

MATHEMATICS S4-S6 SYLLABUS

FOR ACCOUNTING PROFESSION OPTION

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FOREWORD

Rwanda Basic Education Board (REB) is honored to avail the Mathematics Syllabus for the Accounting Profession Option. This syllabus serves as official guide to teaching and learning of Mathematics in the Accounting Program. It ensures consistency and coherence in the delivery of quality education for the Technician Accountant that the country deserves.

The Ministry of Education, through Rwanda Basic Education Board (REB), has undertaken the task to introduce the professional accounting Program in the second cycle of secondary education level. The underlying principle behind the introduction of this program is to ensure that the curriculum responds to the needs of the students, the society, and the labor market.

Mathematics is one of subjects of Competence Based Curriculum that contributes to shape the students with required knowledge, skills, attitudes, and values to produce well-trained Technician accountants at Secondary school level. High Quality Technician Accounting program is an important component of Finance and Economic development of the Rwanda Vision 2050, “*The Rwanda We Want*” that aims at transforming the country’s socioeconomic status. It is only the qualified Technician accountant who can significantly play a major role in this socioeconomic transformation journey. Mathematics subject teaches the mathematical operations, algebraic functions and equations, and basic statistics to train a Technician Accountant capable of successfully perform his/her duties.

The ambition to develop a knowledge-based society and the growth of regional and global competition in the jobs market has necessitated the shift to a competence-based syllabus. With the help of the teachers, whose role is central to the success of the syllabus, students will gain appropriate skills and be able to apply what they have learned in real life situations. Hence they will make a difference not only to their own lives but also to the success of the nation.

I wish to sincerely extend my appreciation to the people who contributed towards the development of this mathematics, particularly REB and its staff who organized the whole process from its inception. Special appreciation goes to the development partners who supported the exercise throughout.

Any comments or contributions towards the improvement of this syllabus for the next edition are welcome.

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I wish to sincerely express my special appreciation to the people who played a role in the development of Mathematics syllabus. The process would not have been successful without the support from different stakeholders.

I wish to sincerely express my appreciation to the people who contributed to the development of this syllabus until its completion. These are the ICPAR, REB, Allan & Gill Gray Philanthropy Rw, Educate!, public and private Universities , Public and Private secondary schools, Independent Consultant companies who availed their staff at various stages of the development of this syllabus.

Furthermore, I owe gratitude to different partners, especially the Ministry of Education (MINEDUC) and the Ministry of Finance and Economic Planning (MINECOFIN) for their guidance, expertise and technical support.

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1. GENERAL INTRODUCTION

1.1 Background on introduction of the Accounting Profession Option in secondary schools

The National strategic for Transformation (NST1) states that, for Rwanda to become a Knowledge based economy; one of the targets is to avail a competent and skilled workforce with capable and performing organizations.

The Education Sector Strategic Plan (2018/19–2023/24) accommodates new thinking and policy directions that will support Rwanda's aspirations for transformation from a predominantly agrarian-based, low-income economy to an industrial upper middle-income nation by 2035. This vision is premised on the ability of Rwanda's education system to produce enough and appropriately skilled workforce capable of realizing this aspiration, as well as upgrading the skills and competencies of the existing workforce.

In this regard, a competency proficiency assessment carried out indicated that majority of the current Public Financial Management (PFM) staff in public entities do not have the required skills to achieve excellent performance in the PFM system necessary to move the country to the next level of becoming a middle-income country.

An analysis of approved organizational structures of public entities and subsidiary entities show that to achieve a critical mass of PFM staff across the PFM disciplines, the government requires training of 8,441 staff to be employed in the public entities and the subsidiary entities (MINECOFIN, 2018-2024, Public Financial Management Learning and Development Strategy).

From this perspective, the Ministerial Order N° 002/MINEDUC/2021 of 20/10/2021 establishing curriculum in general, professional and technical and vocational basic education introduced the **Accounting Profession Option** under the management of Rwanda Basic Education Board (REB).

Accounting Profession Option is being introduced to provide the support needed in accounting, with capacity to progress in different advanced accounting professions. This decision aims to meet the current and contextual accounting needs that present high demand to provide the accountant technicians at different levels of the accounting system, particularly in the community.

For implementation of the above mentioned Ministerial order, the Mathematics syllabus is developed to help learners in Accounting Profession option to become competent accountant technicians.

The motive of developing mathematics is to ensure that the syllabus is responsive to the needs of the student and to shift from objective and knowledge-based learning to competence-based learning. Emphasis in the development of this syllabus is put more on skills, competences

and the coherence within the existing content by benchmarking with syllabi elsewhere with best practices.

The Mathematics syllabus guides the interaction between the teacher and the students in the learning processes and highlights the competences a student should acquire during and at the end of each unit of learning.

Students will have the opportunity to apply Mathematics in different contexts that involve production, Finance and Economics and see its importance in daily life. Teachers shall help the students appreciate the relevance and benefits for studying this subject at an advanced level. This syllabus is prepared to be taught in three periods a week in the Accounting Profession Option.

1.2 Accounting Profession Option leaver's profile

Upon completion of upper secondary education in accounting, the student should have acquired relevant knowledge, skills and attitudes to:

1. Prepare, analyse and interpret financial statements.
2. Apply the key features of the taxation system and compute tax liabilities.
3. Apply auditing principles.
4. Apply basic principles of Management accounting.
5. Act in accordance with the fundamental principles of personal and ethical behaviour.
6. Apply digital and data technologies relevant to finance activities.
7. Develop and maintain effective stakeholder relationships.
8. Manage human and financial resources effectively and efficiently.
9. Express themselves fluently with confidence in official languages.
10. Demonstrate appropriate civic and moral norms and values of the society.
11. Contribute to the development of the country through acquisition of financial, vocational, and entrepreneurial skills in the business

development.

12. Demonstrate knowledge and skills required to progress to the next career path

2. TEACHING AND LEARNING MATHEMATICS

2.1 Rationale of teaching and learning Mathematics

2.1.1. Mathematics and society

Mathematics plays a vital role in Accounting Profession Option. Since people's lives are involved, it is crucial that Accountants are really accurate with their financial calculations and related scenarios to ensure quality and professional works through data collection, data handling, data/graph analysis, and interpretation as well as drawing appropriate decisions. Accountants use Mathematics when they make all production, financial and economical related activities that include the interpretation and analysis of functions on supply and demand, revenue, cost, and profit, etc.

In addition, Mathematics plays an important role in social sciences. The applied mathematics like statistics and probability play an important role in game theory, in the national census process, in scientific research, etc. while basic concepts of algebra are very important in financial mathematics and related areas. Furthermore, some cross-cutting issues such as financial awareness, environment and sustainability are incorporated in Mathematics to improve social and economic welfare of the Rwandan society.

Mathematics is key to the Rwandan education ambition of developing a knowledge-based and technology-led economy since it provides to students all required knowledge and skills to be used in different learning areas. Therefore, Mathematics is an important subject as it supports other subjects. This mathematics syllabus provides appropriate skills, attitudes, and values needed by Accountant Technicians.

2.1.2. Mathematics and students

Students need enough basic mathematical competences to be effective members of Rwandan society including the ability to collect, arrange, analyze, interpret, present, estimate statistics, assess probabilities, and read the commonly used mathematical representations and graphs to inform decision makers and citizen. Therefore, Mathematics equips students with knowledge, skills and attitudes necessary to enable them to succeed in an era of rapid technological growth, production, finance and socio-economic development. Mastery of basic Mathematical ideas and calculations makes students being confident in problem-solving. It enables the students to be

systematic, creative and self-confident in using mathematical language and techniques to reason logically; think critically; develop imagination, initiatives and flexibility of mind. In this regard, learning Mathematics needs to include practical problem-solving activities with opportunities for students to plan their own investigations from identifying alternatives in order to develop their mathematical competence and confidence to make reliable and feasible decisions. As new technologies have had a dramatic impact on all aspects of life, wherever possible in Mathematics, students should gain experience of a range of ICT equipment, financial software and applications.

