

MINISTRY OF SECONDARY EDUCATION
MINISTRE DES ENSEIGNEMENTS SECONDAIRES

INSPECTORATE GENERAL OF EDUCATION
INSPECTION GENERALE DES ENSEIGNEMENTS

ADDITIONAL MATHEMATICS TEACHING SYLLABUS

FORMS 4 AND 5



*Observing the environment to guide better, training choices and build a successful life.
Observer son environnement pour mieux orienter ses choix de formation et réussir sa vie*

INSPECTORATE OF PEDAGOGY IN CHARGE OF SCIENCES

INSPECTION DE PEDAGOGIE CHARGEE DE L'ENSEIGNEMENT DES SCIENCES

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REPUBLIQUE DU CAMEROUN
PAIX – TRAVAIL – PATRIE

MINISTERE DES ENSEIGNEMENTS SECONDAIRES

INSPECTION GENERALE DES ENSEIGNEMENTS

REPUBLIC OF CAMEROON
PEACE – WORK – FATHERLAND

MINISTRY OF SECONDARY EDUCATION

INSPECTORATE GENERAL OF EDUCATION

ARRETE N° 226/18 /MINESEC/IGE DU 22 AOÛT 2018

Portant définition des programmes d'Etudes des classes de Seconde de l'Enseignement Secondaire Général

LE MINISTRE DES ENSEIGNEMENTS SECONDAIRES

Vu la constitution;

Vu la Loi N° 98/004 du 14 avril 1998 d'Orientation de l'Education au Cameroun;

Vu le décret N° 2011/409 du 09 décembre 2011 portant nomination d'un Premier Ministre, Chef du Gouvernement;

Vu le décret N° 2018/190 du 02 mars 2018 modifiant et complétant certaines dispositions du décret N° 2011/408 du 09 décembre 2011 portant organisation du gouvernement;

Vu le décret N° 2012/267 du 11 juin 2012 portant organisation du Ministère des Enseignements Secondaires;

Vu le décret N° 2018/191 du 02 mars 2018 portant réaménagement du Gouvernement :

ARRETE :

Article 1^{er} : les programmes d'études des classes de Seconde sont définis ainsi qu'il suit :

PREFACE

DES PROGRAMMES DES CLASSES DE SECONDE L'ENSEIGNEMENT GENERAL

L'amélioration quantitative et qualitative de l'éducation constitue une préoccupation permanente pour l'Etat camerounais, soucieux d'atteindre son émergence à l'horizon 2035. Ainsi, en accord avec les Objectifs du Développement Durable (ODD), le Document de Stratégie pour la Croissance et l'Emploi (DSCE) et le Document de Stratégie du Secteur de l'Education et de la Formation (DSSEF), le Ministère des Enseignements Secondaires s'est engagé dans une réforme curriculaire depuis plus d'une décennie. Cette réforme, qui s'est traduite par la mise en œuvre des nouveaux programmes d'études du premier cycle selon l'Approche Par les Compétences (l'APC), avec entrée par les situations de vie, se poursuit avec la réécriture des programmes d'études des classes de seconde. Celle-ci répond à un certain nombre d'impératifs :

- (i) Poursuivre les enseignements selon l'Approche Par les Compétences, avec le souci de continuer à offrir à un maximum de jeunes Camerounais, une formation de qualité ;
- (ii) Participer activement à l'ouverture des jeunes du secondaire à la citoyenneté mondiale, aux nouvelles technologies, à l'insertion sociale et à la possibilité de poursuivre, plus tard, des études supérieures.

La réécriture des programmes d'études des classes de seconde de l'enseignement général vient à cet effet consolider les acquis de la vision de l'école camerounaise telle que définie dans la Loi d'orientation de l'éducation au Cameroun et mise en œuvre à travers l'Approche Par les compétences. Elle traduit également la volonté de s'arrimer aux orientations des deux documents de pilotage que sont le Document de Stratégie pour la Croissance et l'Emploi (DSCE) et le Document de Stratégie du Secteur de l'Education et de la Formation (DSSEF).

Il s'agit donc, de mieux outiller les apprenants en termes de ressources nécessaires (savoirs fondamentaux, savoir-faire, savoir être, savoir dire, etc.), au développement optimal des compétences attendues au sortir du secondaire, et nécessaires à la poursuite des études dans le supérieur.

Tout en félicitant, une fois de plus, toute l'équipe de concepteurs de ces programmes, j'invite vivement tous les membres de la communauté éducative, notamment les enseignants, cheville ouvrière de la pédagogie, à s'approprier davantage les fondements conceptuels et opérationnels de l'APC, paradigme choisi pour la mise en œuvre des nouveaux programmes au Cameroun.

LE MINISTRE DES ENSEIGNEMENTS SECONDAIRES



Nalova Lyonga, Ph. D

END - OF - FIRST CYCLE LEARNER'S EXIT PROFILE

The first cycle of Secondary General Education admits young graduates from primary schools aged between ten and fourteen. Its general objectives are not only to build intellectual, civic and moral skills in these children but also competences and fundamental knowledge which will either enable them to foster their education in the second cycle, or to prepare them for a smooth insertion into the job market after professional training.

Thus, within the framework of these new syllabuses, the learner is expected , after the first cycle of secondary education, to be able to use his/her competences to solve problems through family of situations relating to domains of life as indicated in the table below:

N°	Domains/Areas of life	Families of situations to be treated in the 1 st cycle
1	Family and social life	• Participation in family life • Healthy professional relationships • Social integration
2	Economic life	• Discovery of income generating activities • Discovery of the job market, social roles, jobs and professions • Self-confidence, aspirations, talents, self-potential • Practising healthy eating habits
3	Environment , health and well being	• Preservation of the Environment • Quest for a healthy life style • Choosing and practising a healthy life style
4	Citizenship	• Mastery of rules and regulations governing the Cameroonian society • Discovery of cultural values and customs of the Cameroonian society
5	Media and Communications	• Discovery of the media world • Discovery of Information and Communication Technologies

In order to achieve these objectives, the learner should be able to mobilise, within the various disciplines and constructive areas of learning of the syllabuses, all the pertinent resources in terms of knowledge, know-how and attitudes.

The next table gives you a general overview of the afore-mentioned objectives, while the syllabus for each subject unfolds, in details, all the expected competences per level and at the end of the 1st cycle.

Areas of Learning	Disciplines	Expected outcomes at the end of the 1 st cycles
1-Languages and Literature	Living languages: English, French , German, Italian, Spanish, Chinese, Etc.	French and English , L1 Receptive skills: reading and listening Read in an autonomous way, different types of texts related to areas of life as defined in the syllabus; Listen and understand various texts related to the above mentioned areas of life Productive skills: speaking and writing Produce various types of texts , of average length related to these areas of life; Language tools: appropriate use of various language tools in order to produce and read types of texts related to that level;
	English to Francophone learners French to Anglophone learners	Communicate accurately and fluently using all four basic skills in language learning; Be able to transfer knowledge learnt in class to real life situations out of the classroom; Be able to cope and survive in problem solving situations;
		Living languages II Receptive skills: reading and listening Read and understand simple texts on social life, citizenship, the environment, wellbeing and health, media etc.. Listen and get oral information in order to simply interact during communication situations related the various domains of life. Productive skills: speaking and writing Sing, recite, dramatise , orally answer questions related to the various domains of life as defined in the syllabus; Write short passages on various familiar topics.

