and normal to a curve at a point. -Determine the coordinates of stationary points (maximum and minimum values, points of inflexion) -Carry out increasing and decreasing tests (first derivative test, second derivative test) -Distinguish between maximum	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Calculators Graph board/graph paper

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Mapping a town -Building -Surveying		of model shapes	- Rolle's Theorem -Mean value Theorem -Curve sketching: stationary points, points of inflexion, intercepts with coordinate axes, asymptotes(vertical and horizontal only), chart of signs (Table of variation), investigation of the equation $y' = ky$	and minimum points and points of inflexion -State and use Rolle's and Mean-value theorems -Determine the interval(s) within which a function is increasing or decreasing -Evaluate limits at the bounds of the domain of definition of a function -Construct the chart of signs (table of variation) -Determine equations of asymptotes to a curve -Sketch curves of polynomial, simple rational and simple exponential functions	Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts;	Calculators Graph board/graph paper
Representation and transformation of plane shapes within the environment Representation and transformation of plane	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a	**INTEGRATION** Integration as the reverse of differentiation -Indefinite and definite integrals	-Integrate standard functions -Integrate sums -Deduce integrals of standard functions from corresponding derivatives to include the integrals of x^n, $\frac{1}{x}$, e^x, $\cos x$, $\sin x$, $\frac{1}{\sqrt{1-x^2}}$, $(ax+b)^n$ -Find the primitive (integral) of a function -Add an arbitrary constant to an indefinite integral -Evaluate definite integrals	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts;	Calculators

TABLE 3: Module 3: PLANE GEOMETRY LOWER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
shapes within the environment	an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	Recognition of plane shapes and transformation within the environment	theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial;	-Techniques of Integration (Decomposition into partial fractions, linear and nonlinear substitution) - Integration by parts	- Decompose into partial fractions as a process to integrate some rational functions -Use given substitutions to carry out integration of radicals, fractions, composite functions (function of function) etc -Apply appropriate substitutions in very simple cases - Identify special cases that require integration by parts. -Use integration by parts to integrate a product (including cases that require repeated integration by parts)	Perception of suitable concepts	Graph board/graph paper

PURE MATHEMATICS WITH MECHANICS TEACHING SYLLABUS FOR UPPER SIXTH FORM

MODULE 4: PLANE GEOMETRY AND SOLID FIGURES

CREDIT: 83hrs/ 9 periods of 50 minutes each per week

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes -Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house;	**4.1.Circle Geometry** Equations of the circle: -Given centre and radius -Given coordinates of the ends of a diameter - Passing through three given points. -Intersection of a straight line with a circle -Equation of a tangent to a circle -Length of a tangent from external point to a circle - Intersecting circles - Condition for two circles to touch - Orthogonal circles	-Derive general/standard forms of equation of circle: $(\mathrm{i})\, x^2 + y^2 + 2gx + 2fy + c = 0$ where $(-g,-f)$ is the centre and the radius r is given by $r = \sqrt{g^2 + f^2 - c}$ $(\mathrm{ii})\,(x-a)^2 + (y-b)^2 = r^2$, where centre is (a,b) and radius is r -Manipulate the parametric forms of equation of a circle. -State the condition(s) for a straight line to intersect with a circle -Find the coordinates of the point(s) of intersection of a straight line and a circle -Determine the equation of a tangent to a circle at a given point -Apply the conditions of a straight line to be a tangent to a circle in solving problems -Find the length of a tangent from an external point to a circle -State and use condition for two circles to touch (externally or internally) -State and use condition for two circles to cut orthogonally	-Accurate and rapid calculations ; -Good sense of judgement and application.	Geometrical instruments Calculator Materials for activities

