

MINISTRY OF EDUCATION



Republic of Ghana

TEACHING SYLLABUS FOR CORE MATHEMATICS (SENIOR HIGH SCHOOL)

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September, 2010

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RATIONALE FOR TEACHING MATHEMATICS

Development in almost all areas of life is based on effective knowledge of science and mathematics. There simply cannot be any meaningful development in virtually any area of life without knowledge of science and mathematics. It is for this reason that the education systems of countries that are concerned about their development put great deal of emphases on the study of mathematics. The main rationale for the mathematics syllabus is focused on attaining one crucial goal: to enable all Ghanaian young persons to acquire the mathematical skills, insights, attitudes and values that they will need to be successful in their chosen careers and daily lives. The new syllabus is based on the premises that all students can learn mathematics and that all need to learn mathematics. The syllabus is therefore, designed to meet expected standards of mathematics in many parts of the world. Mathematics at the Senior High school (SHS) in Ghana builds on the knowledge and competencies developed at the Junior High School level. The student is expected at the SHS level to develop the required mathematical competence to be able to use his/her knowledge in solving real life problems and secondly, be well equipped to enter into further study and associated vocations in mathematics, science, commerce, industry and a variety of other professions.

GENERAL AIMS

To meet the demands expressed in the rationale, the SHS Core Mathematics syllabus is designed to help the student to:

1. Develop the skills of selecting and applying criteria for classification and generalization.
2. Communicate effectively using mathematical terms, symbols and explanations through logical reasoning.
3. Use mathematics in daily life by recognizing and applying appropriate mathematical problem-solving strategies.
4. Understand the process of measurement and use appropriate measuring instruments.
5. Develop the ability and willingness to perform investigations using various mathematical ideas and operations.
6. Work co-operatively with other students in carrying out activities and projects in mathematics.
7. Develop the values and personal qualities of diligence, perseverance, confidence, patriotism and tolerance through the study of mathematics
8. Use the calculator and the computer for problem solving and investigations of real life situations
9. Develop interest in studying mathematics to a higher level in preparation for professions and careers in science, technology, commerce, industry and a variety of work areas.
10. Appreciate the connection among ideas within the subject itself and in other disciplines, especially Science, Technology, Economics and Commerce

GENERAL OBJECTIVES

By the end of the instructional period students will be able to:

1. Develop computational skills by using suitable methods to perform calculations;
2. Recall, apply and interpret mathematical knowledge in the context of everyday situations;
3. Develop the ability to translate word problems (story problems) into mathematical language and solve them with related mathematical knowledge;
4. Organize, interpret and present information accurately in written, graphical and diagrammatic forms;
5. Use mathematical and other instruments to measure and construct figures to an acceptable degree of accuracy;
6. Develop precise, logical and abstract thinking;
7. Analyze a problem, select a suitable strategy and apply an appropriate technique to obtain its solution;
8. Estimate, approximate and work to degrees of accuracy appropriate to the context;
9. Organize and use spatial relationships in two or three dimensions, particularly in solving problems;
10. Respond orally to questions about mathematics, discuss mathematics ideas and carry out mental computations;
11. Carry out practical and investigational works and undertake extended pieces of work;
12. Use the calculator to enhance understanding of numerical computation and solve real life problems

SCOPE OF CONTENT

This syllabus is based on the notion that an appropriate mathematics curriculum results from a series of critical decisions about three inseparable linked components: content, instruction and assessment. Consequently, the syllabus is designed to put great deal of emphases on the development and use of basic mathematical knowledge and skills. The major areas of content covered in all the Senior High School classes are as follows:

1. Numbers and Numeration.
2. Plane Geometry
3. Mensuration
4. Algebra
5. Statistics and Probability
6. Trigonometry
7. Vectors and Transformation in a Plane
- * Problem solving and application (mathematical processes).

“Numbers and Numeration” covers reading and writing numerals in base two through twelve and the four basic operations on them as well as ratio, proportion, and parentages. Fractions, integers and rational and irrational numbers and four operations on them are treated extensively. Plane geometry covers angles of a polygon, Pythagoras’ theorem and its application and circle theorem including tangents. Mensuration covers perimeters and areas of plane shapes, surface areas and volumes of solid shapes. In addition, the earth as a sphere is also treated under mensuration. “Algebra” – Algebra is a symbolic language used to express mathematical relationships. Students need to understand how quantities are related to one another, and how algebra can be used to concisely express and analyze those relationships. “Statistics and Probability” – are important interrelated areas of mathematics. Each provides students with powerful mathematical perspectives on everyday phenomena and with important examples of how mathematics is used in the modern world. Statistics and probability should involve students in collecting, organizing, representing and interpreting data gathered from various sources, as well as understanding the fundamental concepts of probability so that they can apply them in everyday life. Trigonometry covers the trigonometry ratios and their applications to angles of elevation and depression. Drawing and interpretation of graphs of trigonometric functions is also covered under trigonometry.

Topics treated under vectors include, representation, operations on vectors, equal and parallel vectors as well as magnitude of vectors and bearing. Transformation deals with rigid motion and enlargement including scale drawing and its application.

“Problem solving and application” has not been made a topic by itself in the syllabus since nearly all topics include solving word problems as activities. It is hoped that teachers and textbook developers will incorporate appropriate problems that will require mathematical thinking rather than mere recall and use of standard algorithms. Other aspects of the syllabus should provide opportunity for the students to work co-operatively in small groups to carry out activities and projects which may require out-of-school time. The level of difficulty of the content of the syllabus has been designed to be within the knowledge and ability range of Senior High School students.

STRUCTURE AND ORGANIZATION OF THE SYLLABUS

The syllabus is structured to cover the three years of Senior High School. Each year's work has been divided into units. SHS 1 has 13 units; SHS 2 has 12 units while SHS 3 has 4 units of work. The unit topics for each year have been arranged in a suggested teaching sequence. It is suggested that the students cover most of the basic mathematics concepts in the first term of Year 1 before they begin topics in Elective mathematics. No attempt has been made to break the year's work into terms. This is deliberate because it is difficult to predict, with any degree of certainty, the rate of progress of students in each year. Moreover, the syllabus developers wish to discourage teachers from forcing the instructional pace but would rather advise teachers to ensure that students progressively acquire a good understanding and application of the material specified for each year's class work. It is hoped that no topics will be glossed over for lack of time because it is not desirable to create gaps in students' knowledge. The unit topics for the three years' course are indicated on the table below.

UNIT	SHS1	SHS2	SHS3
1.	Sets and Operations on set	Modular arithmetic	Constructions
2.	Real number system	Indices and logarithms	Mensuration II
3.	Algebraic expressions	Simultaneous linear equation	Logical reasoning
4.	Surds	Percentages II	Trigonometry II
5.	Number Bases	Variation	
6.	Relations and Functions	Statistics II	
7.	Plane Geometry	Quadratic functions	
8.	Linear equations and inequalities	Mensuration I	
9.	Bearing and Vectors in a plane	Plane geometry II (Circle theorems)	
10.	Statistics I	Trigonometry I	
11.	Rigid motion I	Sequences and Series	
12.	Ratio and Rates	Rigid motion II and Enlargement	
13.	Percentages I		

TIME ALLOCATION

Mathematics is allocated five periods a week, each period consisting of forty (40) minutes.