	Ancient languages: Latin, Greek National languages Literature Cameroon Literature; French Literature; Francophone Literature; Other literatures	Develop general knowledge through ancient languages and cultures; know the origins of the French language for linguistic mastery; Carry out elementary tasks in translation.
2-Science and Technology	Mathematics, The Sciences Computer Science	Use mathematic knowledge skills and values 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).
		The Sciences: Acquire the fundamentals of sciences in order to understand the functioning of the human body, the living world, the earth and the environment; Acquire methods and knowledge to understand and master the functioning of technical objects made by man to satisfy his needs; Demonstrate attitudes to protect his/her health and environment.
		Computer Science : Master the basics of Information and Communication Technologies; Exploit and use ICTs to learn.
3- Social Sciences /Humanities	History Geography Citizenship Education	Possess cultural references to better locate events in time and space within a democratic system and become a responsible citizen. History: Acquire a common culture ; be aware of heritage from the past and current challenges; Geography : Develop one's curiosity and knowledge of the world; Get acquainted with landmarks to find your way and fit in the world. Citizenship Education:

		Possess essential knowledge in rights and duties in order to fulfil his/her citizenship.
4- Personal Development	Moral Education; Home Economics; Sports and Physical Education Health Education	Develop his / her physical abilities/skills ; Get ready for physical challenges , save and regain energy after physical efforts; Identify risk factors; possess basic knowledge and principles in hygiene and health education; Demonstrate a sense of self control and appreciate the effect of physical activities. Conceive and draw up sports and cultural animation projects; Acquire methods and develop a high sense of efforts; Conceive, draw up and implement projects that will enable one to project his/her image and feel the wellbeing inspired by self-confidence.
5- Arts and National Cultures	Arts/Artistic Education; National Cultures	Artistic Education: Observe and appreciate works of art; Carry out an artistic activity; Gradually acquire the love for personal expression and creativity; Possess a mastery of creativity in music, plastic arts and the performing arts. Dramatise, recite texts (poems, tales, proverbs, etc.) relating to various areas of society; Practise the different dramatic genres: sketches, comedy, tragedy, drama, etc. National languages and Cultures Demonstrate a mastery of Cameroon cultures; Visit the various cultural areas of the country in order to discover their characteristics; Demonstrate a mastery of basic rules in writing Cameroonian languages as well as basic grammatical notions applied to these languages; Demonstrate a mastery of one of the national languages at 3 levels: morpho-syntax, reception and production of simple oral and written texts.

Even though the learners acquire skills in different disciplines, these competences are accompanied by other skills known as cross curricular competences related to intellectual, methodological, social and personal areas of learning.

6- Cross curricular competences	Intellectual and Methodological domains	Solve Problem in a given situation; Use knowledge skills and values with confidence in order to solve real life problems within the different domains of life; With confidence, find useful information to solve problems he/she is faced with; Give his/her opinion ; Support his/her opinion with strong arguments ; Assess him/herself with a view to remediation; Demonstrate basic knowledge in note taking ; Conceive and realise individual projects; Analyse and summarise information, give feedback and report orally or in writing. Develop problem solving approaches; Exploit and use ICTs in his/her activities.
	Social and Personal Domains	Interact positively and assert his/her personality while respecting that of other people; Join team work, fit in a common initiative project /group; Demonstrate interest in cultural activities ; Develop a sense of effort, love for work, perseverance in tasks or activities carried out ; Understand and accept others in intercultural activities; Accept group assessment.

The resources to be mobilised by the learner are found in many disciplines and areas of learning. So it is important to implement these syllabuses not in isolation but as interrelated subjects. These remarks hold both for subject and cross curricular competences. They are so called to show that they should be developed through teaching/learning activities of the different subjects. The development of subject and cross curricular competences concern the entire education family as they are capable of inspiring an educative project and the putting in place of extracurricular activities. The ultimate training goal of these syllabuses, at the end of the first cycle, is to enable the learner to be self-reliant, to be able to keep on learning throughout his/her life, to contribute to sustainable development and become a responsible citizen.

ADDITIONAL MATHEMATICS TEACHING SYLLABUS FOR FORMS 4 AND 5

LEARNING AREA:
SCIENCE AND TECHNOLOGY

SUBJECT: ADDITIONAL MATHEMATICS

Class: Form 4 and Form 5

TOTAL NUMBER OF TEACHING HOURS FOR EACH LEVEL A YEAR:

Class	Number of hours
Form 4	66
Form 5	66

NUMBER OF PERIODS A WEEK: 2 of 50mins each (100 minutes)

COEFFICIENT: 2

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MODULE N° 1	Erreur ! Signet non défini.
MODULE N° 2	Erreur ! Signet non défini.
MODULE N° 3	Erreur ! Signet non défini.
MODULE N° 4	Erreur ! Signet non défini.
MODULE N° 5	Erreur ! Signet non défini.

GENERAL PRESENTATION

In the first two years of secondary education, ground work was made through the consolidation of Mathematics taught in the primary school, involving the broadening of basic Mathematical skills, introduction of basic facts, principles and notions, all to prepare learners to pursue further studies in the subject and other related courses. The content for forms 4 and 5, has been selected to ensure continuity and reinforcement of what was done in lower forms. All of mathematical knowledge and skills acquired in junior forms will serve as pre-requisite knowledge for students to construct new knowledge. At the end of form 5, students are well equipped to sit in for the General Certificate of Education (GCE) Ordinary 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.

The forms 4 and 5 Additional Mathematics syllabus is also elaborated using the Competency – Based – Approach from a situated perspective (through real life situations) as that of Mathematics for forms 1 to 5. As mentioned in the syllabus for Mathematics from forms 1 to 5, 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 is made functional (act as tools (resources), to solve problems in other subjects and in real life situations. This syllabus therefore emphasizes application of Mathematics to real life situations and a practical approach to teaching and learning. 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.

This syllabus for forms 4 and 5, also has a triple 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.
- Lay a solid foundation for further studies in the second cycle of mathematics and other related subjects.

OUTCOMES OR PROFILES OF THE LEARNER

At the end of the first cycle, the learner who has successfully gone through this content should among others be able to use Additional 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 Additional Mathematics teaching syllabus for forms 4 and 5 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) so as to fully and autonomously assume role as a citizen;
- 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 forms 4 and 5 are knowledge, comprehension, application and simple cases of analysis and synthesis.

I – THE PLACE OF ADDITIONAL MATHEMATICS IN THE CURRICULUM AND ITS CONTRIBUTION TO THE LEARNING AREA.

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.

II- 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, Citizenship. Mathematical skills help in developing competences 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.