2.2 Competences

Competence is defined as the ability to perform a particular task successfully, resulting from having gained an appropriate combination of knowledge, skills, attitudes, and values. This syllabus gives the opportunity to students to develop different competences, including basic and generic competences. Basic competences are addressed in the stated broad subject competences and in key competences highlighted on yearly basis and at the end of each learning unit. The generic competences that must be emphasized and reflected in the learning process are briefly described below and teachers will ensure that students are exposed to tasks that help them acquire the skills.

2.2.1. Generic Competences

Critical and problem-solving skills: Students use different techniques to solve mathematical problems related to production, financial or economical situations. They are engaged in mathematical thinking; they construct, symbolize, apply and generalize mathematical ideas. The acquisition of such skills will help students to think imaginatively and broadly to evaluate and find solutions to problems encountered in all financial situations.

Creativity and innovation: The acquisition of such skills will help students to take initiatives and use imagination beyond knowledge provided to generate new ideas and construct new concepts. Students improve these skills through project-based works and skill lab activities in mathematics.

Research: This will help students to find answers to questions basing on existing information, concepts and to explain phenomena basing on findings from information gathered.

Communication skills: Students effectively communicate their findings through explanations, constructive arguments and drawing relevant conclusions/ decisions. Teachers, irrespective of not being teachers of language, will ensure the proper use of the language of instruction by students which will help them communicate clearly and confidently and convey ideas effectively through speaking and writing and using the correct language structure and relevant vocabulary.

Cooperation, inter personal management and life skills: Students are engaged in cooperative learning groups to promote higher achievement than do competitive and individual work. This will help them to cooperate with others as a team in whatever task assigned and to practice positive ethical moral values and respect for the rights, feelings and views of others.

Lifelong learning: The acquisition of such skills will help students to update knowledge and skills with minimum external support and to cope with evolution of knowledge for personal fulfillment in areas that need improvement and development.

2.2.2. Broad Mathematics Competences

During and at the end of learning process, the students can:

1. Apply algebraic principles and concepts in solving mathematical problems that involve production, financial and economical situations
2. Use financial mathematics in solving and interpreting production, financial and economical related problems such as simple and Compound interests, annuity, sinking funds
3. Apply differentiation and integration in solving mathematical problems that involve finance, production and economics such as marginal cost, revenues and profits, elasticity of demand, and supply
4. Apply statistics and probability to collect, organise, analyse and interpret data and draw appropriate decisions
5. Use index number to interpret statistical data and draw appropriate decisions
6. Apply Matrices and determinants concepts in solving mathematical problems involving production, finance and economics such as inputs and outputs model, linear programming problems, etc.

2.2.3. Mathematics and Developing Competences

The national policy documents based on national aspirations identify some ‘basic competences’ alongside the ‘Generic competences’ that will develop higher order thinking skills and help students learn subject content and promote application of acquired knowledge and skills. Through observations, constructions, using symbols, applying and generalizing mathematical ideas, and presentation of information during the learning process, the student will not only develop deductive and inductive skills but also acquire

cooperation and communication, critical thinking and problem-solving skills. This will be realized when students make presentations leading to interpretations and conclusions at the end of each learning unit. This will be achieved through group work and cooperative learning which in turn will promote interpersonal relations and teamwork. The acquired knowledge in learning Mathematics should develop a responsible citizen who adapts to scientific reasoning and attitudes and develops confidence in independent reasoning. The student should show concern of individual attitudes, environmental protection and comply with the scientific method of reasoning. The scientific method should be applied with the necessary rigor, intellectual honesty to promote critical thinking while systematically pursuing the line of thought. The selection of types of learning activities must focus on what the students are able to demonstrate as competence throughout and at the end of the learning process.

2.3 Pedagogical approach

The change to a competence-based curriculum is about transforming learning, ensuring that learning is deep, enjoyable, and habit-forming.

In order for secondary school Accounting students to develop 21st century skills and technical accounting skills, the pedagogical structure of skills lab is provided in the learning and teaching activities. Skills lab is an easy method to change teacher's pedagogy from theory-based to competence-based instruction. Skills lab ensures teachers are accountable to completing all the learning activities and projects as outlined in the syllabus and it enables students acquire real life experiences. Students should engage in business clubs to guarantee that they practice real accounting profession.

2.3.1. Role of the student

In the competence-based curriculum, the student is the principal actor of his/her education. He/she is not an empty bottle to fill. Considering the initial capacities and abilities of the student, the syllabus lists under each unit, suggested engaging activities for the student in the learning process. The teaching- learning processes will be tailored towards creating a student's friendly environment basing on the capabilities, needs, experience and interests. Therefore, the following are some of the roles or the expectations from the students:

- Students construct the knowledge either individually or in groups in an active way. From the learning theory, students move in their understanding from concrete through pictorial to abstract. Therefore, the opportunities should be given to students to manipulate concrete objects and to use models.

- Students are encouraged to use hand-held calculator. This stimulates mathematics as it is really used, both on the job and in scientific applications. Frequent use of calculators can enhance students' understanding and mastering of arithmetic.
- Students work on one competence at a time in form of concrete units with specific learning objectives broken down into knowledge, skills, attitudes, and values.
- Students will be encouraged to do research and present their findings through group work activities.
- A student is cooperative: students work in heterogeneous groups to increase tolerance and understanding.
- Students are responsible for their own participation and ensure the effectiveness of their work.
- Students are encouraged to participate in the creation and the running of the Students Business Club (SBC) that will serve as a kind of an entrepreneurial platform in which they will apply all the skills and knowledge got from various Accounting subjects.
- Help is sought from within the group and the teacher is asked for help only when the whole group agrees to ask a question.
- The students who learn at a faster pace do the task alone and then the others merely sign off on it.
- Participants ensure the effective contribution of each member, through clear explanation and argumentation to improve the English literacy and to develop sense of responsibility and to increase the self-confidence, the public speech ability, etc.

2.3.2. Role of the teacher

In the competence-based curriculum, the teacher is a facilitator, organizer, advisor, a conflict solver, etc. He/she has to ensure that cross-cutting issues are addressed appropriately in teaching and learning process. The specific duties of the teacher in a competence-based approach are the following:

- He/she is a facilitator, his/her role is to provide opportunities for students to discuss problems that interest and challenge them and that, with appropriate effort, they can solve. This requires an elaborated/prepared plan of activities, related learning materials and appropriate learning environment.
- He/she is an organizer: his/her role is to organize the students in the classroom or outside and engage them through participatory and interactive methods during the learning processes as individuals, in pairs or in groups. To ensure that the learning is personalized,

active, participative and co-operative, the teacher must identify the needs of the students, the nature of the learning to be done, and the means to shape learning experiences accordingly.

- He/she is an advisor: he/she provides counselling and guidance for students in need. He/she comforts and encourages students by valuing their contributions in the class activities. Since every student is expected to have a viable business idea from Senior Four, which he/she will develop its business plan and implement, teachers are encouraged to provide continuous coaching throughout the entire cycle.
- He/she is a conflict-solver: most of the competence-based activities are performed in groups. The members of a group may have problems such as attribution of tasks; they should find useful and constructive the intervention of the teacher as a unifying element.
- He/she is ethical, and preaches by examples, being impartial, being a role-model, and caring for individual needs of students. Slow students and students with physical impairments are provided a special assistance through remedial activities or re-enforcement activities. One should notice that this list is not exhaustive.

2.3.3. Special needs education and inclusive approach

All Rwandans have the right to access education regardless of their different needs. The underpinnings of this provision would naturally hold that all citizens benefit from the same menu of educational programs. The possibility of this assumption is the focus of special needs education. The critical issue is that we have students who are totally different in their ways of living and learning. The difference can either be emotional, physical, sensory, and intellectual learning challenged traditionally known as mental retardation. These students equally have the right to benefit from the free and compulsory basic education in the nearby ordinary/mainstream schools. Therefore, the schools' role is to enroll them and set strategies to provide relevant education to them. The teacher therefore is requested to consider each student's needs during teaching and learning process. Assessment strategies and conditions should also be standardized to the needs of these students. Detailed guidance for each category of students with special educational needs is provided for in the guidance for teachers.

2.4. Assessment approach

Assessment is the process of evaluating the teaching and learning processes through collecting and interpreting evidence of individual student's progress in learning and to make a judgment about a student's achievements measured against defined standards. Assessment is an integral part of the teaching and learning processes. In the competence-based curriculum assessment must also be competence-based; whereby a student is given a complex situation related to his/her everyday life and asked to try to overcome the situation by applying what

he/she learned.