SUGGESTIONS FOR TEACHING THE SYLLABUS

General Objectives

General Objectives for this syllabus have been listed on page iii of the syllabus. The general objectives are directly linked flow to the general aims of mathematics teaching listed on the first page of this syllabus. The general objectives form the basis for the selection and organization of the units and their topics. Read the

general objectives very carefully before you start teaching. After teaching all the units for the year, go back and read the general aims and general objectives again to be sure you have covered both of them adequately in the course of your teaching.

Years and Units

The syllabus has been planned on the basis of Years and Units. Each year's work is covered in a number of units that have been sequentially arranged to meet the teaching and learning needs of teachers and students.

Syllabus Structure

The syllabus is structured in five columns: Units, Specific Objectives, Content, Teaching and Learning Activities and Evaluation. A description of the contents of each column is as follows:

Column 1 - Units: The units in Column 1 are the major topics for the year. The numbering of the units is different in mathematics from the numbering adopted in other syllabuses. The unit numbers consist of two digits. The first digit shows the year or class while the second digit shows the sequential number of the unit. A unit number like 1.2 is interpreted as unit 2 of SHS1. Similarly, a unit number like 3.2 means unit 2 of SHS3. The order in which the units are arranged is to guide you plan your work. However, if you find at some point that teaching and learning in your class will be more effective if you branched to another unit before coming back to the unit in the sequence, you are encouraged to do so.

Column 2 - Specific Objectives: Column 2 shows the Specific Objectives for each unit. The specific objectives begin with numbers such as 1.2.5 or 3.4.1. These numbers are referred to as "Syllabus Reference Numbers". The first digit in the syllabus reference number refers to the year/class; the second digit refers to the unit, while the third refer to the rank order of the specific objective. For instance 1.2.5 means Year 1 or SHS1, Unit 2 (of SHS1) and Specific Objective 5. In other words 1.2.5 refers to Specific Objective 5 of Unit 2 of SHS1. Using syllabus reference numbers provides an easy way for communication among teachers and other educators. It further provides an easy way for selecting objectives for test construction. For instance, Unit 4 of SHS2 may have eight specific objectives 2.4.1 - 2.4.8. A teacher may want to base his/her test items/questions on objectives 2.4.2, 2.4.7 and 2.4.7, and not use the other objectives. The teacher would hence be able to use the syllabus reference numbers to sample objectives within units and within the year to be able to develop a test that accurately reflects the importance of the various skills taught in class.

You will note also that specific objectives have been stated in terms of the students i.e. what the students will be able to do during and after instruction and learning in the unit. Each specific objective hence starts with the following "*The student will be able to...*", this in effect, means that you have to address the learning problems of each individual student. It means individualizing your instruction as much as possible such that the majority of students will be able to master the objectives of each unit of the syllabus.

Column 3 - Content: The "content" in the third column of the syllabus shows the mathematical concepts, and operations required in the teaching of the specific objectives. In some cases, the content presented is quite exhaustive. In some other cases, you could add some more information based upon your own training and based also on current knowledge and information.

Column 4 - Teaching/Learning Activities (T/LA): T/LA activities that will ensure maximum student participation in the lessons are presented in Column 4. The General Aims of the subject can only be most effectively achieved when teachers create learning situations and provide guided opportunities for

students to acquire as much knowledge and understanding of mathematics as possible through their own activities. Students' questions are as important as teacher's questions. There are times when the teacher must show, demonstrate, and explain. But the major part of a students' learning experience should consist of opportunities to explore various mathematical situations in their environment to enable them make their own observations and discoveries and record them. Avoid rote learning and drill-oriented methods and rather emphasize participatory teaching and learning in your lessons. You are encouraged to re-order the suggested teaching/learning activities and also add to them where necessary in order to achieve optimum students learning. Emphasize the cognitive, affective and psychomotor domains of knowledge in your instructional system wherever appropriate.

A suggestion that will help your students acquire the capacity for analytical thinking and the capacity for applying their knowledge to problems and issues is to begin each lesson with a practical and interesting problem. Select a practical mathematical problem for each lesson. The selection must be made such that students can use knowledge gained in the previous lesson and other types of information not specifically taught in class.

Column 5 - Evaluation: Suggestions and exercises for evaluating the lessons of each unit are indicated in Column 5. Evaluation exercises can be in the form of oral questions, quizzes, class assignments, essays, project work, etc. Try to ask questions and set tasks and assignments, etc. that will challenge students to apply their knowledge to issues and problems as we have already said above, and that will engage them in developing solutions, and in developing observational and investigative skills as a result of having undergone instruction in this subject. The suggested evaluation tasks are not exhaustive. You are encouraged to develop other creative evaluation tasks to ensure that students have mastered the instruction and behaviours implied in the specific objectives of each unit.

Lastly, bear in mind that the syllabus cannot be taken as a substitute for lesson plans. It is necessary that you develop a scheme of work and lesson plans for teaching the units of this syllabus.

DEFINITION OF PROFILE DIMENSIONS

The concept of profile dimensions was made central to the syllabuses developed from 1998 onwards. A 'dimension' is a psychological unit for describing a particular learning behaviour. More than one dimension constitutes a profile of dimensions. A specific objective may be stated with an action verb as follows: The student will be able to describe..... etc. Being able to "describe" something after the instruction has been completed means that the student has acquired "knowledge". Being able to explain, summarize, give examples, etc. means that the students has understood the lesson taught.

Similarly, being able to develop, plan, construct etc, means that the student has learnt to create, innovate or synthesize knowledge. Each of the specific objectives in this syllabus contains an "action verb" that describes the behaviour the students will be able to demonstrate after the instruction. "Knowledge", "Application", etc. are dimensions that should be the prime focus of teaching and learning in schools. It has been realized unfortunately that schools still teach the low ability thinking skills of knowledge and understanding and ignore the higher ability thinking skills. Instruction in most cases has tended to stress knowledge acquisition to the detriment of the higher ability behaviours such as application, analysis, etc. The persistence of this situation in the school system means that students will only do well on recall items and questions and perform poorly on questions that require higher ability thinking skills such as application of mathematical principles and problem solving. For there to be any change in the quality of people who go through the school system, students should be encouraged to apply their knowledge, develop analytical thinking skills, develop plans, generate new and creative ideas and solutions, and use their knowledge in a variety of ways to solve mathematical problems while still in school. Each action verb indicates the underlying profile dimension of each particular specific objective. Read each objective carefully to know the profile dimension toward which you have to teach.