III- 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 competences. The different modules for this level are:

a) COMPREHENSIVE TABLE SHOWING THE DIFFERENT MODULES FOR EACH CLASS

Level	Title of module	Family of situations	Duration
Form 4	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	7 hours
	Algebra	Description of patterns and relationships between quantities and ideas using symbols	37 hours
	Plane Geometry	Representations and transformations of points and plane shapes within the environment	22 hours
Form 5	Plane Geometry	Representations and transformations of points and plane shapes within the environment	48 hours
	Statistics and Probability	Organization of information, estimation of quantities and making choices in the consumption of goods and services	36 hours

b) PRESENTATION OF MODULES.

As with the Mathematics syllabus for forms 1 to 5, 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 seven columns:

- The contextual framework embodies the families of situations and some examples of real life situations where the knowledge and skills (competences) can be applied. Teachers are expected to come out with more real life situations within their environment.
- The Competences (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 competences 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 mobilize 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 competences.

VII- 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 that will captivate and sustain the interest of the learners ;
- One or two learning activities 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 mobilize 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 competences. At the end of form 5, students will sit in and write the General Certificate of Education examination, Ordinary level, in Additional Mathematics. The nature and structure of the examination will be defined by the Cameroon GCE 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 introduces progressively and whenever necessary the corresponding symbol for each set of numbers such as $\mathbb{R}$, $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$.

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: $+$, $-$, $\times$, $\div$, π , x^2 , $\sqrt{x}$, $\frac{1}{x}$, x^y , sine, cosine and tangent and their inverses in degrees and in decimals of a degree.

f- Formulae, symbols and notations

Students should master among others, the following formulae:

Circumference of a circle = $2\pi r$, where r is radius of the circle	Volume of pyramid = $\frac{1}{3} \text{base area} \times \text{height}$
Curved surface of right circular cylinder = $2\pi rh$	Volume of right circular cone = $\frac{1}{3} \pi r^2 h$
Area of trapezium = $\frac{1}{2}(a+b)h$	Volume of sphere = $\frac{4}{3} \pi r^3$
Area of circle = πr^2	Sum of interior angles of a polygon with n sides = $(2n - 4)90^\circ$ or $(n - 2)180^\circ$
Area of a triangle = $\frac{1}{2}bc \sin A$ or $\frac{\text{base} \times \text{height}}{2}$, or $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$	Solutions of $ax^2 + bx + c = 0$ is the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Surface area of sphere = $4\pi r^2$	Determinant of the 2 by 2 matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is given by $ad - bc$.
Volume of cylinder = $\pi r^2 h$	Inverse of the 2 by 2 matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is given by $\frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

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

$\{ \}$	the set of	$\in$	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	$\cup$	union
$\subset$	is a subset of	$\cap$	intersection

A'	the complement of the set A	$f(x)$	the image of x under the function f
$f:A \rightarrow B$	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 of the function g
 	open interval on the number line closed interval on the number line	$\vec{AB}$ $ \vec{AB} $	the vector $\vec{AB}$ Magnitude of vector $\vec{AB}$
$[a, b]$	the interval $\{a \leq x \leq b\}$	$\mathbf{a}$	the vector $\mathbf{a}$
$[a, b]$	the interval $\{a \leq x \leq b\}$		
$[a, b)$	the interval $\{a \leq x < b\}$	$\sim p$	not p
(a, b)	the interval $\{a < x < b\}$	$p \Rightarrow q$	p implies q
$[AB]$ AB	Line segment from A to B . Length of $[AB]$	$p \Leftrightarrow q$	p implies and is implied by q (p is equivalent to q)

**ADDITIONAL MATHEMATICS TEACHING SYLLABUS FOR
FORMS 4 AND FORM 5**

MODULE N° 1

NUMBER, OPERATIONS AND RELATIONSHIP IN A SET AND BETWEEN ELEMENTS OF A SET

CREDIT: 7 hours

2 teaching Periods of 50 minutes a week

PRESENTATION OF MODULE

This module is aimed at making the learner competent within the family of situation:” Representation, determination of quantities and identification of objects by numbers ». It is a question for the learner to:

▫ Solve problems relating to life situations such as: determining the tripling time of an investment, the magnitude of an earth quake, the PH of substances e.g. eggs, the loudness of an air plane during take-off, buying and selling of consumable goods, sharing of assets, verification of bills, and comparison of prices of the same article ...

▫ Communicate information containing numbers or digits (telephone numbers, registration numbers, car matriculation numbers etc. ...);

The important aspect here is to consolidate concepts of addition, subtraction, multiplication, division and ordered relations seen in the Mathematics syllabus for forms 1, 2, 3 and 4. Meanwhile more emphasis should be laid on (Euclidean division, decomposition of a whole number into its prime factors and, solving equations, etc.). The cognitive skills here are: knowledge, understanding and application.

Writing decimals as fractions should be limited to simple examples drawn from their everyday life. This module will help the students to be able to use graphics representation to visualise the notions of numbers (compare and find the limits within which a directed number lies)

TABLE 1: NUMBERS, OPERATIONS AND RELATIONSHIP IN THE SET AND BETWEEN ELEMENTS OF A SET FORM 4

Contextualized framework		Competent Action		Resources			
Family of situations	Example of Situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representation, determination of quantities and identification of objects using numbers.	-Find the number of bacteria in a certain bacterial culture; -Measurements; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment; -Daily movements; -Planning a meal; Use of public and private services; -Communication using (telephone numbers, car number plates. -Aviation -Economics -Banking	□ Numerical methods □ Verbal interaction on information containing numbers ; □ Representation and treatment of information and quantities; □ Determination of numbers;	□ Determine: - The tripling time of an investment - The loudness of an airplane during take-off, - The magnitude of an earth quake - The PH of eggs - The doubling time of an investment; □ Draw up a bill; □ calculate the sum at stake for a transaction; □ Arranged parts removed or produced according to date of arrival; □ □ Read the dimensions of a part to be made, read the chassis number of a car, the series number of a part ; Read and interpret the	I. INDICES ,LOGARITHMS AND SURDS -Use and properties of indices and logarithm including change of base -The function ax and $\log_c x$, where c is a positive integer - Logarithmic equations - Simple exponential equations ($a^x = b$) where a and b are real constants. - Definition of a surd, rationalising the denominator, conjugate surds, equality of surds -Arithmetic operations on surds.	-Determine value of a number raised to a negative power; -Express numbers in standard index form or scientific notation: $a \times 10^n$ where $1 \leq a < 10$ and $n \in \mathbb{Z}$ - Write numbers using rational indices: $a^{\frac{1}{n}} = \sqrt[n]{a}$ $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ -Solve simple exponential equations and exponential equations resulting in quadratic equations; -Draw graphs of exponential functions; -Define logarithmic function $y = a^x$; where x is the logarithm of y to the base a ; -Draw graphs of logarithmic functions ; -State and apply rules of logarithms extending to the two special logarithms $\log_a 1 = 0$ and $\log_a a = 1$; -Solve simple logarithmic equations; -Interchange from exponential to logarithmic expressions and vice versa; Determine the range within which a number lies given the	-Accurate and rapid writing of very large and very small numbers, -Good sense of numbers -Confident -Good sense of estimation and approximation -Good sense of orderliness.	Documentation Calculator. Tape for measuring Material for low scale activity Text books Real life situations such as results of mountain race, long jump, triple jump etc. PH meter and chart