Assessment will be organized at the following levels: Comprehensive assessment (School--based assessment, District based assessment, National based assessment) and National examinations. The syllabus is assessed by a three-hour closed book examination. The pass mark is 50%.

Weighting of assessments

Category of assessment	Level of assessment	Weight
Comprehensive assessment	School based assessment	10%
	District based assessment	
	National based assessment	
National examination	Practical assessment	30%
	Theoretical assessment	60%

2.4.1. Structure and format of the examination

There will be one paper in Mathematics subject. An examination of three (3) hours will be set and will consist three sections, “A”, “B” and “C”.

Section A

All questions in section “A” will be compulsory and will require clear and brief answers. This section will carry 40 marks. The questions will be set to give candidates the opportunity to read extensively and express informed, critical thinking, innovative and creative and relevant responses to issues relating to the overall student’s level of knowledge, understanding and comprehension of the syllabus topics and objectives. In addition, the first section will be composed with short answers items/ short calculations which include the questions testing for knowledge and understanding, investigation of patterns, quick calculations and applications of basic mathematical skills in production, finance and economics.

Section B

This section will be general in nature and require candidates to draw on their knowledge from across the syllabus while demonstrating an ability to explain, discuss, examine, apply, analyze, synthesize, evaluate, describe and show support for significant issues related to entrepreneurial, and real life activities. This section will carry 30 marks and students will answer a given number of questions as instructed. The ability to convey a sustained and well thought out argument will be credited.

Section C

This section will be specific in nature and require candidates to draw on their knowledge from across the syllabus while demonstrating an ability to design, invent, produce, devise, develop, propose, generate, reconstruct, plan, and apply significant issues related to entrepreneurial, and real activities. This section will carry 30 marks and students will answer a given number of questions as instructed.

Furthermore, the second and third sections will be composed with long answer items or answers with constructions, more calculations, investigation of patterns and generalization, analysis, interpretation and drawing conclusions. The items for the second and third sections will emphasize on the mastering of Mathematics facts, the understanding of Mathematics concepts and applications in production, finance and economics. In this sections, the assessment will find out not only what skills and facts have been mastered, but also how well students understand the process of solving a mathematical problem and whether they can link the application of what they have learned to the context or to the real-life situations.

The following topic must be assessed: Basic concepts of Algebra; Polynomial functions, equations and inequalities, Exponential / logarithmic functions and equations, Limits of polynomial, logarithm, exponential functions, and applications, Financial Mathematics, Matrices and determinants, Differentiation/derivatives, Index numbers and application, Integrals/ anti-derivatives, linear programming, statistics and probability. Topics with more weight will have more emphasis in the second and third sections.

2.4.2. Types of Assessment

a) Formative Assessment

Formative assessment helps to check the efficiency of the process of learning. It is done within the teaching/learning process. Continuous assessment involves formal and informal methods used by schools to check whether learning is taking place. When a teacher is planning his/her lesson, he/she should establish criteria for performance and behavior changes at the beginning of a unit. Then at the end of every unit, the teacher should ensure that all the students have mastered the stated key unit competences basing on the criteria stated,

before going to the next unit. The teacher will assess how well each student masters both the subject and the generic competences described in the syllabus and from this, the teacher will gain a picture of the all-round progress of the student. The teacher will use one or a combination of the following: (a) Observation (b) Pen and Paper (c) Oral questioning.

b) Summative assessment

When assessment is used to record a judgment of a competence or performance of the student, it serves a summative purpose. Summative assessment gives a picture of a student's competence or progress at any specific moment. The main purpose of summative assessment is to evaluate whether learning objectives have been achieved and to use the results for the ranking or grading of students, for deciding on progression, for selection into the next level of education and for certification. This assessment should have an integrative aspect whereby a student must be able to show mastery of all competences.

Comprehensive assessment average marks by grade (Senior 4 to Senior 6) will contribute 10% of the final national examination but will be progressively increased as teachers gain more experience and confidence in assessment techniques.

2.4.3. Record keeping

This is gathering facts and evidence from assessment instruments and using them to judge the student's performance by assigning an indicator against the set criteria or standard. Whatever assessment procedures used shall generate data in the form of scores which will be carefully be recorded and stored in a portfolio because they will contribute for remedial actions, for alternative instructional strategy and feed-back to the student and to the parents to check the learning progress and to advice accordingly or to the final assessment of the students. This portfolio is a folder (or binder or even a digital collection) containing the student's work as well as the student's evaluation of the strengths and weaknesses of the work. Portfolios reflect not only work produced (such as papers and assignments), but also it is a record of the activities undertaken over time as part of student learning. Besides, it will serve as a verification tool for each student that he/she attended the whole learning before he/she undergoes the summative assessment for the subject.

2.4.4. Item writing in summative assessment

Before developing a question paper, a plan or specification of what is to be tested or examined must be elaborated to show the units or topics to be tested on, the number of questions in each level of Bloom's taxonomy and the marks allocation for each question. In a competence-based assessment, questions from higher levels of Bloom's taxonomy should be given more weight than those from knowledge and comprehension level.

Before developing a question paper, the item writer must ensure that the test or examination questions are tailored towards competence-based assessment by doing the following:

- Identify topic areas to be tested on from the subject syllabus.
- Outline subject-matter content to be considered as the basis for the test.
- Identify learning outcomes to be measured by the test.
- Prepare a table of specifications.
- Ensure that the verbs used in the formulation of questions do not require memorization or recall answers only but also testing broad competences as stated in the syllabus.

With the objective of ensuring that all students undertaking the accounting qualification are able to become Certified Accounting Technicians (CATs); they shall be expected to attempt an ICPAR examinations, most preferably each time a student finishes each grade level i.e., S.4. and progressively to other levels.

2.4.5. Reporting to Parents

The wider range of learning in the Competence- based curriculum means that it is necessary to think again about how to share students' progress with parents. A single mark is not sufficient to convey the different expectations of learning highlighted in learning objectives. The most helpful reporting is to share what students are doing well and where they need to improve.

In addition to the school report, student's portfolio containing students' results, behavior, and the report from a team of all concerned teachers about the progress of students will be shared to parents for them to provide feedback to the school administration.

3. RESOURCES

3.1. Materials needed for implementation of this syllabus

The following list shows the main materials/equipment needed in the learning and teaching process:

- Materials to encourage group work activities and presentations: Computers (Desk tops & lab tops) and projectors; Manila papers and markers, flipcharts, manipulatives such as Number cards, graphs, number blocks, cubic dice, etc.
- Materials for enhancing research skills: Textbooks and internet (the list of the textbooks to consult is given in the reference at the end of the syllabus and those books can be found in printed or digital copies).
- Materials to encourage the development of Mathematical models: Geometric instruments, ICT tools such as scientific calculators, software/applications used in Finance, Math type, Matlab, etc.

The technology used in teaching and learning of Mathematics must be regarded as tools to enhance the teaching and learning process and not to replace teachers.

3.2. Human Resource

The effective implementation of this syllabus needs a joint collaboration of educators at all levels. Given the material requirements, teachers are expected to accomplish their noble role as stated above. On the other hand, school head teachers and directors of studies are required to make a follow-up and assess the teaching and learning of this subject due to their profiles in the schools. These combined efforts will ensure bright future careers and lives for students as well as the contemporary development of the country. The teacher of Mathematics should have the following skills, values and qualities:

- Engage students in a variety of learning activities
- Use multiple teaching and assessment methods, techniques and approaches.
- Adjust instruction to the level of the students
- Have creativity and innovation in the teaching and learning process.

- Be a good communicator and organizer.
- Be a guider/ facilitator and a counselor.
- Manifest passion and impartial love for students in the teaching and learning process.
- Make useful link of Mathematics with other Subjects and real-life situations, especially provide real life application of Mathematics in relation to Financial management, auditing, Taxation, Accounting and Entrepreneurship.
- Have a good master of the Mathematics Content.
- Have good classroom management skills.