In Mathematics, the two profile dimensions that have been specified for teaching, learning and testing at the SHS level are:

Remembering and Understanding	30%
Applying Knowledge	70%

Each of the dimensions has been given a percentage weight that should be reflected in teaching, learning and testing. The weights indicated on the right of the dimensions, show the relative emphasis that the teacher should give in the teaching, learning and testing processes at Senior High School.

Explanation and key words involved in each of the profile dimensions are as follows:

Knowledge and Understanding (KU)

Knowledge	The ability to: Remember information, recognize, retrieve, locate, find, do bullet pointing, highlight, bookmark, network socially, bookmark socially, search, google, favourite, recall, identify, define, describe, list, name, match, state principles, facts and concepts. Knowledge is simply the ability to remember or recall material already learned and constitutes the lowest level of learning.
Understanding	The ability to: Interpret, explain, infer, compare, explain, exemplify, do advanced searches, categorize, comment, twitter, tag, annotate, subscribe, summarize, translate, rewrite, paraphrase, give examples, generalize, estimate or predict consequences based upon a trend. Understanding is generally the ability to grasp the meaning of some material that may be verbal, pictorial, or symbolic

Application of Knowledge (AK)

The ability to use knowledge or apply knowledge, as implied in this syllabus, has a number of learning/behaviour levels. These levels include application, analysis, innovation or creativity, and evaluation. These may be considered and taught separately, paying attention to reflect each of them equally in your teaching. The dimension "Applying Knowledge" is a summary dimension for all four learning levels. Details of each of the four sub levels are as follows:

Application	The process of applying knowledge involves the ability to: Apply rules, methods, principles, theories, etc. to concrete situations that are new and unfamiliar. It also involves the ability to produce, solve, operate, plan, demonstrate, discover, implement, carry out, use, execute, run, load, play, hack, upload, share, edit etc.
Analysis	The process of analyzing knowledge involves the ability to: Break down a piece of material into its component parts, to differentiate, deconstruct, attribute, outline, find, structure, integrate, mash, link, validate, crack, distinguish, separate, identify significant points etc., recognize unstated assumptions and logical fallacies, recognize inferences from facts etc.
Innovation/Creativity	Innovation or creativity involves the ability to: Put parts together to form a novel, coherent whole or make an original product. It involves the ability to combine, compile, compose, devise, construct, plan, produce, invent, devise, make, program, film, animate, mix, re-mix, publish, video cast, podcast, direct, broadcast,

suggest (an idea, possible ways), revise, design, organize, create, and generate new ideas and solutions. The ability to innovate or create is the highest form of learning. The world becomes more comfortable because some people, based on their learning, generate new ideas and solutions, design and create new things.

Evaluation - The ability to appraise, compare features of different things and make comments or judgments, contrast, criticize, justify, hypothesize, experiment, test, detect, monitor, review, post, moderate, collaborate, network, refractor, support, discuss, conclude, make recommendations etc. Evaluation refers to the ability to judge the worth or value of some material based on some criteria and standards. Evaluation is a constant decision making activity. We generally compare, appraise and select throughout the day. Every decision we make involves evaluation. Evaluation is a high level ability just as application, analysis and innovation or creativity since it goes beyond simple knowledge acquisition and understanding.

FORM OF ASSESSMENT

It is important that both instruction and assessment be based on the specified profile dimensions. In developing assessment procedures, first select specific objectives in such a way that you will be able to assess a representative sample of the syllabus objectives. Each specific objective in the syllabus is considered a criterion to be mastered by the students. When you develop a test that consists of items and questions that are based on a representative sample of the specific objectives taught, the test is referred to as a “Criterion-Referenced Test”. It is not possible to test all specific objectives taught in the term or in the year. The assessment procedure you use i.e. class test, homework, projects etc. must be developed in such a way that it will consist of a sample of the important objectives taught over the specified period.

The diagram below shows a recommended examination structure for end of term examination in Senior High School following the structure of WAEC examination papers. The structure consists of two examination papers. Paper 1 is the objective test paper essentially testing knowledge and understanding. The paper may also contain some items that require application of knowledge. Paper 2 will consist of questions that essentially test “application of knowledge”. The application dimension should be tested using questions that call for reasoning. Paper 2 could also contain some questions that require understanding of mathematical principles etc. The SBA should be based on both dimensions. The distribution of marks for Paper 1, Paper 2 and the SBA should be in line with the weights of the profile dimensions as shown in the last column of the table below.

Distribution of Examination Paper Weights and Marks

Dimensions	Paper 1	Paper 2	SBA	Total Marks	Total Marks scaled to 100
Knowledge and Understanding	30	20	10	60	30
Application of Knowledge	10	80	50	140	70
Total Marks	40	100	60	200	

% Contribution of Examination Papers	20	50	30		100
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Paper 1 or Section A, will be marked out of 40, while Paper 2, the more intellectually demanding paper, will be marked out of 100. The mark distribution for Paper 2 or Section B will be 20 marks for “knowledge and understanding” and 80 marks for “application of knowledge”. SBA will be marked out of 60. The last row shows the percentage contribution of the marks from Paper 1/Section A, Paper 2/Section B, and the School Based Assessment on total performance in the subject tested.

For testing in schools, the two examination sections could be separate where possible. Where this is not possible, the items/questions for Papers 1 and 2 could be in the same examination paper as two sections; Sections A and B as shown in the example above. Paper 1 or Section A will be an objective-type paper/section testing knowledge and understanding, while Paper 2 or Section B will consist of application questions with a few questions on knowledge and understanding.

GUIDELINES FOR SCHOOL BASED ASSESSMENT

A new School Based Assessment system (SBA) will be introduced into the school system in 2011. The new SBA system is designed to provide schools with an internal assessment system that will help schools to achieve the following purposes:

- Standardize the practice of internal school-based assessment in all Senior High Schools in the country
- Provide reduced assessment tasks for subjects studied at SHS
- Provide teachers with guidelines for constructing assessment items/questions and other assessment tasks
- Introduce standards of achievement in each subject and in each SHS class
- Provide guidance in marking and grading of test items/questions and other assessment tasks
- Introduce a system of moderation that will ensure accuracy and reliability of teachers’ marks
- Provide teachers with advice on how to conduct remedial instruction on difficult areas of the syllabus to improve class performance.

SBA may be conducted in schools using the following: Mid-term test, Group Exercise, End-of-Term Test and Project

1. Project: This will consist of a selected topic to be carried out by groups of students for a year. Segments of the project will be carried out each term toward the final project completion at the end of the year. The projects may include the following:
 - i) experiment
 - ii) investigative study (including case study)\
 - iii) practical work assignment

A report must be written for each project undertaken.

2. Mid-Term Test: The mid-term test following a prescribed SBA format
3. Group Exercise: This will consist of written assignments or practical work on a topic(s) considered important or complicated in the term’s syllabus

4. End-of-Term Test: The end –of-term test is a summative assessment system and should consist of the knowledge and skills students have acquired in the term. The end-of-term test for Term 3 for example, should be composed of items/questions based on the specific objectives studied over the three terms, using a different weighting system such as to reflect the importance of the work done in each term in appropriate proportions. For example, a teacher may build an End-of-Term 3 test in such a way that it would consist of the 20% of the objectives studied in Term 1, 20% of objectives studied in Term 2 and 60% of the objectives studied in Term 3.