Contextualized framework		Competent Action		Resources			
Family of situations	Example of Situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representation, determination of quantities and identification of objects using numbers.		□ identification of objects using numbers ; □ Read and write information containing numbers; □ Verbal interaction on information containing numbers;	Read and interpret the dash-board of a car. Calculate the hypotenuse of a piece of land whose shape is that of a right angled triangle Measure distances using surds eg construct a circle whose radius is a surd. E.g. $5\sqrt{2}$cm, $3\sqrt{10}$ cm etc Write very small and very large numbers in standard form.		range within which a radical lies. -State and use the rules involving surds: $\sqrt{mn} = \sqrt{m} \times \sqrt{n}$, $\sqrt{\frac{m}{n}} = \frac{\sqrt{m}}{\sqrt{n}}$ iff $m > 0$ and $n > 0$: -Reduce surds to basic forms; -Rationalize the denominator of surd expressions; NB: Knowledge of the shape of the graphs of a^x and $\log_c x$ is expected, but not a formal expression for the gradient.	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.

MODULE N° 2

ALGEBRA FORM 4

CREDIT: 37HOURS / 2 teaching periods of 50 minutes per week

GENERAL PRESENTATION OF MODULE

Algebra focuses on describing pattern and relationships between variables through the use of symbolic expressions, graphs and tables. It 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 relationships as well as translate real life problems into different forms of equations and solve them.

CONTRIBUTION OF MODULE TO LEARNING AREA

Algebra is the language for investigating and communicating most of Mathematics, Science and Technological work. Formulae are highly used in natural Sciences (calculating air pressure, resistance, voltage) 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, 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, economic growth such as calculating pension for those on retirement etc.

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 life, cultural life, political and environmental issues. 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. Business, Industry, engineers and all sorts of workers use algebra to, solve many problems. 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.

Table 2: ALGEBRA FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Description of patterns and relationships between quantities and ideas using symbols	-Travelling	Interpretation of algebraic models	-Determine the relationship between the area of a rectangular garden and the length of its sides.	II. SEQUENCES -Sequence as functions involving the sets: $\mathbb{N}$, $\mathbb{N}^*$; -Increasing and decreasing sequences; -Arithmetic and geometric sequences; -Use of the Σ notation; -The n^{th} term of an AP; the n^{th} term of a GP; -Sum of an arithmetic sequence, arithmetic mean; -Sum of a geometric sequence, geometric mean -Sum to infinity of a geometric sequence; -Simple notion of the convergence of a sequence -Simple cases of recurrence sequence. $(U_n = aU_{n-1} + b)$ -Determine U_n from S_n	-Identify and state pattern in a sequence of numbers; -Determine the next term in a sequence of numbers; -Use (U_n) and (U_{n+1}) to establish whether a sequence is increasing or decreasing; -Express the term T_n of a sequence as a function of n where T_n is the image given by the function $T_n = f(n)$ where $n = 0, 1, 2, 3, \dots$ -Use the general term U_n and U_{n+1} to establish that a sequence is either an AP or GP; -Determine the first term and the common difference for an AP; - Determine the first term and the common ratio for a GP; -- Determine the arithmetic mean for the three consecutive terms of an AP and geometric mean for three consecutive terms of a G.P.	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.
	-Marketing		-Find expenses or total cost for an event				
	-Construction		-Find the profit on a given sale				
	-Mountains and valleys		-Find income for a given business enterprise				
	-Hiring	Determination of quantities from algebraic models	-Determine the number of article bought from the total cost				
	-Currency		-Find change in prices				
	-Planning		-Express the cost of renting a car in terms of number of hours or days and caution				
	-Agriculture		-Write total amount spent in terms of unit cost and number of articles				
	-Politics	Representing quantities and relationships	-Calculate simple and compound interest				
	-Loan scheme and leasing						
	-Growth						
	-Banking						
	-Transport						

Table 2 cont': ALGEBRA FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Description of patterns and relationships between quantities and ideas using symbols	-Travelling -Marketing -Construction -Mountains and valleys -Hiring -Currency -Planning -Agriculture -Politics -Loan scheme and leasing -Growth -Banking -Transport	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 the lengths of its sides. -Find expenses or total cost for an event -Find the profit on a given sale -Find income for a given business enterprise -Determine the number of article bought from the total cost given the unit cost. -Find change in prices -Express the cost of renting a car in terms of number of hours or days and caution -Write total amount spent in terms of unit cost and number of articles -Calculate simple and compound interest		- Determine the sum of the first n terms of an AP : $S_n = \frac{n}{2} [2a + (n - 1)d]$ and Sum of first n terms of a GP: $S_n = \frac{a(1-r^n)}{1-r}, r \neq 1$ -Determine sum to infinity of a GP: $S_\infty = \frac{a}{1-r}, -1 < r < 1;$ -Solve real life problems involving sequences; NB: The $\sum$ notation may be employed wherever its use seems desirable. - Obtain the terms of a given sequence from the general term of the sum of the sequence $(U_n = S_n - S_{n-1})$	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.

Table 2 cont': ALGEBRA FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Description of patterns and relationships between quantities and ideas using symbols	-Travelling -Marketing - Construction -Mountains and valleys -Hiring -Currency -Planning -Agriculture -Politics -Loan scheme and leasing -Growth -Banking -Transport	Interpretation of algebraic models Determination of quantities from algebraic models Representing quantities and relations	-Determine the relationship between the area of a rectangular garden and the lengths of its sides. -Find expenses or total cost for an event -Find the profit on a given sale -Find income for a given business enterprise -Determine the number of article bought from the total cost -Find change in prices -Express the cost of renting a car in terms of number of hours or days and caution -Write total amount spent in terms of unit cost and number of articles -Calculate simple and compound interest	III. QUADRATIC FUNCTIONS AND SIMPLE EQUATIONS -Roots of quadratic equations -Sum and product of roots; -Symmetric functions of roots -Quadratic functions; -Nature of roots of a quadratic equation; -Maximum and minimum values of a quadratic function; -Quadratic inequalities; IV. ABSOLUTE VALUE FUNCTION -Definition of the absolute value function -Inequality involving absolute value functions;	-Solve quadratic equations: $f(x) = 0$ by factorization, completing the square and use of the quadratic formula; - interpret results -Derive quadratic formula; -Construct equation from sum and product of roots; -Determine the value of a symmetric function of α and β ; -Sketch graphs of quadratic functions - interpret graphs -Determine maximum or minimum values of a quadratic function; -Line of symmetry of graph of quadratic function; -Solve quadratic inequalities; Establish the notion of absolute value using the number line; -Solve equations involving absolute value functions such as $ f(x) = k$; -Draw graphs of functions defined as $ f(x) = k$; -Solve inequalities involving absolute value functions - Differentiate between a function and an equation.	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.