4. SYLLABUS UNITS

4.1. Presentation of the structure of the Syllabus Units

Mathematics is developed to be taught and learnt at an advanced level of secondary education, i.e. in S4, S5 and S6 respectively. It means that Mathematics syllabus is developed for Professional Accounting Program. At every grade, the syllabus is structured in Topic Areas, sub-topic Areas and then further broken down into Units to promote the uniformity, effectiveness and efficiency of teaching and learning Mathematics. The units have the following elements:

1. Unit is aligned with the Number of Periods.
2. Each Unit has a Key Unit Competence whose achievement is pursued by all teaching and learning activities undertaken by both the teacher and the students.
3. Each Key Competence of the unit is broken into three types of Learning objectives as follows:
 - a) **Type I:** Learning objectives relating to knowledge and understanding (**Type I** Learning objectives are also known as Lower Order Thinking Skills or LOTS)
 - b) **Type II and Type III:** These are learning objectives relate to acquisition of skills, attitudes and values (**Type II and Type III** Learning objectives are also known as Higher Order Thinking Skills or HOTS) – These Learning Objectives are actually considered to be the ones targeted by the Competence Based Curriculum.
4. Each unit has a content which indicates the scope of coverage of what to be taught and learnt in line with stated learning objectives
5. Each unit suggests a non-exhaustive list of learning activities that are expected to engage, as much as possible, students in an interactive learning process (student-centered and participatory approaches).
6. Finally, each unit is linked to other subjects, its assessment criteria, and the materials (or Resources) that are expected to be used in teaching and learning process.

The Mathematics syllabus for Accounting Profession Option has 3 main topic areas: Algebra, Calculus, Statistics and Probability that are found in S4, S5 and S6. These Topics areas are broken down into different units as follow: 5 units in S4, 6 units in S5 and 4 units in S6.

4.2. Senior four

4.2.1. Key Competences at the end of Senior four

After completion of senior four, the mathematics syllabus will help the student to:

- Apply algebraic principles and basic concepts in solving production, financial and economical related problems
- Solve production, financial and economical related problems using polynomial functions, equations and inequalities
- Solve production, financial and economical related problems using logarithmic/ exponential functions and equations
- Apply limits in solving production, financial and economical related problems
- Use financial mathematics techniques in solving production, financial and economical related problems such as simple and Compound interests, annuity, sinking funds

4.2.2. Mathematics units for Senior Four Accounting

Topic Area: ALGEBRA		Sub-topic Area: NUMBERS AND OPERATIONS		
S4 -MATHEMATICS		Unit1: Basic concepts of Algebra		Number of Periods: 18
Key Unit Competence: Apply algebraic principles and basic concepts in solving production, financial and economical related problems				
Learning Objectives				
Knowledge and Understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Match a number and the set to which it belongs. - Define a power / an exponent, a radical, logarithm and the absolute value of a real number. - Define decimal logarithm using properties - State logarithmic and exponent properties 	<ul style="list-style-type: none"> - Classify numbers into naturals (counting and whole numbers), integers, decimals, rational, irrationals, and real numbers. - Carry out mathematical operations on numbers - Use Venn diagram in solving production, financial and economical related problems - Apply set operations in solving production, financial and economical related problems - Use powers and decimal logarithm to optimize simple problems related to production, finance and economics. - Transform a logarithmic expression to equivalent power or radical form and vice versa. - Calculate a percentage of given value. - Apply ratios in writing percentages 	<ul style="list-style-type: none"> - Appreciate the use of real numbers and their operations in every day calculations. - Develop critical thinking in handling production, financial and economical related problems. - Show concern of using Venn diagrams in modeling and solving production, financial and economical related problems. - Handle profitability ratios related problems to advise the managers. 	<ul style="list-style-type: none"> - Set theory and applications: 1. Venn diagram and operations, 2. Sets of numbers and operations. - Indices/powers/ exponents, decimal logarithms and applications, absolute value - Percentages and ratios 	<ul style="list-style-type: none"> - In groups, students make a research in the library or on internet about natural numbers, integers, rational numbers, irrational, and real numbers and present their findings. - In groups, students make a research in the library or on internet about Venn diagrams and operations and present their findings. - Individually, students classify a mixture of numbers into integers, natural, decimal, rational, irrational and real numbers. - In groups, students are asked to model and solve problems related to production, finance and economics using Venn diagrams. - In groups, students are asked to solve problems related to production, finance and economics by applying properties of powers and decimal logarithms. - Individually, student compute return on investment (ROI), returns on assets (ROA), returns on equity (ROE) and other related ratios

Links to other subjects: *Financial accounting, Management accounting, Auditing, and Entrepreneurship*

Assessment criteria: *Ability to think critically and solve production, financial and economical related problems by applying principles and basic concepts of algebra.*

Materials: *Graph papers, manila papers, digital technology including calculators, interactive multimedia activities,...*

Topic Area: ALGEBRA

Sub-topic Area: Functions, equations , and inequalities

S4MATHEMATICS

Unit 2: Numerical functions, equations and inequalities

Number of Periods: 27

Key Unit Competence: Solve production, financial and economical related problems using numerical functions, equations and inequalities

Learning Objectives

Knowledge and understanding

- List the steps to follow in solving linear or quadratic equations or inequalities related word problems in production, finance and economics
- Explain the use of Graphical representations of linear and quadratic functions in solving production, financial and economical related word problems

Skills

- Apply graphical representation methods in solving production, financial and economical related word problems involving linear or quadratic equations
- Solve graphically and algebraically financial and economical related problems involving linear and quadratic equations and inequalities.
- Interpret and make conclusions on linear and quadratic graphs representing production, finance, and economics models.
- Perform accurate calculations in algebra in order to interpret and analyse functions related to supply and demand, revenue, cost, and profit.

Attitudes and values

- Appreciate the importance of linear and quadratic functions and equations in the interpretation and analysis of production, financial, and economical situations.
- Show concern on applications of algebraic concepts in solving problems related to production, finance and economics

Content

- Linear, rational and irrational functions
- Linear equations and system of linear equations
- Inequalities
- Quadratic equations and functions
- Analysis of supply and demand, revenue, cost, and profit functions using algebraic concepts and calculations.

Learning Activities

- In groups, students discuss the importance and necessity of linear equations, inequalities, linear and quadratic functions and how they take place in Finance and economics
- Individually, students are asked to present graphically linear and quadratic functions related to production, finance and economics model
- In group discussions, students are asked to interpret linear / quadratic graphs related to demand and supply, marginal revenue, and marginal cost and finally draw appropriate conclusions.
- **Skills lab:** in groups, students make a research in the library/ or on internet about the application of algebraic equations and functions into finance or economic situations and make presentation of their findings.

Links to other subjects: *Management accounting, Financial accounting, entrepreneurship, Auditing and Taxation*

Assessment criteria: *Ability to solve production, financial and economical related problems by using polynomial functions, equations and inequalities*

Materials: *Graph papers, manila papers, ruler, digital technology including calculators,...*

Topic Area: ALGEBRA		Sub-topic Area: Logarithmic/ exponential functions and equations		
S4 MATHEMATICS		Unit 3: Exponential /logarithmic functions and equations		Number of Periods: 24
Key Unit Competence: Solve production, financial and economical related problems using logarithmic/ exponential functions and equations				
Learning Objectives			Content	Learning Activities
Knowledge and understanding	Skills	Attitudes and values		
<ul style="list-style-type: none"> - Define logarithmic and exponential functions in any base - State restrictions on the base, variable in a logarithmic and exponential functions 	<ul style="list-style-type: none"> - Find out the domain and the range of logarithmic or exponential functions - Solve exercises on logarithmic and exponential functions. - Analyze and interpret logarithmic and exponential functions involving finance and economics contexts. 	<ul style="list-style-type: none"> - Appreciate the use of logarithmic and exponential equations in solving problems in economics, finance, accounting, and related subjects. - Show curiosity to solve problems in finance, production and economics using logarithmic and exponential equations 	<ul style="list-style-type: none"> - Exponential functions - Exponential equations - Applications of exponential functions and equations in economics, finance, and accounting. - Decimal logarithmic functions and equations 	<ul style="list-style-type: none"> - Individually, students do research on real application of logarithmic and exponential functions into finance, production and economics. Finally, initiate group discussions to share the identified real-life scenarios’. - Through group discussions, students discuss the steps for solving logarithms and exponential equations