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
	-Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes -Determination of measures	-Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	- Radical axis of two circles. -The equation of a circle through the points of intersection of two given circles and a given point.	- State the properties of the radical axis of two circles (Circles touching, intersecting and not touching) - Find the equation of the radical axis of two circles - Find the equation of a circle which passes through the points of intersection of two given circles and a given point	-Accurate and rapid calculations ;	Geometrical instruments Calculator
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling Demarcation of land boundaries -Housing in an estate -Art or design	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of	**4.2 Complex numbers** -Introduction to the Complex Number System -The imaginary number i and its algebra -Complex Numbers -Complex conjugate -The Argand Diagram -Geometrical representation of a complex numbers -Addition and subtraction of complex numbers	- Obtain solutions of a quadratic equations for which discriminant $b^2-4ac<0$ in terms of an imaginary unit i -Define and make use of $\mathrm{i}=\sqrt{-1}$ -Define and make use of: $z=x+\mathrm{i}y,\ \ x,y\in\mathbb{R}$, -Differentiate between the real and imaginary parts: $\mathrm{Re}(z)=x,\ \mathrm{Im}(z)=y$ -Define, determine and use the complex conjugate of $z=x+\mathrm{i}y,\ \ x,y\in\mathbb{R}$: z^* or $\bar{z}=x-\mathrm{i}y, x,y\in\mathbb{R}$ -Represent complex numbers on an Argand Diagram (complex plane) -Evaluate sums and difference of two complex numbers	-Accuracy and rapid calculation ; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts Accuracy and rapid	Calculators Graph board/graph paper Calculators

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Representation and transformation of plane shapes within the environment	-Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	a flag pole or of a radio aerial; -Find distance/area of model shapes	-Product and Quotient of Complex Numbers -Equality of Complex Numbers -Square root of complex Numbers: -Complex roots of a polynomial equation -Modulus and Argument of a Complex Number. -Modulus-Argument (Polar) form of a complex Number **De Moivre's theorem** - simple equations and	-Evaluate the product of two complex numbers -Use the knowledge of complex conjugate to evaluate quotient of two complex numbers - Use concept of equality in varied contexts - Factorise the function $f(z)$ and solve the equation $f(z) = 0$ -Find the square roots of complex numbers in algebraic form -Find the complex roots of polynomial with real coefficients -Define and compute the modulus and argument of a complex number - Transform a complex number in Cartesian form to modulus-argument form (or polar form) $z = r(\cos\theta + \mathrm{i}\sin\theta)$ and exponential form $z = re^{\mathrm{i}\theta}$ and vice versa - Use the factor theorem to solve equations with real and/or complex roots -Use De Moivre's theorem $(cos\theta + sin\theta)^n = \cos n\theta + \sin n\theta$	calculation ; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts;	Graph board/graph paper

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling Demarcation of land boundaries -Housing in an estate -Art or design	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar	expansions -Multiplication and Division in Polar form -Geometrical representation of sums, products and quotients of complex numbers -The n^{th} roots of unity -Cube roots of a complex number	to express: (i) $\sin n\theta,\ \cos n\theta\ and\ \tan n\theta$ in terms of powers of $sin\theta, cos\theta\ and\ tan\theta$ (ii) powers of sine and or cosine of angles in terms of sine and cosine of multiple angles -Find the product and quotient of two complex numbers given in modulus-argument form -Determine loci and represent them geometrically on Argand diagrams -Evaluate the nth roots of 1 for $n = 1, 2, 3, 4, 5$ and generalise the results -Evaluate the cube roots of any complex number. - Find the powers and roots of complex numbers in polar form -Represent roots on Argand diagrams and interpret them.	Accuracy and rapid calculation ; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts	Calculators Graph board/graph paper

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	**4.3 VECTORS** - Equations of planes -Different forms of the equation of a plane - Lines and planes - Intersection of a line and a plane -Angle between two planes -Intersection of two planes -Perpendicular distance of a point from a plane	-Make use of normal vector to a plane, three points on a plane, two lines on a plane to derive equation of a plane -Determine equation of a plane in the different forms: (i) the scalar product form: $\mathbf{r}.\mathbf{n} = \mathrm{p}$ (ii) vector parametric form: $\mathbf{r} = \mathbf{a} + s\mathbf{b} + t\mathbf{c}$ (iii) Cartesian form: $ax + by + cz = \mathrm{d}$ -Transform equation from vector form to Cartesian form and vice versa -Determine the angle between a plane and a line -Determine whether a line is contained in a plane or not - Determine the point of intersection of a line and a plane -Determine the angle between two planes -Determine the equation of the line of intersection of two planes -Calculate the perpendicular distance of a point from a plane	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Calculators Graph board/graph paper