Table 2 cont': ALGEBRA FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Description of patterns and relationships between quantities and ideas using symbols	-Travelling -Marketing -Construction -Mountains and valleys -Hiring -Currency -Planning -Agriculture -Politics -Loan scheme and leasing -Growth -Banking -Transport	Interpretation of algebraic models Determination of quantities from algebraic models Representing quantities and relations	Determine the relationship between the area of a rectangular garden and the lengths of its sides. -Find expenses or total cost for an event -Find the profit on a given sale -Find income for a given business enterprise -Determine the number of article bought from the total cost -Find change in prices -Express the cost of renting a car in terms of number of hours or days and caution -Write total amount spent in terms of unit cost and number of articles -Calculate simple and compound interest - Determine the best alternatives for maximum profit or lowest cost.	V. LINEAR PROGRAMMING -Graphical representation and solutions of linear inequalities in two variables; -Objective functions -Extreme values of a system of linear inequalities. -Extreme values of a system of linear inequalities. -Maximisation or minimisation; -Real life problems requiring the maximization and minimization of objective functions.	-Solve linear inequalities in two unknowns graphically -Represent or shade the regions or outer boundary on the Cartesian plan; -Solve word problems that lead to linear inequalities; -Explain the terms maximization and minimization using real life situations-Solve problems involving maximization or minimization -Derive objective functions from worded problem. -Explain and use the terms objective function, constraints feasible solution; feasible region, optimal solution and controlled variable; -Distinguish a function from an equation;	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.

Table 2 cont': ALGEBRA FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Description of patterns and relationships between quantities and ideas using symbols	Travelling -Marketing -Construction -Mountains and valleys -Hiring -Currency -Planning -Agriculture -Politics -Loan scheme and leasing -Growth -Banking -Transport	Interpretation of algebraic models Determination of quantities from algebraic models Representing quantities and relations	Determine the relationship between the area of a rectangular garden and its sides -Find expenses or total cost for an event -Find the profit on a given sale -Find income for a given business enterprise -Determine the number of article bought from the total cost -Find change in prices -Express the cost of renting a car in terms of number of hours or days and caution -Write total amount spent in terms of unit cost and number of articles -Calculate simple and compound interest	VI. POLYNOMIALS -Polynomials of degree less than or equal to 3; -Polynomial functions -Remainder and factor theorems;	-Divide a polynomial by another where the degree of the divisor is lower or the same; -Use the remainder theorem to find the remainder when any polynomial is divided by a linear polynomial; -Use the factor theorem to factorize polynomials up to cubic expressions; -Solve cubic equations.		

TABLE 2 cont': ALGEBRA FORM 4

Contextual framework		Competences		Resources								
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources					
Description of patterns and relationships between quantities and ideas using symbols	Travelling	□ Determination of numbers;	□ Determine the relationship between the area of a rectangular garden and its sides -Find expenses or total cost for an event -Find the profit on a given sale -Find income for a given business enterprise -Determine the number of article bought from the total cost -Find change in prices -Express the cost of renting a car in terms of number of hours or days and caution -Write total amount spent in terms of unit cost and number of articles -Calculate simple and compound interest	VII. ELEMENTARY GROUP THEORY -Binary operations; -Operation tables; -Properties of binary operations: closure, identity element, inverse element, associativity law; commutative law -Definition of a group; -Order of a group; -Sub group of a group -Abelian group;	-Carry out simple binary operations -State and verify the properties of a binary operation(closure, associative law, commutative law; -Determine the identity element e for a given binary operation if it exists; -Determine the inverse element a^{-1} for an element of the set S under operation $*$ such that $a * a^{-1} = e$; -Draw up operation tables -Verify whether a set S and a binary $*$ forms a group $(S,*)$; -Justify that a given group $(S,*)$ is an Abelian group; -Determine proper and improper subgroups for any given group;	Develop: spirit of critical thinking, sense of order and of method, Sense of rigour and being concise. Be curious while reading a text containing numbers.	Documentation. Calculator. Tables. Materials for experimentation Thermometer.					
	-Marketing											
	-Construction											
	-Mountains and valleys											
	-Hiring	□ identification of objects using numbers ;										
	-Currency											
	-Planning											
	-Agriculture											
	-Politics	□ Read and write information containing numbers;										
	-Loan scheme and leasing											
	-Growth											
	-Banking											
	-Transport	□ Verbal interaction on information containing numbers;										

MODULE 3

PLANE GEOMETRY, FORM 4

Credit: 22 Hours / 2 teaching periods a week

GENERAL PRESENTATION

All what was done from plane figures, angles, metric system and circles form basic knowledge and skills necessary to continue this module on geometry. This module continues with some aspects of vectors and vector geometry. It goes further to simple transformation and coordinate geometry. 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 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 vectors 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 due to 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. Vectors and trigonometry are used in Physics while transformation, circle are applied in other science subjects. The earth as a sphere shows the application of Mathematics to understand nature. Transformation is used by computer and video game programmers to, create patterns for animations. The learning of plane geometry provides the basic knowledge and skills needed to study 3-dimensional geometry.

CONTRIBUTION OF MODULE TO AREAS OF LIVING

The study of this module enables the learners to:

- Develop the ability to visualize, reason and justify,
- Interpret, understand, classify, appreciate and describe the world through 2- dimensional shapes, their locations, movement and relationships.

By these, they should be able for example to use national flags to demonstrate transformations 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. The learner each 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 analysing 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

TABLE 3: PLANE GEOMETRY FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	The map of a town, country or continent	-Recognition plane shapes and transformation within the environment	Determine measures of similar containers	VIII. COORDINATE GEOMETRY -Rectangular or Cartesian coordinates; -Distance between two points; -The straight line and its equation; -The coordinates of the mid-point joining two points; -Centroid of a triangle; -Area of a triangle given the coordinate of the vertices; -Intersection of two lines; -Angle between two lines; -Distance from a point to a line; -Parallel and perpendicular lines. -Internal division of a line segment by a point.	-Determine distance between two points -Determine coordinates of midpoint of line segment; -Calculate gradient of a line; -State conditions for two lines to be parallel or to be perpendicular; -State conditions for points to be collinear; -Determine the equation of a straight line using (i) gradient-intercept form, (ii) gradient and one point form (iii) two points form; -Say whether two lines intersect or not; -Determine coordinates of point of intersection of two lines;	- 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
	-Model of a building	-Scale drawing	-Cut out into similar shapes				
	-Travelling	-Production of planes shapes	-Make model of a car				
	-Demarcation of land boundaries	Determination of measures	-Identify objects using shape and size				
	-Putting a ceiling		-Draw a motive for decoration				
	-Art or design		-Find distance				
	-Designing a dress		-Draw a plan for a house				
	-Mapping a town		-Locate one self in an area				
	-Building		-Find the height of a building or of a flag pole ;				
	-Surveying						
	-Location						