Apart from the SBA, teachers are expected to use class exercises and home work as processes for continually evaluating students’ class performance, and as a means for encouraging improvements in learning performance.

Marking SBA Tasks

At the SHS level, students will be expected to carry out investigations involving use of mathematics as part of SBA and other assignments. The suggested guideline for marking investigative project assignments is as follows:

1.	Introduction	20%
2.	Main text – descriptions, analysis, charts etc.	40%
3.	Conclusion and evaluation of results/issues	20%
4.	Acknowledgement and other references	20%

In writing a report on an experiment or any form of investigation, the student has to introduce the main issue in the investigation, project or report. The introduction carries a weight of 20%. The actual work, involving description of procedures and processes, use of charts and other forms of diagrammes, and the analysis of data is given a weight of 40%. Conclusions and generalizations from the investigation, project etc. is weighted 20%. The fourth item, that is, acknowledgement and references is intended to help teach young people the importance of acknowledging one’s source of information and data. The students should provide a list of at least three sources of references for major work such as the project. The references could be books, magazines, the internet or personal communication from teacher or from friends. This component is given a weight of 20%.

GRADING PROCEDURE

To improve assessment and grading and also introduce uniformity in schools, it is recommended that schools adopt the following WASSCE grade structure for assigning grades on students’ test results. The WASSCE grading system is as follows:

Grade A1:	80 - 100%	-	Excellent
Grade B2:	70 - 79%	-	Very Good
Grade B3:	60 - 69%	-	Good
Grade C4:	55 - 59%	-	Credit
Grade C5:	50 - 54%	-	Credit
Grade C6:	45 - 49%	-	Credit
Grade D7:	40 - 44%	-	Pass
Grade D8:	35 - 39%	-	Pass

Grade F9: 34% and below - Fail

In assigning grades to students' test results, you are encouraged to apply the above grade boundaries and the descriptors which indicate the meaning of each grade. The grade boundaries i.e., 60-69%, 50-54% etc., are the grade cut-off scores. For instance, the grade cut-off score for B2 grade is 70-79% in the example. When you adopt a fixed cut-off score grading system as in this example, you are using the criterion-referenced grading system. By this system a student must make a specified score to be awarded the requisite grade. This system of grading challenges students to study harder to earn better grades. It is hence a very useful system for grading achievement tests.

Always remember to develop and use a marking scheme for marking your class examination scripts. A marking scheme consists of the points for the best answer you expect for each question, and the marks allocated for each point raised by the student as well as the total marks for the question. For instance, if a question carries 20 marks and you expect 6 points in the best answer, you could allocate 3 marks or part of it (depending upon the quality of the points raised by the student) to each point, hence totaling 18 marks, and then give the remaining 2 marks or part of it for organization of answer. For objective test papers you may develop an answer key to speed up the marking.

SENIOR HIGH SCHOOL 1

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.1 SETS AND OPERATIONS ON SETS	The student will be able to: 1.1.1 determine and write the number of subsets in a set 1.1.2 identify the properties of operations on sets.	Finding the number of subsets in a set with n elements Properties of Set Operations- Commutativity Associativity Distributivity	Review with students description of sets; - words/set builder notation - listing. - Venn diagrams. Guide students to deduce the number of subsets in a set with 'n' elements. i.e. the number of subsets = 2^n Guide students to determine the commutative property of sets involving given sets A and B i.e. $A \cap B = B \cap A$; $A \cup B = B \cup A$ Guide students to determine the associative property of sets involving three given sets A, B and C, i.e. $(A \cup B) \cup C = A \cup (B \cup C)$ and $(A \cap B) \cap C = A \cap (B \cap C)$ Guide students to determine the distributive property of sets involving three given sets A, B and C, i.e. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ Illustrate the properties with Venn diagrams.	Let students find the number of subsets in a given set. verify commutative, associative and distributive properties of operations on sets Illustrate properties of set operations using Venn diagrams

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>1.1 (CONT'D)</p> <p>SETS AND OPERATIONS ON SETS</p>	<p>The student will be able to:</p> <p>1.1.3 describe the regions of a Venn diagram in terms of the set operations - union, complement</p> <p>1.1.4 find solution to practical problems involving classifications using Venn diagrams</p>	<p>Description and identification of the regions of Venn diagrams using set operations</p> <p>Three-set problems using Venn diagrams</p>	<p>Guide students to revise the concept of universal set and the complement of a set in a Venn diagram, E.g.</p> <div data-bbox="1213 448 1556 613" data-label="Diagram"> </div> <p>Guide students to</p> <ol style="list-style-type: none"> describe regions of three (3) intersecting sets shade regions corresponding to given descriptions <p>Assist students to verify (using Venn diagrams) that given any two intersecting sets, A and B,</p> $(A \cup B)^c = A^c \cap B^c$ $(A \cap B)^c = A^c \cup B^c$ <p>Review two-set problems. Guide students to solve problems involving three sets e.g.</p> <div data-bbox="1129 1024 1409 1219" data-label="Diagram"> </div> <ol style="list-style-type: none"> List the elements of $(A \cap B) \cup C$ What is $n\{(A \cup B)^c \cap C\}$ 	<p>Let students</p> <p>draw 2 intersecting sets and shade given regions</p> <p>describe shaded regions of 3 intersecting sets</p> <p>write or pose 2 set problems involving real life situations</p> <p>solve 3 set problems involving real life situations</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
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UNIT 1.2 REAL NUMBER SYSTEM	The student will be able to: 1.2.1 distinguish between rational and irrational numbers.	Rational and irrational numbers	Guide students to revise natural numbers, whole numbers and integers. Guide students to distinguish between rational and irrational numbers i.e. rational numbers can be expressed as $\frac{a}{b}$, where a and b are real numbers and $b \neq 0$ Guide students to draw Venn diagrams to illustrate the relationship between the members of the real number system. <p>i.e.</p>	Let students: Identify regions representing given types of real numbers from Venn diagrams and place given real numbers in the appropriate region. Copy the Venn diagram and shade the region that contains given rational numbers.
	1.2.2 represent real numbers on the number line.	Real Numbers on the number line	Assist students to locate or estimate the points for real numbers on the number line. E.g. ...-7, $-\frac{1}{2}$, 0, $\frac{1}{2}$, 1, 1.5, 2.17171717, ..., $\sqrt{5}$, ... Guide students to (i) graph given sets of real numbers on the number line; (ii) find the range of values for a given graph. E.g. $-1 \leq x \leq 2$	illustrate a given range of numbers on the number line (vice versa)

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.2 (CONT'D)	The student will be able to:			Let students:

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
REAL NUMBER SYSTEM	1.2.3 compare and order rational numbers	Comparing and ordering rational numbers	Assist students to compare and order different types of rational numbers E.g. common fractions, whole numbers, percentages, decimal fractions and integers using $<$, $>$ and the number line. E.g. arrange the fractions; 0.3 , $\frac{1}{4}$, 45% and 28 in ascending order.	arrange sets of rational numbers in order of magnitude.
	1.2.4 approximate by rounding off decimal numbers to a given number of place values	Approximating and rounding off numbers	Guide students to approximate decimal numbers to given place values E.g. 587.3563 to 2 decimal places (nearest hundredth) is 587.36 and 5873456 rounded to the nearest thousand is 5873000 .	round off numbers to given number of place values.
	1.2.5 approximate a decimal number to a given number of significant figures	Significant figures	Guide students to approximate given decimal numbers to given number of significant figures E.g. 46.23067 approximated to 5 significant figures is 46.231 .	approximate numbers to given number of significant figures.
	1.2.6 express recurring decimals as common fractions.	Recurring decimals	Review changing common fractions to decimals and vice versa. Guide students to realize that a recurring decimal has a digit or a block of digits which keep repeating E.g. $1.666\dots$ or $1.\dot{6}$ $0.727272\dots$ or $0.\dot{7}2$ Guide students to express recurring decimals as fractions of the form $\frac{a}{b}$ where $b \neq 0$ E.g. $0.\dot{7} = \frac{7}{9}$ and $0.\dot{1}\dot{8} = \frac{18}{99} = \frac{2}{11}$ Encourage students to verify results using the calculator or computer.	express given recurring decimal fractions as common fractions.

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.2 (CONT'D) REAL NUMBER SYSTEM	<p>The student will be able to:</p> <p>1.2.7 express very large or very small numbers in standard form.</p> <p>1.2.8 state and use properties of operations on real numbers.</p> <p>1.2.9 interpret given binary operations and apply them to real numbers</p>	<p>Standard form</p> <p>Properties of operations</p> <p>Commutative property</p> <p>Associative Property</p> <p>Distributive Property</p> <p>Binary operations</p>	<p>Guide students to express a very large number and a very small number in the form: $k \times 10^n$, where $1 \leq k < 10$ and n is an integer. E.g. $14835 = 1.4835 \times 10^4$ $0.0034678 = 3.4678 \times 10^{-3}$</p> <p>Guide students to investigate the commutative properties of addition and multiplication. i.e. $a + b = b + a$ and $ab = ba$</p> <p>Guide students to investigate the associative property of addition and multiplication. i.e. $(a + b) + c = a + (b + c)$, and $(ab)c = a(bc)$</p> <p>Guide students to investigate the distributive property of multiplication over addition and subtraction. i.e. $a(b + c) = ab + ac$, and $a(b - c) = ab - ac$.</p> <p>Guide students to interpret and carry out binary operations on real numbers such as $a * b = 2a + b - ab$ $p * q = p + q - 2pq$.</p> <p>Encourage students to verify results using the calculator or computer.</p>	<p>Let students:</p> <p>express given numbers in standard forms and vice versa E.g. The planet Neptune is 4,496,000,000 kilometres from the Sun. Write this distance in standard form.</p> <p>State the properties of operations applied in given mathematical sentences.</p> <p>apply the appropriate properties to evaluate expressions E.g. $18 \times 22 = 18(20+2)$ $90 \times 95 = 90(100 - 5)$.</p> <p>If a and b are non-zero whole numbers, which of these is not always a whole number: $(a^2 + b^2)$, $(a \times b)$, $(a \div b)$, $(a - b)$, ab</p> <p>carry out defined binary operations over real numbers E.g. If $m * n = m + n + 5$, find $8 * (-4)$</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.3 ALGEBRAIC EXPRESSIONS	<p>The student will be able to:</p> <p>1.3.1 express statements in mathematical symbols</p> <p>1.3.2 add and subtract algebraic expressions</p> <p>1.3.3 multiply two binomial expressions</p> <p>1.3.4 factorize algebraic expressions</p> <p>1.3.5 apply difference of two squares to solve problems</p>	<p>Algebraic expressions</p> <p>Operations on algebraic expressions</p> <p>Binomial expressions</p> <p>Factorization</p> <p>Difference of two squares</p>	<p>Assist students to express simple statements involving algebraic expressions in mathematical symbols.</p> <p>Guide students to add, subtract and simplify algebraic expressions involving the four basic operations.</p> <p>Assist students to multiply two binomial expressions and simplify E.g. $(a + b)(c + d) = c(a + b) + d(a + b)$ $= ac + bc + ad + bd$</p> <p>Guide students to identify common factors in algebraic expressions and factorize (index of the variable not exceeding 2).</p> <p>Assist students to develop the rule of difference of two squares i.e. $a^2 - b^2 = (a + b)(a - b)$</p> <p>Guide students to apply the idea of difference of two squares to evaluate algebraic expressions, E.g. $x^2 - y^2 = (x + y)(x - y)$, i.e. $6.4^2 - 3.6^2$ $= (6.4 + 3.6)(6.4 - 3.6) = 10 \times 2.8 = 28$.</p>	<p>Let students</p> <p>translate statements involving algebraic expressions in mathematical symbols.</p> <p>add and subtract algebraic expressions..</p> <p>expand and simplify product of two binomial expressions.</p> <p>factorize given algebraic expressions with variable index not exceeding 2.</p> <p>apply difference of two squares to simplify algebraic expressions</p>

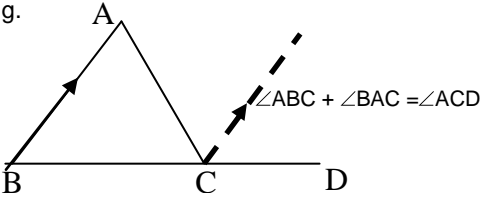
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.3 (CONT'D) ALGEBRAIC EXPRESSIONS	<p>The student will be able to:</p> <p>1.3.6 perform operations on simple algebraic fractions.</p> <p>1.3.7 determine the conditions under which algebraic fraction is zero or undefined</p>	<p>Operations on algebraic fractions with monomial denominators</p> <p>Operation on algebraic fractions with binomial denominators</p> <p>Zero or Undefined algebraic fractions</p>	<p>Guide students to add and subtract algebraic fractions with monomial denominators. E.g. $\frac{2}{a} + \frac{1}{x} = \frac{2x+a}{ax}$</p> <p>Assist students to add and subtract algebraic fractions with binomial denominators. E.g. $\frac{1}{x-b} + \frac{1}{x-a} = \frac{2x-a-b}{(x-b)(x-a)}$, where $x \neq a, x \neq b$</p> <p>Discuss with students the condition under which an algebraic expression is zero. $\frac{3a}{5y}$, is zero. When $3a = 0$, i.e. $a = 0$</p> <p>Assist students to determine the condition under which an algebraic expression is undefined $\frac{1}{2-2x}$ E.g. $\frac{1}{2-2x}$ is undefined when $2 - 2x = 0$, or when $x=1$.</p>	<p>Let students solve problems involving addition and subtraction of algebraic fractions with monomial and binomial denominators.</p> <p>solve for the value of variables in algebraic fractions for which the fraction is zero.</p> <p>find the value of a variable for which an algebraic fraction is undefined.</p>