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	-Recognition of plane shapes and transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance/area of model shapes	**4.4 INTEGRATION** - Definite integral -Simple applications of integration to calculate: • area of plane • volumes of solids of revolution, • centroids and centres of mass -Approximations to definite integrals using the trapezium rule **4.5 First order differential equations with separable variable** -Solution of simple first order differential equations (involving polynomial, trigonometriconometric, exponential and logarithmic functions) with variables that can be separated	- Use Riemann sum to define definite integral. -Express definite integral as area defined under a curve - Use integration to calculate areas under a curve (to include area below x-axis) and between two curves - Calculate volumes of solids of revolution -Use integration to calculate centroids and centres of mass of plane figures - Calculate volumes of solids of revolution about the two axes -Use trapezium rule to evaluate definite integrals and as approximation -Separate variables before integrating -Find general as well as particular solutions to simple first order differential equations	-Accuracy and rapid calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Calculators Graph board/graph paper

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
Describing patterns and relationships between quantities using symbols	-Travelling -Marketing -Construction -Saving -Hiring -Currency exchange -Planning a meal -Agriculture -Politics -Family ties -Social ties	Interpretation of algebraic model Determination of quantities from algebraic models Representing quantities and relationships	-Determine the relationship between the area of a rectangular garden and its sides; -Find expenses or cost for a event; -Find profit on a given sale; -Find income for a given enterprise; -Determine the number of articles bought from the total cost; -Find change in prices; -Express the cost of renting a car in terms of the number of days and caution; -Write total amount spent in terms of unit cost and number of articles; -Indicate the distance covered by a car in terms of speed and time; -Justify a result	**4.6 LOCATION OF THE ROOTS OF ANY EQUATION** -Determination of an interval $a < x < b$ within which a root of the equation $f(x) = 0$ lies, either graphically or by use of the signs of $f(a) and\ f(b)$ -Graphical method of solving equations -The Newton-Raphson process $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ -Any other iterative process, including the interval bisection or midpoint method and the method of Linear interpolation or Chord method.	- Verify that a root of the equation $f(x) = 0$ lies in the interval $a < x < b$ from the signs of $f(a) and\ f(b)$ -Use sketch graph to determine an interval within which a root of an equation lies -Sketch graph(s) of function(s) to find an approximate value for the root of an equation -Use Newton-Raphson process repeatedly to determine up to a third approximation to the root of an equation -Use linear interpolation and interval bisection repeatedly to determine up to a third approximation to the root of an equation -Use other iterative processes -Demonstrate an understanding of the convergence of iterative processes	-Accurate and rapid writing of very large and very small numbers ; -Good sense of numbers; -Confidence;	Calculator Graph board/graph paper
Representation and transformation	-Painting and tiling -Drawing the	-Recognition of plane shapes and	-Constructing houses of same size and type;	**4.7 CURVE SKETCHING** stationary points, points of inflexion,	-Determine the coordinates of stationary points (maximum and minimum values, points of inflexion)	-Accuracy and rapid	

Table 4: MODLE 4: PLANE GEOMETRY AND SOLID FIGURES: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Examples of actions	Core Knowledge	Skills	Attitudes	Other Resources
of plane shapes within the environment	map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design	transformation within the environment -Scale drawing -Production of plane shapes Determination of measures	-Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a model for decoration; -Find area of a theatre stage;	intercepts with coordinate axes, asymptotes(vertical and horizontal only), chart of signs (table of variation), investigation of the equation $y' = ky$	-Distinguish between maximum and minimum points and points of inflexion -Determine the interval(s) within which a function is increasing or decreasing -Evaluate limits at the bounds of the domain of definition of a function -Construct the chart of signs (table of variation) -Determine equations of asymptotes to a curve -Sketch curves of polynomial, simple rational and simple exponential functions	calculation; -Good sense of geometry and applications; -Confidence in manipulating mathematical concepts; Perception of suitable concepts	Calculators Graph board/graph paper