TABLE 3 cont': PLANE GEOMETRY FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	The map of a town, country or continent -Model of a building -Travelling -Demarcation of land boundaries -Putting a ceiling -Art or design -Designing a dress -Mapping a town -Building -Surveying -Location	-Recognition plane shapes and transformation within the environment -Scale drawing -Production of planes shapes Determination of measures	Determine measures of similar containers -Cut out into similar shapes -Make model of a car -Identify objects using shape and size -Draw a motive for decoration -Find distance -Draw a plan for a house -Locate one's self in an area -Find the height of a building or of a flag pole or of a radio or Tv antenna		- Determine angle between two lines. -Determine the centroid of a triangle given the coordinates of the vertices; -Calculate the area of a triangle given the coordinates of the vertices of the triangle; -Use straight line graphs to solve real life problems; -Determine equation of a line perpendicular to a given line; NB: The $y = mx + c$ and $y - y_1 = m(x - x_1)$ forms of the equation of a straight line are expected to be used. - Divide a line segment internally and externally	- 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 3 cont': PLANE GEOMETRY FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	The map of a town, country or continent	-Recognition of plane shapes and transformation within the environment	Determine measures of similar containers	IX. APPLICATION AND TRANSFORMATION IN THE 2-D PLANE. -Application and interpretation of 2×2 matrices; -Transformations in a plane associated with 2×2 matrices: translation, enlargements, reflections, rotations, stretch and shears; -Combination of transformations; -Invariant properties of simple rectilinear figures under transformations; -The invariant point or invariant line - Geometrical transformations without the use of matrices.	-invariant and inverse of a matrix. -Describe any given transformation; -Describe complete successful transformation; - Describe a transformation in matrix form; -Determine the determinant and inverse of a transformation; -Find and draw the image of a point or object under a transformation whose matrix is given; -Determine the transformation matrix from the coordinates of the object and those of its image; -Composite transformation. -Determine the matrix representing a combination of transformation. -A transformation T followed by a rotation R will be written as RT ; -Determine the area of the image figure using the relationship: $ ad - bc = \frac{\text{area of image figure}}{\text{area of original figure}}$ -Determine the invariant line for a given transformation;	- 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
	-Model of a building	-Scale drawing	-Cut out into similar shapes				
	-Travelling	-Production of planes shapes	-Make model of a car				
	-Demarcation of land boundaries	Determination of measures	-Identify objects using shape and size				
	-Putting a ceiling		-Draw a motive for decoration				
	-Art or design		-Find distance				
	-Designing a dress		-Draw a plan for a house				
	-Mapping a town		-Locate one's self in an area				
	-Building		-Find the height of a building or of a flag pole or of a radio or TV antenna				
	-Surveying -Location						

TABLE 3 cont': PLANE GEOMETRY FORM 4

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	The map of a town, country or continent	-Recognition of plane shapes and transformation within the environment	Determine measures of similar containers	X. VECTORS -Scalar and vector quantities, equality of vectors, magnitude (modulus) direction and sense of a vector. -The addition and subtraction of vectors and the multiplication of a vector by a scalar; -Dot product of two vectors. -Vector equation of a straight line: $(\vec{r} = \vec{a} + t\vec{b}$ where $\vec{a}$ is the position vector and $\vec{b}$ the direction vector) -Median and centroid of a triangle. -Angle between two vectors -Use of vectors to establish simple properties of geometrical figures; -Components of a vector; -Position vectors; -The unit vectors: $\vec{i}$ and $\vec{j}$	-Give examples of vector quantities such as velocity; -Represent vectors in column form in an orthonormal reference system (O, $\vec{i}$, $\vec{j}$). -Denote vectors either by a single letter $\vec{u}$ ($\vec{u}$ or $\underline{u}$) or by two letters: $\overrightarrow{AB}$ or $\underline{AB}$. -Determine the modulus or magnitude of a vector; -Multiply a vector by a scalar; -Give the conditions for vectors to be collinear; -Draw vector equivalent to a given vector -Construct accurate vector diagrams; -Resolve a given vector into its component -Express a given vector in terms of unit vectors; -Show that two points are collinear; NB: Knowledge of the fact if $a_i\vec{i} + b_1\vec{j} = a_2\vec{i} + b_2\vec{j}$ then $a_1 = a_2$ and $b_1 = b_2$ is expected. The simple properties will in general involve co linearity and concurrency.(point of intersection)	- 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
	-Model of a building	-Scale drawing	-Cut out into similar shapes				
	-Travelling	-Production of planes shapes	-Make model of a car				
	-Demarcation of land boundaries	Determination of measures	-Identify objects using shape and size				
	-Putting a ceiling		-Draw a motive for decoration				
	-Art or design		-Find distance				
	-Designing a dress		-Draw a plan for a house				
	-Mapping a town		-Locate one's self in an area				
	-Building		-Find the height of a building or of a flag pole or of a radio or TV antenna				
	-Surveying						
	-Location						

MODULE 4

PLANE GEOMETRY, FORM 5

Credit: 48 hours / 2 teaching periods a week

TABLE 4: PLANE GEOMETRY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	The map of a town, country or continent -Model of a building -Travelling -Demarcation of land boundaries -Putting a ceiling -Art or design -Designing a dress -Mapping a town -Building -Surveying -Location	-Recognition plane shapes and transformation within the environment -Scale drawing -Production of planes shapes Determination of measures	Determine measures of similar containers -Cut out into similar shapes -Make model of a car -Identify objects using shape and size -Draw a motive for decoration -Find distance -Draw a plan for a house -Locate one's self in an area -Find the height of a building or of a flag pole or of a radio or a TV antenna	XI. FORCES -Force as a vector; -Coplanar forces; the resultant of two coplanar forces -Resolution of forces into components: parallelogram law of forces, Triangle law of forces, Lami's theorem; -Moment of a force: moment of a force in component form about the origin; -Simple cases of equilibrium of particles and rigid bodies under coplanar forces; -Friction;	-List some types of forces(weight, normal contact force, tension, friction, thrust) -Resolve the force F into two components by the use of force diagrams - Perpendicular components are $ F \cos \theta$, $ F \sin \theta$; -Carry out calculations involving forces; -Determine the resultant force F of two forces(like parallel, unlike parallel forces) -Use parallelogram law of forces; -Solve problems involving three forces graphically; -Determine the moment of a force(turning effect) about an axis;	- 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 4 cont': PLANE GEOMETRY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of shapes within the environment	The map of a town, country or continent	-Recognition plane shapes and transformation within the environment	Determine measures of similar containers	XII. CIRCULAR MEASURE AND TRIGONOMETRY -Definition of radian -Radian measure: arc length, area of sector and area of segment -The three basic trigonometric ratios of angles up to $360^\circ(2\pi)$ and those of their reciprocals; -Special angles: trigonometric ratios for the angles: $0, 30^\circ, 45^\circ, 60^\circ, 90^\circ$ and their associates; -Angles measured in the clockwise direction and anti-clockwise direction; -Graphs of $y = \sin x, y = \cos x, y = \tan x$ and their composites; and their periodicities; -Graphs of composite of the trigonometric functions;	-Convert some common angles to radians: $90^\circ = \frac{\pi}{2}, 180^\circ = \pi, 360^\circ = 2\pi$ etc -Calculate length of an arc subtending an angle θ at the centre; -State and apply the three main trigonometric ratios of angles up to $360^\circ (2\pi)$; -Determine trigonometric ratios for angles $0, 30^\circ, 45^\circ, 60^\circ, 90^\circ$, 180° and trigonometric ratios of their reciprocals; -State and apply the sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$; -State and apply the cosine rule : $a^2 = b^2 + c^2 - 2bc\cos A$, $b^2 = c^2 + a^2 - 2ac\cos B$ and $c^2 = a^2 + b^2 - 2ab\cos C$ -Calculate area of triangle using Heron's formula: $A = \sqrt{(s - a)(s - b)(s - c)}$ Where $s = \frac{1}{2}(a+b+c)$ -Area given sides plus included angle -Draw graphs of $y = \sin x, y = \cos x, y = \tan x$ and their composites;	- 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
	-Model of a building	-Scale drawing	-Cut out into similar shapes				
	-Travelling	-Production of planes shapes	-Make model of a car				
	-Demarcation of land boundaries	Determination of measures	-Identify objects using shape and size				
	-Putting a ceiling	-Recognition plane shapes and transformation within the environment	-Draw a motive for decoration				
	-Art or design	-Scale drawing	-Find distance				
	The map of a town, country or continent	-Production of planes shapes	-Draw a plan for a house				
	-Model of a building	-Locate one's self in an area	-Locate one's self in an area				
	-Travelling	-Find the height of a building or of a flag pole or of a radio or a TV antenna	-Find the height of a building or of a flag pole or of a radio or a TV antenna				
	-Demarcation of land boundaries	Determine	Determine				
Representations and transformation							