	<ul style="list-style-type: none"> - Use logarithmic and exponential properties and equations to solve mathematical problems that involve production, finance and economics. 		<ul style="list-style-type: none"> - Natural/Naperian logarithmic functions and equations - Applications of decimal and Natural/Naperian logarithmic functions/ equations to economics, finance, accounting, and related areas. 	<ul style="list-style-type: none"> - In pairs, students are invited to use logarithmic or exponential equations in solving problems related to production, finance and economics - Skills lab: Invite students to discuss in small groups and find out how powers, exponential and logarithmic functions / equations are used to easily solve financial or economic problems in order to suggest possible solutions
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Links to other subjects: *Financial accounting, Management accounting, Auditing, and Entrepreneurship*

Assessment criteria: *Ability to solve production, financial and economical related problems by using logarithmic/ exponential functions and equations*

Materials: *Graph papers, manila papers, digital technology including calculators,...*

Topic Area: CALCULUS Sub-topic Area: Limits, differentiation and integration

S4 MATHEMATICS

Unit4: Limits of polynomial, logarithm, exponential functions, and applications

**Number of
Periods: 15**

Key unit Competence: Apply limits in solving production, financial and economical related problems

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Contents	Learning Activities									
<ul style="list-style-type: none"> - Explain the concept of limits for real-valued, and logarithmic or exponential functions. - List properties of limits. - Describe properties of limits in handling basic real-life problems. 	<ul style="list-style-type: none"> - Determine the limits of polynomial, logarithmic and exponential functions - Evaluate the limits of functions and apply to determine vertical, horizontal, and oblique asymptotes and continuity of functions. - Apply informal methods to explore the concepts of - Limits (one sided, and impossible limits). - Apply limits of polynomial, logarithmic and exponential functions in solving production, financial and economical related problems. 	<ul style="list-style-type: none"> - Appreciate the importance and use of limits to find continuity of a function at a point or on the interval - Show concern of using limits concepts to handle continuity, and asymptotes related issues. - Show the curiosity of using limits concepts in solving financial and economical related problems. 	<ul style="list-style-type: none"> - Concepts of limits: Neighborhood of areal number, Limit of a variable, Definition and graphical interpretation of limit of a function, One-sided limits, Squeeze theorem - Limits of functions at infinity, and operations of limits of polynomial, logarithm, exponential functions - Indeterminate cases: $\frac{\infty}{\infty}, \frac{0}{0}$ $, \infty - \infty, 0 \cdot \infty, 0^0, \infty^0, 1^\infty$ - Applications of limits in determination of Continuity of a function at a point or on interval, asymptotes, and in solving production, financial and economical related problems. 	<ul style="list-style-type: none"> - Individually students are asked to find out three symmetric values of five in both sides as boundaries <table border="1" data-bbox="1493 586 1777 742" style="margin: 10px auto;"> <tr> <td style="padding: 2px;">4.9</td> <td rowspan="4" style="padding: 2px; text-align: center; vertical-align: middle;">5</td> <td style="padding: 2px;">5.01</td> </tr> <tr> <td style="padding: 2px;">4.99</td> <td style="padding: 2px;">5.001</td> </tr> <tr> <td style="padding: 2px;">4.999</td> <td style="padding: 2px;">5.0001</td> </tr> <tr> <td style="padding: 2px;">.....</td> <td style="padding: 2px;">.....</td> </tr> </table> - In group discussions, students evaluate the limits of functions at a point both algebraically and graphically, extend this perceptive to determine the asymptotes and continuity of a function. - Represent on graph papers limits of some chosen functions and draw the possible asymptotes - In pairs, students apply limits to solve problems related to finance, production and economics. 	4.9	5	5.01	4.99	5.001	4.999	5.0001
4.9	5	5.01											
4.99		5.001											
4.999		5.0001											
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Links to other subjects: *Management accounting, Taxation, Auditing and Financial accounting*

Assessment criteria: *Ability to apply limits in solving production, financial and economical related problems*

Materials: *Manila papers, Graph Papers, ruler, markers, Map containing boundaries, Digital technology (calculator, etc...)*

Topic Area: ALGEBRA

Sub-topic Area: Number patterns and applications


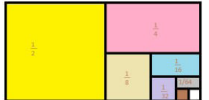
S4 MATHEMATICS

Unit 5: Financial Mathematics

Number of Periods: 24

Key unit Competence: Use financial mathematics techniques in solving production, financial and economical related problems such as simple and compound interests, annuity, sinking funds

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Explain the basic concepts of financial mathematics and time preference of money. - Define arithmetic and geometric sequences - State properties of both arithmetic and geometric sequences. - Define simple, compound interests, annuity, and sinking funds. 	<ul style="list-style-type: none"> - Apply the basic concepts and formulas of interest rates in finance. - Use sequences to find the "n^{th} n^{th}" terms for arithmetic, and geometric progressions - Calculate both geometric and arithmetic sums of sequences. - Apply the sequences to solve financial related problems. - Use simple and compound interests in all calculations that involve financial Mathematics. 	<ul style="list-style-type: none"> - Develop critical thinking in drawing conclusion on financial markets and risks basing on mathematical concepts. - Show curiosity to compute terms, and sums for both arithmetic and geometric progressions for appropriate decisions. - Appreciate the use of sequences and interests in finance and economics related issues include value of annuity and sinking funds 	<ul style="list-style-type: none"> - Basic concepts / terminology of financial mathematics - Arithmetic sequences - Geometric sequences - Simple interest - Compound interest, - Applications of simple and compound interest in calculating annuity include final value investment, Nominal, and annual, interest rates, loan amortization. 	<ul style="list-style-type: none"> - Individually, students make deep research on the basic concepts of financial mathematics to establish links between mathematics and finance such as interest, principal, rates, risks, and annuity. - Use sticks to generate terms of an arithmetic sequence 4, 7, 10, 13,.. of common difference 3. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> - Fold a piece of paper to understand the meaning of geometric sequence, and think about what should be the last term when n approaches the infinity: <div style="text-align: center;">  </div> $\frac{1}{2}, \frac{1}{2^2}, \frac{1}{2^3}, \dots, \frac{1}{2^n}$ <ul style="list-style-type: none"> - In pairs, invite students to use financial mathematics in solving a given production, financial and economical related problems hence interpret results

<ul style="list-style-type: none"> - Describe the applications of financial mathematics in various areas. 	<ul style="list-style-type: none"> - Apply simple or compound interest in calculating annuities and sinking funds 	<ul style="list-style-type: none"> - Show concern, patience, mutual respect, tolerance, and curiosity in discussion of financial scenarios and risks management. 	<ul style="list-style-type: none"> - Application of compound interest in calculating sinking funds - Financial risks 	<ul style="list-style-type: none"> - Skills lab: students are invited to discuss the scenario about Bank rates increase or decrease unexpectedly, to find out how the situation will be in the next n- years.
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Links to other subjects: Finance, economics, entrepreneurship, taxation and Auditing.

Assessment criteria: Ability to use, link, and interpret mathematics for finance in solving production, financial and economical related problems such as simple and Compound interests, annuity, sinking funds

Materials: Manila papers, graph papers, geometric instruments (ruler, pen, and pencil), digital technology including calculators, Ms excel

4.3. Senior five

4.3.1. Key Competences at the end of Senior five

After completion of senior five, the mathematics syllabus will help the student to:

- Use matrices and determinants notations and properties to solve simple production, financial and economical related problems
- Solve Economical, Production, and Financial related Problems using Derivatives
- Apply differentiation in solving Mathematical problems that involve financial context such as marginal cost, revenues and profits, elasticity of demand, and supply
- Apply univariate statistical concepts to collect, organise, analyse, interpret data and draw appropriate decisions
- Apply bivariate statistical concepts to collect, organise, analyse, present, and interpret data to draw appropriate decisions
- Apply price and quantity indices in solving financial related problems, interpreting statistical data, and drawing appropriate decisions.