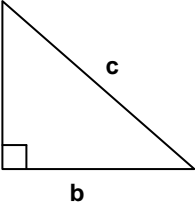
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.4 SURDS.	The student will be able to: 1.4.1 simplify surds	Simplifying surds.	Guide students to simplify surds of the form \sqrt{a} E.g. $\sqrt{8} = 2\sqrt{2}$ $\sqrt{27} = 3\sqrt{3}$ $\sqrt{72} = 6\sqrt{2}$ Assist students to simplify the product of surds. i.e. $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ $(\sqrt{a})^2 = a$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$	Let students: simplify surds of the form \sqrt{a} and products of surds. use the relations in surds to solve problems
	1.4.2 carry out operations involving surds	Addition, subtraction and multiplication of surds.	Guide students to find sums, differences and products of surds.	solve problems involving addition, subtraction and multiplication of surds
	1.4.3 rationalize a surd with monomial denominator	Rationalization of surds with monomial denominators.	Guide students to rationalize surds with monomials denominators. E.g. $\frac{2}{\sqrt{3}} = \frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$	simplify and rationalize the denominators of surds

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.5 NUMBER BASES	<p>The student will be able to:</p> <p>1.5.1 convert base ten numerals to other bases and vice-versa</p> <p>1.5.2 solve simple equations involving number bases</p> <p>1.5.3 perform operations on number bases other than base ten</p>	<p>Converting base ten numerals to numerals in other base and vice versa.</p> <p>Equations involving number bases</p> <p>Operations on numbers involving number bases other than base ten.</p> <ul style="list-style-type: none"> • Addition and subtraction • Multiplication 	<p>Guide students to revise number bases by converting base ten numerals to bases two and five and vice-versa.</p> <p>Guide students to convert given numerals from base ten to numerals in other bases up to base twelve.</p> <p>Guide students to solve equations involving number bases E.g. $132_x = 42_{ten}$</p> <p>Guide students to add and subtract numbers in bases other than base ten.</p> <p>Guide students to construct addition tables for bases other than base ten.</p> <p>Guide students to find the product of two numbers and construct multiplication table in a given base other than base ten.</p>	<p>Let students:</p> <p>convert numerals in base ten to numerals in other bases and vice-versa.</p> <p>solve for the base of a number in equations involving number bases.</p> <p>construct addition table in given base other than base ten and use it to solve problems</p> <p>solve problems on number bases (other than base ten) involving addition and subtraction</p>

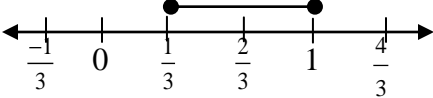
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.6 RELATIONS AND FUNCTIONS	<p>The student will be able to:</p> <p>1.6.1 distinguish between the various types of relations.</p> <p>1.6.2 Identify functions from other relations.</p> <p>1.6.3 determine the rule for a given mapping</p>	<p>Types of relations</p> <p>Functions</p> <p>Mapping</p>	<p>Review with students, relations between two sets; arrow diagrams; ordered pairs; domain; co-domain; range.</p> <p>Use expressions of real life relations such as “is the father of”, “is the wife of” to describe relations. (Encourage students to develop the sense of belongingness)</p> <p>Guide students to use arrow diagrams to illustrate types of relations including “one-to-one”, “one-to-many”, “many-to-one” and “many-to-many” relations.</p> <p>Use arrow diagrams to guide students to identify the relations “one-to-one” and “many-to-one” as functions.</p> <p>Assist students to determine the rule for a given mapping on the set of real numbers</p> <div data-bbox="1213 1019 1619 1323" data-label="Diagram"> </div> <p>The rule is: $f(x) = 2x - 3$.</p>	<p>Let students</p> <p>find the range of function defined by a given set of ordered pairs E.g. determine the range of function defined by the set of ordered pairs $\{(2,3),(1,4),(5,4),(0,3)\}$</p> <p>determine the type of relation described by a given set of ordered pairs or in a given arrow diagram.</p> <p>give reasons why a given relation is or is not a function</p> <p>determine the rule for a given function.</p>