of plane shapes within the environment	-Putting a ceiling -Art or design -Designing a dress -Mapping a town -Building -Surveying -Location	Determination of measures	measures of similar containers -Cut out into similar shapes -Make model of a car -Identify objects using shape and size -Draw a motive for decoration -Find distance Determine: - The tripling time of an investment - The loudness of an airplane during take off, - The magnitude of an earth quake - The PH of eggs - The doubling time of an investment;	-Relationships between trigonometric ratios; the $\sin^2x + \cos^2x = 1$, $\frac{\sin x}{\cos x} = \tan x$ -Compound angle identities, double angle identities, -Application to simple problems in two dimensions: solution of triangles, Hero's formula; -Treat trigonometric inequalities graphically XII. DIFFERENTIATION - Determining limiting value of functions in the neighbourhood of a point. -The derivative defined as a limit;	-Determine maximum and minimum values of trigonometric functions such as: $a\sin\theta + b\cos\theta = c$ -Solve simple trigonometric equations of the form: $\sin x = b, \cos x = c, \tan x = d$ where $b, c, d \in \mathbb{R}$ and give their general solutions -Solve trigonometric equations in $[0, 2\pi]$ Establish trigonometric ratios for negative angles (use of quadrants) NB/ The use of quadrants, complementary angles are expected. General proofs of sine and cosine formulae will not be required. -Treat simple trigonometric inequalities graphically e.g. $\sin x \leq \frac{1}{2}$. -Denote gradient function $f'(x) = \frac{dy}{dx}$ -Differentiate algebraic functions from first principle; -Differentiate function of a function; -Apply gradients, stationary points, tangents and normals;		
Representations and transformation	- Find the number of bacteria in a certain bacterial culture; -Measurements; -Find total value of an investment at the end of a defined period; -Calculate the amount to be	Numerical methods □ Verbal interaction on information containing numbers ;	□ Draw up a bill; □ calculate the sum at stake for a transaction; □ Calculate maximum volume of cuboids □ Calculate the number of articles			Sense of organization -Precision -Sense of	-Calculator - Graph board -Data from environment -Charts illustrating various data -News paper

of plane shapes within the environment	-Daily movements; -Agriculture -Stock management; -Use of public and private services -Navigation -Price evolution. -Aviation -Economics -Banking -Engineering -Aviation Find the number of bacteria in a certain bacterial culture; -Measurements; -Find total value of an investment at the end of a defined period; -Calculate the amount to be paid at each instalment;	□ Representation and treatment of information and quantities;	-Calculate: areas, volumes of revolutions, mean values, centroids, centre of gravity, length of curves etc. Determine: - The tripling time of an investment - The loudness of an airplane during takeoff, - The magnitude of an earth quake - The PH of eggs - The doubling time of an investment; □ Draw up a bill; □ calculate the sum at stake for a transaction; □ Calculate maximum volume of cuboids □ Calculate the number of articles to be produced so as to realize maximum profit -Calculate the slope of a curve at a given point -Calculate marginal cost -Calculate: areas, volumes of revolutions, mean values, centroids, centre of gravity, length of curves etc.	-Indefinite and definite integrals; -Application of integration: area under a curve, area between two curves,	curve, and area bounded by two curves;		various presentations of data
Representations and transformation of plane shapes within the environment	-Daily movements; -Agriculture -Stock management; -Use of public and private services -Navigation -Price evolution. -Aviation -Economics -Banking -Engineering -Aviation	- Numerical methods □ Verbal interaction on information containing numbers ; □ Representation and treatment of information and quantities		XIV. APPLICATION OF CALCULUS -Rate of change -Connected rates of change; -Solids of revolution; -Centre of mass of uniform laminae; -Centre of mass of points distributed in a plane;	-Determine rate of change of one quantity with respect to another; -Determine distance, velocity, acceleration of a moving body; -Determine percentage change of one quantity with respect to another; -Calculate volumes of solids of revolution; NB: simple cases only.	- Sense of organization -Precision -Sense of good judgement -Critical thinking -Vigilant -Patient -Politeness	-Calculator - Graph board -Data from environment -Charts illustrating various data -News paper - Computer - National department of statistics -Students -Data from the environment -Charts illustrating various presentations of data

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Representations and transformation of plane shapes within the environment	town, country or continent	-Recognition plane shapes and transformation within the environment	Determine measures of similar containers	XV. DYNAMICS -Kinematics of a moving particle in a straight line; -Speed, velocity and acceleration when position is a function of time or simple examples of the equations: $a = \frac{dv}{dt} = \frac{d^2s}{dt^2}$ and their solutions; -Displacement, velocity and acceleration as vectors; -Relative velocity; -Newton's laws of motion; -Momentum and impulse; -Momentum as a vector; -The impulse-momentum principle; -Conservation Linear momentum	Draw distance-time graphs and velocity-time graphs; -Determine the area under a velocity-time graph(distance covered); -Set up and solve problems of motion in one dimension; -State and use Newton's laws of motion; -Determine the velocity of a body relative to that of another; -Determine the momentum of a moving object; -Determine the change of momentum(impulse) after collision; NB: Problems will include motion of connected particles over a smooth single pulley. Problems involving Newton's law of restitution will not be set.	Sense of organization -Precision -Sense of good judgement -Critical thinking -Vigilant -Patient -Politeness	-Calculator - Graph board -Data from environment -Charts illustrating various data -News paper - Computer - National department of statistics -Students -Data from the environment -Charts illustrating various presentations of data;
	-Model of a building -Travelling -Demarcation of land boundaries -Putting a ceiling -Art or design	-Scale drawing -Production of planes shapes Determination of measures	-Cut out into similar shapes -Make model of a car -Identify objects using shape and size -Draw a motive for decoration -Find distance -Draw a plan for a house -Locate one self in an area -Find the height of a building or of a flag pole or of a radio or TV antenna Determine measures of similar containers Determine: - The tripling time of an investment - The loudness of an airplane during takeoff, - The magnitude of an earth quake				
Representations and transformation of plane shapes	Find the number of bacteria in a certain bacterial culture;	Numerical methods				Sense of organization	-Calculator - Graph board