MECHANICS

MODULE 5: KINEMATICS

CREDIT: 43 hours / 9 periods of 50 minutes each a week

TABLE 5: MODULE 5: KINEMATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes Determination of measures	-Displacing a log of wood using a crowbar; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance	**5.1 Application of vectors in mechanics** - Vector differentiation and Vector integration, displacement(r), velocity(v), acceleration(a) - Velocity of a particle at time (t) - Acceleration of particles at time (t). - Vector integration.	- Distinguish between scalar and vector quantities. -Differentiate displacement and velocity with respect to time - Integrate acceleration and velocity with respect to time -Use $\mathbf{r}^{/}(t)$ as the velocity of a particle at time t seconds -Use $\mathbf{r}^{//}(t)$ as the acceleration of a particle at time t seconds -Calculate magnitude of physical quantities. -Use concepts such as parallel and perpendicular vectors in solving problems. -Solve simple vector differential equations.	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	-Metre rule -Tape measures of different lengths
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building		-Determine measure of similar containers;	**5.2 KINEMATICS OF PARTICLES MOVING IN A STRAIGHT LINE.** - Motion in one dimension - Equations for uniform acceleration. - Graphs in kinematics.	-Define distance, displacement, velocity and acceleration. - Develop and apply the equations for uniform acceleration formulae - Sketch and interpret motion graphs: Displacement - time graphs, velocity-time graphs	-Sense of order -Precision in calculation -Critical thinking	-Metre rule -Tape measures of different lengths -Geometrical

TABLE 5: MODULE 5: KINEMATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Travelling -Demarcation of land boundaries -Housing in an estate -Art or design -Designing a sport complex -Mapping a	-Recognition of plane shapes and transformation within the environment -Scale drawing	-Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a motive for decoration;	- Motion under gravity. - The use of the equations $\frac{dv}{dt} = f(v)$ or $f(t)$ The use of the equation $v\frac{dv}{dx} = f(x)$ or $f(v)$ **5.3 VELOCITY AND ACCELERATION AS VECTORS.** - Relative velocity - Non-parallel forces - True velocity - Interception and collision - Relative positions. - Relative motion. **5.4 KINEMATICS OF PARTICLES IN A PLANE.** - Velocity and acceleration when position is a function of time.	etc. -Find speed and acceleration from distance and vice versa. - Determine the time if speed, distance and acceleration are given with certain restrictions (motion in resistive medium) -Find a vector equation of the path of a moving particle -Find the position vector of a moving particle relative to another moving particle at time t -Show that two moving objects will collide and find the position vector of the point of collision -Calculate the least distance between two objects -Calculate the velocity of a particle relative to another particle at time t -Calculate horizontal and vertical distances of projectile. -Do motion in two dimensions. -Determine the direction of motion at a given time -Determine the maximum	-Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	Instruments -Set square -Cartesian plane, graph papers, square boards, geoboards, straight edge topographical maps, real life situations

TABLE 5: MODULE 5: KINEMATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	town -Building -Surveying	-Production of plane shapes - Determination of measures	-Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance	- Simple problems on projectiles. - Projectiles from a height -Vertical motion under gravity. **5.5 Motion in a circle with uniform speed**. - Motion on a horizontal circle. - Linear and angular speed**.** - Conical pendulum. - Relationship between angular speed and linear speed	horizontal range of a projectile. -Derive the equation of a trajectory. -Calculate maximum height and time of flight -Derive basic equations of motion for circular motion -Express angular displacement in radians. - Demonstrate understanding of centripetal forces. -Calculate the net force acting on a body i.e. $\mathbf{F} = \mathrm{m}\frac{v^2}{r}$ - Establish the relationship between angular speed and linear speed: $v = rw$ - Calculate angular speed and linear speed	-Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	Cartesian plane, graph papers, square boards, geoboards

MODULE 6: STATICS

CREDIT: 60 hours / 9 periods of 50 minutes each a week

TABLE 6: MODULE 6: STATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	Housing in an estate -Art or design	Recognition of plane shapes and transformation within the environment	Transporting, carrying objects Pivots of a metal bar, objects…	**6.1 CENTRE OF MASS OF UNIFORM RIGID BODIES.** - System of particles. - Use of coordinates to find centre of mass of a system of particles - Use of position vectors to find centre of mass of a system of particles - Uniform laminae - Use of symmetry	- Describe a uniform rigid body - Define centre of mass, centre of gravity and centroid and differentiate between them. - Locate coordinates of masses in a system of particles. - Derive $R = \frac{\sum_{i=1}^{n} m_i r_i}{\sum_{i=1}^{n} m_i}$ where m_i are the masses with coordinates r_i and R the coordinates of the centre of mass. -Use notion of moment to derive the vector form, $\bar{r} = \frac{\sum_{i=1}^{n} m_i r_i}{\sum_{i=1}^{n} m_i}$ where r_i are position vectors of m_i. - Describe uniform lamina - Use symmetry and integration to find centre of mass of uniform lamina. (use familiar plane figures)	-Precision in calculation -Critical thinking -Scientific method	Documentation, Calculator Rigid bodies Strings