4.3.2. Mathematics units for Senior Five

Topic Area: ALGEBRA			Sub-Topic Area: Matrices and determinants	
S5 MATHEMATICS		Unit 1: Introduction to matrices and determinants		Number of Periods:15
Key Unit Competence: Use matrices and determinants notations and properties to solve simple production, financial economical, and mathematical related problems				
Learning Objectives			Content	Learning Activities
Knowledge and understanding	Skills	Attitudes and values		
<ul style="list-style-type: none"> - Define a matrix, determinant for order $n \leq 3$ - Give order and type of a matrix - List /Mention operations on matrices of order less than or equal to 3 - Define a transpose of matrix. - Write the determinant and matrix of order n where $n \leq 3$ - Explain that a square matrix for order n $n \leq 3$ is invertible or not 	<ul style="list-style-type: none"> - Perform operations on matrices of order less than or equal to 3. - Compute the determinants of order $n(n \leq 3)$ - Determine the inverse of a matrix of order less than or equal to 3. - Apply matrix and determinants in finance related problems 	<ul style="list-style-type: none"> - Appreciate the importance and the use of matrices in computing determinants for $n(n \leq 3)$ and solving finance related problems. 	<ul style="list-style-type: none"> - Definition, notation, types, order of matrices. - Operations and properties on matrices: Addition, subtraction, scalar multiplication, matrix multiplication, Transpose of a matrix of order $n(n \leq 3)$, Inverse of a regular matrix - Determinants: definition and properties - Application of matrices and determinants in solving mathematical problems 	<p>In group:</p> <ul style="list-style-type: none"> - Invite students to base on matrix notation and identify types, and order of a matrix. - Individually re-organize given data into matrices and then perform different operations on matrices including the calculation of their determinants. - In pairs, given the matrix notation below: $A_{n \times m} [a_{ij}]$ - invite students to write different matrices where $i = 1, 2, 3$ and $j = 1, 2, 3$, choose any values for n and m such that $n \leq 3$ and find out whether the matrix is invertible or not. In case it is invertible, find its inverse. - Given a system of 2 or 3 linear equations, with 2 or 3 variables, invite students to write it in a matrix form and vice versa-
Links too their subjects: financial and management accounting.				

Assessment criteria: Ability to use matrices and determinants properties to solve simple financial and mathematical related problems

Materials: *Geometric instruments and shapes (ruler, square, rectangle...), graph papers, digital technology including calculators,...*

Topic Area: CALCULUS

Sub-Topic Area: LIMITS, DIFFERENTIATION AND INTEGRATION

S5 MATHEMATICS

Unit 2 : Differentiation/derivatives

Number of Periods: 24

Key unit Competence: Solve Economical, Production, and Financial related Problems using Derivatives

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Define derivative using first principle of gradient at any point. - List differentiation rules to any differentiable function. 	<ul style="list-style-type: none"> - Use limit definition to calculate derivatives of functions. - Evaluate the Derivatives of any function using differentiation rules. - Perform derivative for polynomial, exponential and logarithmic functions. - Apply the hospital rule to evaluate limits that involve determinate cases. - Apply the rules and techniques of differentiation to solve Mathematical problems that involve financial context. 	<ul style="list-style-type: none"> - Appreciate the use of gradient as a measure of rate of change in derivative concept clarification - Appreciate the importance and use of differentiation in solving economics and financial related problems. 	<ul style="list-style-type: none"> - Definition of derivative/ differentiation - Rules of differentiations: Chain rule, product rule, quotient rule. - Derivative of functions including polynomial, logarithm, exponential functions. - Application of Hospital rule to evaluate limits of indeterminate cases: $\frac{\infty}{\infty}$, $\frac{0}{0}$ 	<ul style="list-style-type: none"> - Practically – students represent on graph papers the gradient of a straight line and interpret results algebraically. - Individually, invite students to apply definition of derivative, chain, quotient and product rules to evaluate derivatives of functions. - In group- invite students to apply techniques of differentiation to solve Mathematical problems that involve financial context.

Links to other subjects: *Entrepreneurship, Financial management and accounting, Economics (in Optimization problems, related rate of change problems....)*

Assessment criteria: Ability to use differentiation to solve problems and interpret data in various contexts.

Materials: Manila paper, graph paper, digital technology including calculators...

Topic Area: CALCULUS

Sub-Topic Area: LIMITS, DIFFERENTIATION AND INTEGRATION

S5 MATHEMATICS

Unit 3: Applications of derivatives in Finance and Economics

Number of Periods:18

Key unit Competence: Apply differentiation in solving Mathematical problems that involve financial context such as marginal cost, revenues and profits, elasticity of demand, and supply

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
- Identify the areas of application of derivatives.	- Apply the concepts and techniques of differentiation to model, and solve problems in production, financial and economic situations.	- Appreciate the importance and use of differentiation in solving mathematical problems that involve costs, revenues, and profits functions	- Applications of derivatives of polynomial, exponential, and logarithmic functions to calculate marginal cost, revenues and profits, elasticity of demand, and supply, extrema (maximum & minimum) points and point of inflection: calculation of first and second derivatives.	- Through group discussions, invite students to read the scenarios related to profit function in bank, or firm, to determine the level of outputs, and interpret results. - Practically–students use function (algebraically and graphically) in order to interpret and recommend appropriate measures in production, financial and economic related problems.

Links to other subjects: *Entrepreneurship, financial management and accounting especially in production, financial and economic problems related to optimization*

Assessment criteria: *Ability to use differentiation in solving and interpreting mathematical problems that involve financial contexts.*

Materials: *Manila paper, graph paper, digital technology including calculators...*

Topic Area: STATISTICS AND PROBABILITY

Sub-topic Area: Descriptive Statistics

S5 MATHEMATICS

Unit 4: Univariate statistics and applications

Number of Periods: 33

Key Topic Competence: Apply univariate statistical concepts to collect, organise, analyse, interpret data and draw appropriate decisions

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Define statistics, univariate statistics. - Differentiate terminologies used in statistics. - List the types of data and give examples of where there are used. - Give the meaning of central tendency/location measures (mean, mode, median). - Define the range, quartiles variance, standard deviation and the coefficient of variation. 	<ul style="list-style-type: none"> - Represent quantitative and qualitative data in tabular and graphical forms. - Calculate mean, and find out mode, and median of quantitative statistical data. - Determine the measures of dispersion (range, quartiles variance, standard deviation and the coefficient of variation) of a given statistical series. - Establish a link (percentiles) between measures of central tendency and measures of dispersion: median and quartiles 	<ul style="list-style-type: none"> - Appreciate the use of statistical graphs (qualitative & quantitative) in solving and interpretation of mathematical problems that involve production, finance and economics contexts. - Show concern of using univariate statistics in solving, analyzing, and interpretation of mathematical problems that involve production, financial and economical situations. 	<ul style="list-style-type: none"> - Definitions and branches of statistics: descriptive statistics and inferential statistics - Common used terminologies in statistics: population; sample; parameter; statistic; variable; data; outliers; values; information; datasets; data base management (DBMs); - Types of data: <ol style="list-style-type: none"> 1. categorical/ qualitative data: nominal and ordinal data 2. Numerical/ quantitative: (Discrete and continuous); - Tabular and graphical presentations of data 	<ul style="list-style-type: none"> - In groups, students make a research and find out different branches of statistics, types of data in statistics and the meaning of the common used terminologies in statistics. - In groups, students are given different types of data and asked to categorize them into qualitative and quantitative data.