MODULE 5

STATISTICS AND PROBABILITY, FORM 5

Credit: 36 hours / 2 teaching periods a week

TABLE 5: STATISTICS AND PROBABILITY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
Organization of information and estimation of quantities in the consumption of goods and services	-Census of a population by 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	-Organization, 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) -Result of football matches -Display a month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor bike -Choose a career - Analyse data collected for a project - Report on epidemics	XVII. DESCRIPTIVE STATISTICS -Types of variables -Collection , classification and tabulation of statistical data; -Data representation, pie chart, pictogram, histogram, bar charts and line graphs -Frequency distribution, -Grouped frequency distribution; -Cumulative frequency distribution; -Cumulative frequency curves (orgive)	-Classify data as either qualitative or quantitative data; -Represent data using different types of data representation(grouped) and ungrouped data) -Draw histogram of equal class intervals -Draw frequency polygon; -Draw up a cumulative frequency table; -Cumulate frequency curves (ogives); -Contrast between good and misleading representation. NB: Realistic data should be used. Candidates should participate in collecting data.	- Sense of organization -Precision -Sense of good judgement -Critical thinking -Vigilant -Patient - Politeness	-Calculator - Graph board -Data from environment -Charts illustrating various data -News paper - Computer - National department of statistics -Students -Data from the environment -Charts illustrating various presentations of data;

Contextual framework		Competences		Resources			
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TABLE 5 cont': STATISTICS AND PROBABILITY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
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TABLE 5 cont': STATISTICS AND PROBABILITY FORM 5

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TABLE 5 cont': STATISTICS AND PROBABILITY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
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TABLE 5 cont': STATISTICS AND PROBABILITY FORM 5

Contextual framework		Competences		Resources			
Family of situations	Examples of situations	Categories of actions	Actions	Core knowledge	Skills	Attitudes	Other resources
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Organization of information and estimation of quantities in the consumption of goods and services	-Census of a population by 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 sex, age	Organization, presentation and exploitation of information Interpretation of results -Taking chances Organization, presentation	-Record production of crude oil by some countries -Compile results (exams, elections etc) -Result of football matches -Display a month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor bike -Choose a career - Analyse data collected for a project. -Record yearly rainfall -Record production of crude oil by some countries	XX. ELEMENTARY NOTIONS OF DISCRETE PROBABILITY DISTRIBUTION -Elementary notions of discrete probability distributions. -The binomial distribution.	<u>-Elementary distributions</u> i) Discrete random variables, if x is a discrete random variable which takes values $x_1, x_2, \dots, x_n$ then $\sum_{n} P(X = x) = 1.$ ii) Draw probability distributions as a table with associating probabilities to the random variable including cumulative probability distribution table. iii) State the mode and calculate the median, mean, variance and standard deviation of discrete random variable. IV) Define and state the properties of a binomial distribution knowing the meaning of the probability of success and failure. $X \sim \text{Bin}(n, p) = P(X = x) = {}^nC_x p^x q^{n-x} \text{ where}$ $x = 0, 1, 2, \dots, n \text{ for } n \leq 10$ v) Using binomial distribution to solve simple problems of probability; vi) Calculate the mean and variance of a binomial distribution ($\mu = np$ and $\sigma^2 = npq$) NB Proofs of mean and variance of binomial	Sense of organization -Precision -Sense of good judgement -Critical thinking -Vigilant -Patient -Politeness Sense of organization	-Calculator - Graph board -Data from environment -Charts illustrating various data -News paper - Computer - National department of statistics -Students -Data from the environment -Charts illustrating various presentations of data; -Calculator
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Organization of information and estimation of quantities in the consumption of goods and services	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	and exploitation of information Interpretation of results -Taking chances	-Compile results (exams, elections etc) -Result of football matches -Display a month's sales by a shop -Compare production or events -Forecast weather or election result -Record number of accidents by motor bike -Choose a career - Analyse data collected for a project.		distribution not required. Questions will not be set on rectangular geometric and Poisson distribution. -Including knowledge , but not proof of the mean, np, and the standard deviation $\sqrt{npq}$ of the binomial distribution.	-Precision -Sense of good judgement -Critical thinking -Vigilant -Patient -Politeness	- Graph board -Data from environment -Charts illustrating various data -News paper - Computer - National department of statistics -Students -Data from the environment -Charts illustrating various presentations of data
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FOR FORM FIVE ONLY: TOTAL NUMBER OF HOURS IS $36 + 56 = 92$. (MODULE 4 TAKES 56 HOURS WHILE MODULE 5 TAKES 36 HOURS) THIS EXCEEDS THE 66 HOURS ORIGINALLY MEANT FOR THE ENTIRE COURSE. THIS IS BECAUSE DYNAMICS, FORCES, WORK, ENERGY AND POWER IN MODULE 4 ARE TAUGHT SIMULTANEOUSLY WITH STATISTICS, PROBABILITY AND ELEMENTARY PROBABILITY DISTRIBUTION IN MODULE 5.

Article 2 : Les programmes visés à l'article premier ci-dessus entrent en vigueur à compter de la rentrée scolaire 2018-2019.

Article 3 : Sont abrogées toutes les dispositions antérieures contraires aux termes du présent arrêté.

Article 4 : L'Inspecteur Général des Enseignements, les Inspecteurs Coordonnateurs Généraux de Pédagogie, le Directeur de l'Office du Baccalauréat, les Délégués Régionaux et Départementaux des Enseignements Secondaires, les Secrétariats à l'Education des différents ordres d'Enseignements Privés, les Chefs d'établissements Privés et Publics, sont chargés, chacun en ce qui le concerne, de la stricte application du présent arrêté qui sera enregistré, publié selon la procédure d'urgence, puis inséré au journal officiel en Anglais et en Français, et communiqué partout où besoin sera.

Fait à Yaoundé, le 22 AOUT 2018

LE MINISTRE DES ENSEIGNEMENTS SECONDAIRES



Nalova Lyonga, Ph. D

Ampliations :

- PM (ATCR)
- CAB/MINESEC
- SEESN
- IGE
- ICG(s)
- DAJ
- DESG
- DESTP
- DIR. OBC
- REGISTRAR GCE BOARD
- DRES
- DDES
- SECRÉTARIATS A L'EDUCATION
- CHEFS D'ETABLISSEMENTS
- CHRONO/ARCHIVES