TABLE 6: MODULE 6: STATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
	Housing in an estate -Art or design			- Use of integration - Composite rigid bodies. -Equilibrium of suspended bodies	- Derive $\bar{x} = \frac{\int_a^b xydx}{\int_a^b ydx}$ and $\bar{y} = \frac{\frac{1}{2}\int_a^b y^2dx}{\int_a^b ydx}$ - Describe a composite body and find its centre of mass. - Identify and calculate angle of inclination of suspended body when in equilibrium. - Apply notion of moment and vector to find the position vector of centre of mass of a system of particles		Documentation, Calculator Rigid bodies Strings
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate	Recognition of plane shapes and transformation within the environment	-Determine measure of similar containers; -Constructing	**6.2 APPLICATION OF VECTORS IN MECHANICS.** - Force as a vector -Identification of forces -Resolving forces -Resultant of coplanar forces	- Define a force and calculate its magnitude - Use diagrams to illustrate forces acting in real life situations - Find the horizontal and vertical components of every force and equally the component parallel to an inclined plane. - Illustrate geometrically and calculate magnitude of resultant force -Apply Lami's theorem in solving problems	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to	-Metre rule -Tape measures of different lengths -Geometrical instruments -Set square -Cartesian

TABLE 6: MODULE 6: STATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
			houses of same size and type;	Lami's theorem -Moment of a force	-Apply the knowledge of triangle of forces in solving problems - Determine the direction of the resultant. - Derive the equation of line of action of a force - - Define vector product	visualize -Ability to reason and justify -Sense of appreciation	plane, graph papers, square boards, geoboards, straight edge topographical maps, real life situations
Representation and transformation of plane shapes within the environment	-Art or design	Scale drawing	-Cut out into similar shapes;	- Couples	- State and use condition for coplanar forces to form a couple - Find the couple and its magnitude.		
	-Designing a sport complex	Production of plane shapes	-Carpeting and putting a ceiling; -Displacing a log of wood using a crowbar; -Draw a motive for decoration;	-Forces in equilibrium -Parallel forces and Couples -Friction - Equilibrium of particles and rigid	–State and use the condition for forces to be in equilibrium and show that coplanar forces are in equilibrium. – State law of friction - Calculate the coefficient of static friction -Calculate the angle of friction - Draw diagram to illustrate a ladder/rod indicating all the forces acting on it. - Resolve these forces vertically and horizontally. - Take moments about an axis		
	-Mapping a						

TABLE 6: MODULE 6: STATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
	town -Building -Surveying	- Determination of measures	-Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance	bodies under the action of coplanar forces -Hooke's laws	through a convenient point: either about the contact of ladder with a floor or with a wall. -State Hooke's law - Define the spring constant - Define and use modulus of elasticity - Calculate energy in an elastic string (Using the relation: $T = \frac{\lambda x}{l}$) - Calculate work done ($work\ done = \frac{\lambda x^2}{2l}$)		
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries -Housing in an estate -Art or design	Recognition of plane shapes and transformation within the environment Scale drawing	-Determine measure of similar containers; -Constructing houses of same size and type; -Cut out into similar shapes; - -Draw a motive for decoration; -Find area of a	**6.3 WORK, ENERGY, POWER** -Work ; -Work done against gravity -work done by variable force -Energy; -Conservation of energy	- Derive Newton's equations of motion - Define work done - Calculate work done by a force through a given distance; -Calculate work done against gravity; - - Calculate the rate of work done - State the law of conservation of energy - Calculate the kinetic and potential energy possessed by a body; - Find the work done by a force in	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize -Ability to reason and	-Metre rule -Tape measures of different lengths -Geometrical instruments -Set square -Cartesian plane, graph

TABLE 6: MODULE 6: STATICS. UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Designing a sport complex -Mapping a town -Building -Surveying	Production of plane shapes Determination of measures	theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance	- Power; - Power and velocity - Pumping water or Water jets (Ejecting water)	vector form. Define power – Use Power- Force-Velocity relationship to calculate the power of an engine - Find the maximum speed of a car or body moving up or down a slope, on the level plane, working at a given constant rate - Find the non-gravitational resistances to motions of cars given necessary conditions. - Calculate the rate at which a pump is working (raising or ejecting water)	justify -Sense of appreciation	papers, square boards, geoboards, straight edge topographical maps, real life situations