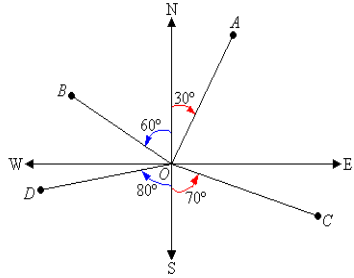
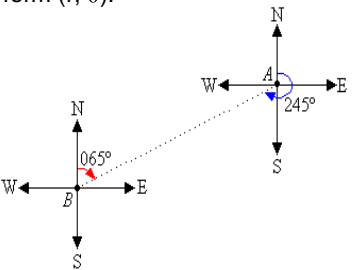
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
1.6 (CONT'D) RELATIONS AND FUNCTIONS	<p>The student will be able to:</p> <p>1.6.4 draw graphs for given linear functions</p> <p>1.6.5 find the gradient of a straight line, given the co-ordinates of two points on the line</p> <p>1.6.6 find the equation of a straight line</p> <p>1.6.7 find the distance between two points</p> <p>1.6.8 draw graphs for given quadratic functions</p>	<p>Graphs of Linear Functions</p> <p>Gradient of a straight line</p> <p>Equation of a straight line</p> <p>Magnitude of a line segment</p> <p>Graphs of Quadratic functions</p>	<p>Guide students to form table of values for a given linear function defined on the set of real numbers for a given domain.</p> <p>Guide students to use completed tables to plot points, draw graphs and read values from the graphs.</p> <p>Assist students to use graph (or square grid) to develop the ratio $\frac{y_2 - y_1}{x_2 - x_1}$ as the gradient of a straight line joining the points (x_1, y_1) and (x_2, y_2).</p> <p>Guide students to derive the equation of a line from $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$ where (x, y) is an arbitrary point on the line</p> <p>Discuss with the students different forms of equation of a straight line i.e. (i) $y = mx + c$ (ii) $ax + by + c = 0$</p> <p>Guide students to find the distance between two points with coordinates (x_1, y_1) and (x_2, y_2) as $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$</p> <p>Guide students to draw table of values for quadratic functions defined on the set of real numbers for a given domain and use the table of values to draw quadratic graphs and also to read values from the graphs.</p>	<p>Let students</p> <p>draw graphs of given linear functions and read values of the function for a given pre-image and vice versa</p> <p>find the gradient of a line from given coordinates of points on the line</p> <p>find the equation of a line from given points on the line</p> <p>find the length of a line joining two given points</p> <p>draw the graphs of given quadratic functions</p> <p>read the value of the function for a given pre-image and vice versa</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.7 PLANE GEOMETRY I	<p>The student will be able to:</p> <p>1.7.1 calculate the angles at a point</p> <p>1.7.2 state and use the properties of parallel lines</p> <p>1.7.3 state and use the exterior angle theorem of a triangles</p>	<p>Angles at a point</p> <p>Parallel lines Relationships between corresponding angles, vertically opposite angles, alternate angles and adjacent angles, supplementary angles</p> <p>Exterior angle theorem</p>	<p>Revise with students the sum of angles on a straight line by measuring using a protractor.</p> <p>Assist students to use protractors to measure angles at a point to verify that they add up to 360°.</p> <p>In groups let students draw parallel lines and a transversal and, measure all the angles to discover the relationships between; corresponding angles, vertically opposite angles, alternate angles, adjacent angles, and supplementary angles.</p> <p>Guide students to measure the interior and the exterior angles of a triangle to verify the exterior angle theorem of a triangle. E.g.</p>  <p>Guide students to use the idea of corresponding and alternate angles to verify the exterior angle theorem of a triangle.</p> <p>Guide students to apply this knowledge to find the value of missing angles in a triangle</p>	<p>Let students:</p> <p>find missing angles in given diagrams</p> <p>find missing angles between parallel lines and a transversal</p> <p>find missing angles of triangles from given diagrams</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1.7 (CONT'D)</p> <p>PLANE GEOMETRY I</p>	<p>The student will be able to:</p> <p>1.7.4 identify various properties of special triangles</p> <p>1.7.5 state and use the relationship between the hypotenuse and the two other sides of a right-angled triangle (i.e. Pythagoras theorem)</p>	<p>Special triangles Isosceles and equilateral triangles</p> <p>Right-angled triangle</p>	<p>Revise different types of triangles including scalene, isosceles equilateral and right-angled triangles.</p> <p>Guide students to establish the properties of isosceles and equilateral triangles.</p> <p>E.g. (i) the line of symmetry of an isosceles triangle bisects the base and the angle opposite it, and is perpendicular to the base</p> <p>(ii) an isosceles triangle has one line of symmetry and one rotational symmetry</p> <p>(ii) an equilateral triangle has three lines of symmetry, the lines are congruent, and has rotational symmetry of order 3.</p> <p>Guide students to use practical activities, including the use of the geoboard to identify the right-angled triangle and discover the relationship between the hypotenuse and the other two sides.</p> <div style="text-align: center;">  $c^2 = a^2 + b^2$ </div> <p>Guide students to use the Pythagoras theorem to find the missing side of given right-angled triangle when two sides are given.</p>	<p>Let students:</p> <p>use properties of special triangles to find missing angles in triangles</p> <p>identify some Ghanaian symbols that are symmetrical E.g. 'Gye Nyame' symbol.</p> <p>identify special triangles in some Ghanaian symbols.</p> <p>solve problems involving the application of the Pythagoras theorem.</p> <p>The vertices are P(1, 2), Q(4, 6) and R(- 4,12)</p> <p>Show whether or not the triangle PQR is a right-angled triangle.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION																																		
UNIT 1.7 (CONT'D) PLANE GEOMETRY	<p>The student will be able to:</p> <p>1.7.6 state and use the properties of quadrilaterals</p> <p>1.7.7 calculate the sums of interior angles and exterior angles of a polygon</p> <p>1.7.8 identify various plane shapes (including the special triangles) by their geometric properties -</p>	<p>Quadrilaterals</p> <p>Polygons</p>	<p>Guide students to use cut-out shapes and fold to establish congruent sides, congruent angles and, lines of symmetry of quadrilaterals such as parallelograms, kites, rectangles, etc.</p> <p>Guide students to use the idea of sets to sort shapes with common properties.</p> <p>A. E.g. Given that $P = \{\text{parallelograms}\}$, $Q = \{\text{quadrilaterals with all sides equal}\}$ and $R = \{\text{rectangles}\}$. If P, Q and R are subsets of the set $U = \{\text{kite, square, rectangle, rhombus}\}$. What is $P \cap Q$?</p> <p>Guide students to establish the relation between the number of sides and the number of triangles in any polygon with 'n' sides.</p> <p>Assist students to complete the table below.</p> <table border="1" data-bbox="1142 899 1644 1162"> <thead> <tr> <th rowspan="2">Polygon</th> <th colspan="2">Number of</th> <th rowspan="2">Sum of Angles</th> </tr> <tr> <th>Sides</th> <th>Triangles</th> </tr> </thead> <tbody> <tr> <td>Triangle</td> <td>3</td> <td>1</td> <td>180°</td> </tr> <tr> <td>Quadrilateral</td> <td>4</td> <td>2</td> <td>360°</td> </tr> <tr> <td>Pentagon</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hexagon</td> <td></td> <td></td> <td></td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>n-sided polygon</td> <td>n</td> <td></td> <td></td> </tr> </tbody> </table> <p>Guide them to use their results to find the formula for finding the sum of the interior angles of a regular polygon; i.e. $\text{sum of angles} = (n - 2)180^\circ$</p> <p>Guide students to perform activities to find the sum of the exterior angles of a regular polygon.</p>	Polygon	Number of		Sum of Angles	Sides	Triangles	Triangle	3	1	180°	Quadrilateral	4	2	360°	Pentagon				Hexagon				⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	n-sided polygon	n			<p>Let students:</p> <p>find the number of lines of symmetry of given quadrilaterals. E.g. Rhombus Parallelogram, etc.</p> <p>Is the statement "square $\in (P \cup Q \cap R)$" true?</p> <p>calculate the sum of interior angles of given polygon</p> <p>find an interior or exterior angle of a polygon using the ideas of the sum of interior angles and exterior angles of a regular polygon.</p>
Polygon	Number of		Sum of Angles																																			
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UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.8 FORMULARS, LINEAR EQUATIONS AND INEQUALITIES	The student will be able to:			Let students
	1.8.1 construct a formula (or algebraic expression) for a given mathematical task.	Formula	Guide students to construct a formula for a given mathematical task. E.g. Aku has y cedis more than Baku, if Baku has x cedis, then Aku has $(x + y)$ cedis.	construct a formula for a given mathematical task, E.g. Aku has y mangoes more than Baku. If Baku has x mangoes, how many do they have altogether?
	1.8.2 change the subject of formula	Change of subject of an equation	Guide students to find one variable in terms of the others in a relation.	make a variable the subject of a given formula E.g. Make r the subject of the formula $V = \frac{1}{3}\pi r^2 h$
	1.8.3 find solution sets for linear equations in one variable.	Solution sets of linear equations in one variable	Guide students to find solution sets of given linear equations in one variable $\frac{5x - 2}{3} = \frac{3x + 2}{2}$ E.g. $T = \{x : x = 10\}$	find the truth sets of linear equations in one variable.
	1.8.4 solve word problems involving linear equations in one variable	Word problems involving linear equations in one variable	Guide students to solve word problems involving linear equations in one variable.	solve word problems involving linear equations in one variable.
1.8.4 solve word problems involving linear inequalities in one variable	Linear inequalities in one variable	Find and illustrate truth sets of linear inequalities in one variable on the number line. E.g. $0 \leq 3x - 1 \leq 2$ $\frac{1}{3} \leq x \leq 1$ 	solve problems involving linear inequalities in one variable and show the solution on the number line.	
1.8.6 solve word problems involving linear inequalities in one variable	Word problems involving linear inequalities in one variable	Guide students to solve word problems involving linear inequalities in one variable	solve real life problems involving linear inequalities	