<ul style="list-style-type: none"> - Provide/ Identify example of a statistical situation that can be analyzed and interpreted in order to draw conclusions. 	<ul style="list-style-type: none"> - Apply and explain the standard deviation as the more convenient measures of spreads. - Apply measures of location and spreads in empirical rule, and Chebyshev's theorem. - Apply univariate statistics in finance, accounting, and economics. 		<ul style="list-style-type: none"> - Measures of central tendency (location): mean, mode, median - Measures of variability (spreads): Range, Quartiles, variance, standard deviation, coefficient of variation - Measures of symmetry: Empirical rule; and Chebyshev's theorem - Applications of univariate statistics in mathematical problems that involve finance, accounting, and economics. 	<ul style="list-style-type: none"> - Individually students are asked to provide their own statistical data arising from finance, production and economics contexts and then present them in tabular or any other form of data presentation. - In group, students are given quantitative data on a real situations in production, Finance or economics and invited to find out mean, mode, median, range, quartiles, variance, standard deviation and then interpret the results.
<p>Links to other subjects: <i>Entrepreneurship, Financial management and accounting, Auditing and taxation.</i></p>				
<p>Assessment criteria: <i>Ability to extend understanding, analysis and interpretation of data arising from problems in daily life to draw appropriate conclusions.</i></p>				
<p>Materials: <i>Manila papers, Graph Papers, ruler, digital technology including calculators, Microsoft Excel sheet or spread sheet , etc.</i></p>				

Topic Area: STATISTICS AND PROBABILITY

Sub-topic Area: Descriptive Statistics

S5 MATHEMATICS

Unit 5: Bivariate statistics and applications

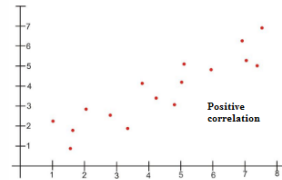
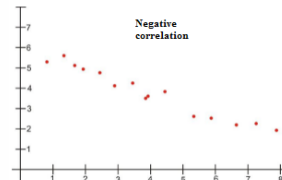
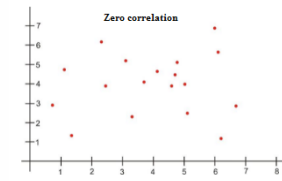
Number of Periods: 9

Key Topic Competence: Apply bivariate statistical concepts to collect, organise, analyse, present, and interpret data to draw appropriate decisions

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Define bivariate statistics - Define the terms used in linear relationships between two variables such as covariance, coefficient of correlation and regression lines. - List down the steps for analyzing and interpreting bivariate data critically and draw conclusion. - Explain the coefficient of correlation and its interpretation of data and decision making. <p>Use regression lines with statistical interpretation.</p>	<ul style="list-style-type: none"> - Differentiate between bivariate and univariate, - Differentiate correlation and regression line in bivariate statistics. - Determine the coefficient of correlation, covariance, and regression lines of bivariate statistical data. - Analyze and interpret bivariate statistical data critically and make conclusions. - Apply the coefficient of Correlation and regression line in the interpretation of data and decision making. 	<ul style="list-style-type: none"> - Appreciate the importance of regression lines and coefficient of correlation in interpretation and decision making. 	<ul style="list-style-type: none"> - Introduction to bivariate statistics: Definition and basic terminologies such as dependent variable and independent variable,... - Measures of linear relationship between two variables: covariance, Correlation, regression line and analysis, and spearman's coefficient of correlation. - Examples and applications of bivariate statistics in accounting related subjects or any other area: Relationship between advertising products and total revenue, relationship between attendance in class and the marks scored, etc. 	<ul style="list-style-type: none"> - In groups, students provide and discuss various real life examples that involve bivariate data by identifying causes (independent), and responses (dependent). - In pairs, students compute linear relationship between two given variables such as relationship between class results and students' ranks in the class or relationship between advertising products and total revenue. Students are asked to analyze the relationship between variables under considerations, and check how the change of independent variable affects dependent variable. - Individually, students may be asked to plot data on scatter diagram or scatter plot to represent a correlation between two variables and then, they can analyze the graph and make conclusions and predictions basing on the calculated coefficient of correlation. E.g:

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Links to other subjects: *Financial Accounting and management, trends Analysis, spatial statistics research, Population growth,.....*

Assessment criteria: *Ability to correctly extend understanding, analysis, and interpretation of bivariate data to correlation coefficients and regression lines, and draw better conclusion.*

Materials: *Geometric instruments (ruler,....),graph papers, digital technology including calculators*

Topic Area: STATISTICS AND PROBABILITY

Sub-topic Area: Descriptive statistics

S5 MATHEMATICS

Unit 6: Index numbers and applications

Number of Periods:9

Key unit Competence: Apply price and quantity indices in solving financial related problems, interpreting statistical data, and drawing appropriate decisions.

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Define index or indices number - Give examples of index number - Explain how the Consumer Price Index is constructed and interpreted - Explain how industrial production index is constructed 	<ul style="list-style-type: none"> - Differentiate between a weighted and un-weighted indices - Use index number to interpret a value index; - Use index number to interpret a Laspeyer's and Paasche's price index - Apply index number in solving financial and economical related problems 	<ul style="list-style-type: none"> - Be familiar with the use of some widely used index numbers and appreciate its limitations - Appreciate price index as good measure of cost living - Show the curiosity of using index number to interpret Laspeyer's and Paasche's price index - Appreciate the use of index numbers in solving financial and economical related problems and making comparison among nations and regions 	<ul style="list-style-type: none"> - Meaning of index number, characteristics, types, examples: Consumer price index (CPI) , ` Producer Price index (PPI), Wholesale Price index (WPI) and use of index numbers in real contexts. - Production/quantity indices, - Construction of indices with examples, price indices, - Laspeyres prices, paasche price indices and fisher price index 	<ul style="list-style-type: none"> - With think-pair and share, invite students to brainstorm the meaning of index number and share ideas. - Provide a list of prices of various foods in years. Do these prices represent base year or current year? Compute the fisher price index

Links to other subjects: *Entrepreneurship, National account, macroeconomics, economic growth and development, etc....*

Assessment criteria: *Ability to apply price and quantity indices in solving financial related problems by interpreting statistical data, and draw appropriate decisions.*

Materials: *Manila paper, graph paper, digital technology including calculators and Excel sheet*

4.4. Senior Six

4.4.1. Key competences at the end of Senior Six

After completion of senior six, the mathematics syllabus will help the student to:

- Apply Matrices and determinants concepts in solving inputs & outputs model and related problems
- Solve linear programming problems
- Use integration to solve mathematical and financial related problems involving marginal cost, revenues and profits, elasticity of demand, and supply
- Use probability concepts to solve mathematical and production, financial, and economical related problems and draw appropriate decisions

4.4.2. Mathematics Units for Senior Six

Topic Area: ALGEBRA Sub-topic Area: Matrices and determinants				
S6 MATHEMATICS		Unit 1: Applications of matrices and determinants		Number of Periods:27
Key unit Competence: Apply Matrices and determinants concepts in solving inputs & outputs model and related problems.				
Learning Objectives				
Knowledge and understanding	Skills	Attitudes and values	Contents	Learning Activities
<ul style="list-style-type: none"> - Give application examples of determinant matrices of order less than or equal to 3. - Explain the inputs outputs models 	<ul style="list-style-type: none"> - Use matrices in solving mathematical problems that involve financial and organizational contexts like shopping, waiting lines, affectation, transportation, budgeting. - Calculate the outputs levels of each of the two given assets to meet a change in final demand 	<ul style="list-style-type: none"> - Appreciate the importance of matrices and determinants in organizing data, modelling and solving related mathematical problems that involve production, financial, economical contexts. 	<ul style="list-style-type: none"> - Recall determinants of order less or equal to 3 and Matrix inversion - Applications of determinants in finance, accounting, and economics - Solving simultaneous equations using graphical, elimination, comparison, and substitution methods - Input-outputs model and Leontief theorem for matrix of order 2. 	<ul style="list-style-type: none"> - Given any situation happened in a bank where there exists 3 outlets and 3 customers on each outlet. Formulate these scenarios into a matrix form, deduce a system of equations. Hint: $AX = B$; and $A_{3 \times 3} = \begin{pmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{pmatrix}$ - Invite students to consider two sectors and list worth of its own products. Form the matrix for these two sectors. What was left over from each of these sectors for use by other parts of the economy or for export? - In groups, students are given a word problem involving matrix of order 2 on a job with a monthly salary of certain amount and a fixed amount of annual increment. Invite students to use matrix inversion method to solve the problem - Individually, invite students to make research about the use of matrices and determinants in solving daily life problems that involve buying and selling and report their findings.
Links to other subjects: Financial accounting and management, auditing				
Assessment criteria: Ability to successively apply matrix and determinant of order 3 to solve related problems.				
Materials: Graph papers, Manila papers, calculators.				