MODULE 7: DYNAMICS

CREDIT: 43 hours / 9 periods of 50 minutes each a week

TABLE 7: MUDULE 7: DYNAMICS: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Representation and transformation of plane shapes within the environment	-Painting and tiling -Drawing the map of a town, country or continent -Draw model of a building -Travelling -Demarcation of land boundaries	Recognition of plane shapes and transformation within the environment Scale drawing Production of plane shapes	-Determine measure of similar containers; -Constructing houses of same size and type; -Cut out into similar shapes; -Carpeting and putting a ceiling;	**7.1 NEWTON'S LAWS OF MOTION.** - Newton's laws of motion - Equations of motion for a particle in one or two dimensions under constant forces. **7.2 Motion of connected particles** - Pulley systems (Smooth fixed) - Horizontal and inclined planes (Smooth or rough) - Motion in one dimension when forces on each particle are constant - Motion under a force which changes from one constant value to another. **7.3 MOMENTUM AS**	- State Newton's laws - Apply knowledge of rectilinear motion. - Apply Newton's law of motion i.e. $\mathbf{F} - \mathbf{R} = \mathrm{m}\mathbf{a}$ - Set up and solve equations of motion for a particle in one or two dimensions under constant forces. -Solve problems involving: a) variable motion b) constant motion. -Calculate speed, distance moved by particles from some point. - Use the assumption that all connected bodies have the same speed and acceleration to solve problems (Only task involving smooth fixed pulleys)	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	-Metre rule -Tape measures of different lengths -Geometrical instruments -Set square -Cartesian plane, graph papers, square boards, geoboards, straight edge topographical maps, real life situations

TABLE 7: MUDULE 7: DYNAMICS: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
	-Housing in an estate -Art or design -Designing a sport complex -Mapping a town -Building -Surveying	Determination of measures	-Displacing a log of wood using a crowbar; -Draw a motive for decoration; -Find area of a theatre stage; -Draw the plan for a house; -Find height of a building or of a flag pole or of a radio aerial; -Find distance	**A VECTOR** **- D**efinition and examples **-** Principle of conservation of linear momentum. **-** Impulse **-** direct impact of elastic bodies **-**Newton's law of restitution .	- Define momentum and state its SI unit. -State and apply the principle of conservation of linear momentum to solve problems on direct impact -Define impulse and state its SI unit -Give examples of direct impact. - Determine the nature of a collision (elastic or inelastic collision) -State newton's law of restitution - Find the loss or gain in KE due to collision. - Find the impulse exerted by one body on the other. – Calculate the impulse exerted on a body due to collision. -Use law of conservation of linear momentum alongside the restitution equation in direct impact between particles or particle and a surface -Calculate kinetic energy loss due to impact(s).	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize	-Metre rule -Tape measures of different lengths -Geometrical instruments -Set square -Cartesian plane, graph papers, square boards, geoboards, straight edge topographical maps, real life situations

MODULE 8: PROBABILITY

CREDIT: 19 hrs/ 9 periods of 50 minutes each a week

TABLE 8: MODULE 8: PROBABILITY: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Organisation of information and estimation of quantities in the consumption of goods and services	-Census of a population by some characteristics such as sex, age group, profession, religion etc. -Demographic growth -Classification of football teams -Opinion polls on a new product or new policy -Evolution of the budget of a country due to economic growth	Organisation, presentation and exploitation of information Interpretation of results Taking chances	-Record yearly rainfall -Record production of crude oil by some countries -Compile results (exams, elections etc) -Make a choice -Results of football matches -Display month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor cars -Choose a career	**8.1 ELEMENTARY PROBABILITY**. - Probability terminology - Empirical or experimental method of obtaining probabilities (tossing coins and dice, drawing cards…). -Possibility space and probability space for such experiments - Classical definition of probability - Probability of an event **Probability laws** - Limit law (probability scale) - Complementary events -Compound events -The occurrence of only one of two events -Mutually exclusive	-Define basic terms like: trial, outcome, event, biased, etc -Interpret statistical experiments -Identify outcomes of statistical experiments -Define probability space and possibility space - State sample space for a simple statistical experiment - Distinguish between an event and a sample space - Use Venn and lattice grid diagrams to represent sample space - Define and calculate the probability of an event. - State the probability scale $0 \leq p(A) \leq 1$ - Deduce and apply the complement of an event. $P(A') = 1 - P(A)$ - Calculate the probabilities of compound events (Can extend to three sets) $p(A \cup B) = P(A) + P(B) - P(A \cap B)$ - Calculate the occurrence of only one of two events $P(A \cap \bar{B}) = P(A) - P(A \cap B)$	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	Coins, packs of playing cards, dice, marbles, balls, shapes, ….

TABLE 8: MODULE 8: PROBABILITY: UPPER SIXTH FORM

Contextual framework		Competences		Resources			
Family of situations	**Examples of situations**	**Categories of actions**	**Examples of actions**	**Core Knowledge**	**Skills**	**Attitudes**	**Other Resources**
Organisation of information and estimation of quantities in the consumption of goods and services	Census of a population by some characteristics such as sex, age group, profession, religion etc. -Demographic growth -Classification of football teams -Opinion polls on a new product or new policy -Evolution of the budget of a country due to economic growth	Organisation, presentation and exploitation of information Interpretation of results Taking chances	Record yearly rainfall -Record production of crude oil by some countries -Compile results (exams, elections etc) -Make a choice -Results of football matches -Display month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor cars -Choose a career	events -Exhaustive events - Conditional probability -Independent events and their applications -Probability Trees - Use of permutations and combinations to calculate probability Bayes' theorem	-Define mutually exclusive events-State and apply the additive law $\mathrm{P}(A\cup B)=\mathrm{P}(A)+\mathrm{P}(B)$ -Define exhaustive events -Deduce and use the rule $\mathrm{P}(A_1\cup A_2\cup\ldots\cup A_n)=1$ - State and apply the formula $\mathrm{P}(A/B)=\frac{\mathrm{P}(A\cap B)}{\mathrm{P}(B)}$ -Use the multiplication rule $\mathrm{P}(A\cap B)=\mathrm{P}(A)\times\mathrm{P}(B)$ -State condition for two events to be independent $\mathrm{P}(A\cap B)=\mathrm{P}(A/B)\times\mathrm{P}(B)$ -Solve problems involving sampling with and without replacement -Draw and use tree diagrams with not more than three branches. -Use permutations and combinations to calculate probabilities. $P(Ai/B)=\frac{P(B/A_i)P(A_i)}{P(B/A_1)P(A_!)+P(B/A_2)P(A_2)+..+P(B/A_n)P(A_n)}$ Where $A_1,\ldots,A_n$ are n mutually exclusive and exhaustive events. - Apply probability to real life situations	-Sense of order -Precision in calculation -Critical thinking -Scientific method -Ability to visualize -Ability to reason and justify -Sense of appreciation	Coins, packs of playing cards, dice, marbles, balls, shapes,

Article 2: This syllabus shall go into operation following the time schedule below:
Academic year 2019 – 2020 Lower Sixth Science
2020 – 2021 Upper Sixth Science

Article 3: This syllabus replaces all existing syllabuses for the teaching of Pure Mathematics with Mechanics in the Lower Sixth Science (LSS) and Upper Sixth Science (USS) Forms of Secondary General Education.

Article 4: The Secretary General, the Inspector General of Education, the Inspector Coordinator General in Charge of the Teaching of Sciences, the Registrar of the Cameroon General Certificate of Education Board (CGCEB), the Director of Secondary General Education, the Director of Private Education, Regional Delegates for Secondary Education, Divisional Delegates for Secondary Education, Education Secretaries of various Lay and Confessional Education Agencies, Principals and Teachers of public and private schools, each in their sphere of competence, are responsible for the strict implementation of this order which shall be registered and published in the Official Gazette in English and in French.

Done in Yaoundé, on the

The Minister of Secondary Education

CC:
-PRC;
-PM;
-MINESEC/CAB/IGE/Directorates;
-Ministry of Higher Education;
-Regional Delegations of MINESEC;
-National Representatives of Organisations of Private Education;
-Offices of Education Secretaries of Lay and Confessional Education Agencies;
-Schools/Institutions concerned;
-Archives;
-Chrono.