Topic Area:ALGEBRA

Sub-topic Area: Linear inequalities and linear programming

S6 MATHEMATICS

Unit 2: Linear inequalities and their applications in linear programming problems

Number of Periods: 15

Key unit Competence: Solve linear programming problems

Learning Objectives

Knowledge and understanding

Skills

Attitudes and values

Content

Learning Activities

- Recall definition of linear inequalities
- Explain the basic concepts of linear programming problems
- Identify the objective function, decision variables and constraints
- Find out steps of solving linear programming problems

- Apply linear inequalities to solve linear programming problems
- Decide the appropriate optimal solutions and draw conclusions

- Appreciate the use of graphical method in solving linear programming problems

- Recall linear inequalities,
- Basic concepts of linear programming problem (LPP) including definition, objective function, decisions variables, and conditions/constraints, mathematical model, corner points, feasible regions and optimal solution.
- Solving LPP using graphical method

- In pairs, invite students to formulate linear inequalities and represent them on Cartesian plane
- In groups, students are asked to define basic concepts of linear programming problems and link them to inequalities.
- In groups, students are given various examples related to production and finance to apply linear inequalities in solving LPP and make feasible decisions.

Links to other subjects: Financial management and accounting, Entrepreneurship, Economical and financial optimization problems

Assessment criteria: Ability to solve linear programming problems

Materials: Manila paper, graph paper, pencils, markers

Topic Area: CALCULUS Sub-topic Area: LIMITS, DIFFERENTIATION and INTEGRATION

S6 MATHEMATICS

Unit 3: Integrals/ anti-derivatives

No. of Periods:36

Key Unit Competence: Use integration to solve mathematical and financial related problems involving marginal cost, revenues and profits, elasticity of demand, and supply

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Clarify the relationship between derivative and anti-derivative of functions. - List properties, formula and techniques of indefinite and definite integrals - Explain the use of basic integration properties, techniques and formulas in solving finance related problems. - Extend the concepts of indefinite integrals to definite integrals to solve problems involving finance 	<ul style="list-style-type: none"> - Use integration to calculate total cost functions from information involving marginal cost (that is, the rate of change of cost) for a commodity. - Use integration to derive profit functions from the marginal revenue functions - Optimize profit, given information regarding marginal cost and marginal revenue functions. 	<ul style="list-style-type: none"> - Show concern of the application of definite integrals and indefinite integral in solving problems involving marginal cost, revenues and profits, elasticity of demand, and supply. - Appreciate the use of various properties, appropriate techniques and basic formulas to evaluate integrals of functions that involve financial related problems 	<ul style="list-style-type: none"> - Indefinite integral <ul style="list-style-type: none"> - Definition and properties - Primitive functions - Examples, - Techniques of integration <ul style="list-style-type: none"> - Separable of variables, - Integration by parts, - Decomposition/ Simple fraction. - Definite integral: Definition, properties and examples - Application of integration: calculation of marginal cost, revenues and profits, elasticity of demand, and supply, Present, Future Values of an Income Stream and Growth Rates 	<ul style="list-style-type: none"> - In pairs, students are invited to brainstorm the relationship between derivative and anti-derivative of functions by providing examples on each category. - In groups, students are given printed papers with various problems on marginal cost function of firm and asked apply properties and techniques of integration to calculate total cost function - In groups, students are invited to make research on applications of integration in computation of Revenue, Cost function, demand function and profit function from the given function

Links to other subjects: *Entrepreneurship, Financial and Accounting management*

Assessment criteria: *Ability to use integration in solving mathematical and financial related problems involving marginal cost, revenues and profits, elasticity of demand, and supply*

Materials: *Manila papers, Graph Papers, ruler, markers*

Topic Area: STATISTICS AND PROBABILITY

Sub-topic Area: Probability

S6 MATHEMATICS

Unit 4: Introduction to probability

Number of Periods: 30

Key unit Competence: Use probability concepts to solve mathematical and production, financial, and economical related problems and draw appropriate decisions

Learning Objectives

Knowledge and understanding	Skills	Attitudes and values	Content	Learning Activities
<ul style="list-style-type: none"> - Define probability using empirical rule - Clarify probability terminologies - Distinguish between mutually exclusive and non-exclusive events. - Give examples of applications of probability in production, finance and economics related problems 	<ul style="list-style-type: none"> - Find out the expectations and probability of events arising from an experiment - Apply properties of probability to calculate the number of possible outcomes of occurring event under equally likely assumptions. - Determine probability expectations from an experiment with possible outcomes - Apply Bayes theorem to solve problems involving conditional probability in production and finance. 	<ul style="list-style-type: none"> - Appreciate the use of probability as a measure of chance in making appropriate decisions. - Appreciate the application of probability (distribution) in production, finance, and economics 	<ul style="list-style-type: none"> - Definition of probability, Event and sample space, - Empirical rule, axioms and theorems, - Mutual exclusive, mutual exhaustive, independence, conditional probability, - Bayes theorem - Applications of probability in solving production finance and economics related problems. - Probability distributions: Discrete, continuous, binomial, Bernoulli, and Poisson ,normal distribution - Applications of probability distribution in production, finance and economics. 	<ul style="list-style-type: none"> - In pairs, invite students to brainstorm on the meaning of probability, event, and sample space and then give examples on each key term. - In pairs, students are given 2 different events and discuss the number of possible outcomes of event B occurring when event A has already taken place. - In groups, invite students to discuss the scenarios about likely, unlikely, certain, uncertain, impossible events and share their own examples for each category of event. - Give to the learners a scenario about arrangement of x boys and y girls at random in a row and invite them to discuss the probability that either all are boys or all girls then come up with possible outcomes.

Links to other subjects: Financial management and accounting, entrepreneurship and auditing

Assessment criteria: Ability to use probability concepts to solve production, financial, and economical related problems and draw appropriate decisions

Materials: Manila papers, Graph Papers, compass, ruler, and calculators...

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6. ANNEXES

ANNEX 1: SUBJECTS AND WEEKLY TIME ALLOCATION FOR ACCOUNTING

SN	Subjects	Number of periods		
		(Period= 40 minutes)		
		S4	S5	S6
1	Financial Accounting	7	7	7
2	Management Accounting	7	7	7
3	Taxation	7	7	
4	Auditing			7
5	General Studies and Communication Skills	3	3	3
6	Mathematics for Accounting	3	3	3
7	Entrepreneurship	3	3	3
8	English	3	3	3
	Sub-Total 1	33	33	33
	II. Core Subject examinable at School level			
9	ICT in Accounting	3	3	3
10	Kinyarwanda	3	3	3
11	Physical Education and Sports	2	2	2
12	French	3	3	3
	Sub-total 2	11	11	11
	III. Co-curricular activities (compulsory)	6	6	6
	Total number of contact periods per week	50	50	50
	Total number of contact hours/week	33.3	33.3	33.3
	Total number of contact hours per year (39 weeks)	1300	1300	1300

ANNEX 2: OVERVIEW OF MATHEMATICS FOR ACCOUNTING

TOPIC AREA	SUB-TOPIC AREA	KEY UNIT COMPETENCES		
		SENIOR 4	SENIOR 5	SENIOR 6
ALGEBRA	Number and operations	Apply algebraic principles and basic concepts in solving production, financial and economical related problems		
	Numerical Functions , equations ,and inequalities	Solve production, financial and economical related problems using numerical functions, equations and inequalities		
	Logarithmic/ exponential functions and equations	Solve production, financial and economical related problems using logarithmic/ exponential functions and equations		

	Number patterns and applications	Use financial mathematics techniques in solving production, financial and economical related problems such as simple and Compound interests, annuity, sinking funds		
	Matrices and determinants		Use matrices and determinants notations and properties to solve simple production, financial economical, and mathematical related problems	Apply Matrices and determinants concepts in solving inputs & outputs model and related problems.
	Linear inequalities and linear programming			Solve linear programming problems
CALCULUS	Limits, differentiation and integration	Apply limits in solving production, financial and economical related problems	Solve Economical, Production, and Financial related Problems using Derivatives	
			Apply differentiation in solving Mathematical problems that involve financial context such as marginal cost, revenues and profits, elasticity of demand, and supply	Use integration to solve mathematical and financial related problems involving marginal cost, revenues and profits, elasticity of demand, and supply

STATISTICS AND PROBABILITY	Univariate Statistics		Apply univariate statistical concepts to collect, organise, analyse, interpret data and draw appropriate decisions	
	Bivariate statistics		Apply bivariate statistical concepts to collect, organise, analyse, present, and interpret data to draw appropriate decisions	
	Index number		Apply price and quantity indices in solving financial related problems, interpreting statistical data, and drawing appropriate decisions.	
	Inferential Statistics			Use probability concepts to solve mathematical and production, financial, and economical related problems and draw appropriate decisions