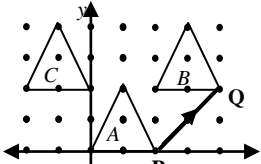
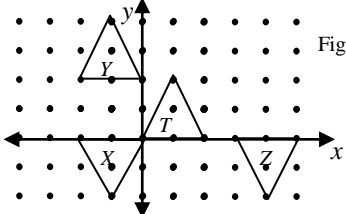
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1.9</p> <p>BEARINGS AND VECTORS IN A PLANE</p>	<p>The student will be able to:</p> <p>1.9.1 interpret bearing as direction of one point from another.</p> <p>1.9.2 write the distance and bearing of one point from another as (r, θ).</p>	<p>Bearing of a point from another.</p> <p>Distance-bearing form</p>	<p>Guide students to state the bearing of a point from a given point. For example, in the figure the bearing of A from O is B is 300°.</p> <p>Guide students to state direction to a point in number of degrees east or west of north or south. For example, in the figure the direction of A from O is $N30^\circ E$; B is $N60^\circ W$ from O; and C is $S70^\circ E$ from O.</p>  <p>Guide students to deduce and write the bearing of one point from another in the distance-bearing form (r, θ).</p>  <p>E.g. the distance and bearing of A from B is $(5\text{cm}, 065^\circ)$.</p>	<p>Let students:</p> <p>record angle measure in 3-digits.</p> <p>Find the direction of D from O.</p> <p>find the bearing of a point C from A, given the bearing of B from A and the bearing of C from B.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.9 (CONTD) BEARINGS AND VECTORS IN A PLANE	The student will be able to: 1.9.3 find the bearing of a point A from another point B, given the bearing of B from A. 1.9.4 distinguish between scalar and vector quantities 1.9.5 represent vectors in various forms 1.9.6 add and subtract vectors, 1.9.7 multiply a vector by a scalar	Reverse bearing Scalar and vector quantities Vector notation and representation Addition and subtraction of vectors Multiplying a vector by a scalar	Assist students to deduce reverse bearings i.e. if B is θ° from A, then A is (i) $(180 + \theta)^\circ$ from B for $0^\circ < \theta < 180^\circ$ (ii) $(\theta - 180)^\circ$ from B for $180^\circ < \theta < 360^\circ$ E.g. the reverse bearing of bearing of B from A is 245° Guide students to use diagrams to illustrate the idea of scalar and vector quantities. Guide students to identify the following: (a) free vector notation; \mathbf{a} , \mathbf{u} , etc. (b) position vector notation; \overrightarrow{OP} , \overrightarrow{OB} , etc. (c) representation of vectors in component form $\begin{pmatrix} x \\ y \end{pmatrix}$ (d) in bearing-magnitude form (r, θ°) Guide students to add and subtract vectors. E.g. (a) $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix} + \begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} x_1 + x_2 \\ y_1 + y_2 \end{pmatrix}$ (b) $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix} - \begin{pmatrix} x_2 \\ y_2 \end{pmatrix} = \begin{pmatrix} x_1 - x_2 \\ y_1 - y_2 \end{pmatrix}$ Guide students to multiply a vector by a scalar k. E.g. $k \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} kx \\ ky \end{pmatrix}$	Let students: find the bearing of one point from another, given the reverse bearing. distinguish between scalar and vector quantities express given vectors with the appropriate notations find the sum and difference of given vectors multiply given vectors by given scalars

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.9 (CONTD) BEARINGS AND VECTORS IN A PLANE	<p>The students will be able to:</p> <p>1.9.8 express the components of a vector in column form</p> <p>1.9.9 add two vectors using the triangle law of vector addition.</p> <p>1.9.10 state the conditions for two vectors to be equal or parallel</p>	<p>Column vectors</p> <p>Triangle law of vectors</p> <p>Equal and Parallel vectors</p>	<p>Guide students to use graph to determine components of vectors in column form for given coordinates E.g. A (x₁, y₁) and B (x₂, y₂) in the Oxy plane;</p> <p>(a) $\vec{OA} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}, \vec{OB} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$</p> <p>(b) $\vec{AB} = \begin{pmatrix} x_2 - x_1 \\ y_2 - y_1 \end{pmatrix}$</p> <p>Using graphs guide students to deduce the triangle law of vectors addition. $\vec{AB} + \vec{BC} = \vec{AC}$ where A, B and C are points in the Oxy plane.</p> <p>Assist students to establish conditions for vectors to be equal or parallel : i.e. If. $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$, then $x_1 = x_2$ and $y_1 = y_2$.</p> <p>If $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix}$ is parallel to $\begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$ then $\begin{pmatrix} x_1 \\ y_1 \end{pmatrix} = k \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}$, where k is a scalar.</p>	<p>Let students</p> <p>find the vector AB given coordinates of A and B</p> <p>find the coordinates of B, given the vector AB and the coordinates of A.</p> <p>find the diagonals of a quadrilateral ABCD in vector component form, given the coordinates of the vertices</p> <p>add two given vectors</p> <p>use the idea of equal and parallel vectors to solve related problems</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.9 (CONTD) BEARINGS AND VECTORS IN A PLANE	1.9.11 find the negative vector of a given vector 1.9.12 find the magnitude and direction of a vector.	Negative vectors Magnitude and direction of a vector	Assist students to find the negative vector of a given vector. E.g. the negative vector of $\vec{AB} = \begin{pmatrix} -3 \\ 2 \end{pmatrix} \text{ is } -\vec{AB} = \vec{BA} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ Guide students to find the magnitude and direction of a given vector. i.e. if $\vec{AB} = \begin{pmatrix} x \\ y \end{pmatrix}$, then $ \vec{AB} = \sqrt{x^2 + y^2}$ and direction is given by $\theta = \tan^{-1}\left(\frac{y}{x}\right)$	find negative vectors of given vectors in component form find the magnitude and direction of given vectors.
UNIT 1.10 STATISTICS I	1.10.1 organise data in frequency tables (i.e. ungrouped and grouped) 1.10.2 read, interpret, and draw simple inferences from, data/information presented in tables	Frequency distribution tables Data presented in tables	Guide students to identify situations and problems for data collection, and state appropriate methods for the collection of the data. Guide students to prepare frequency tables for grouped and ungrouped data. (exclude unequal class intervals) Assist students to interpret data/information presented in tables. E.g. mileage chart. league tables, etc. Guide students to draw simple inferences from tabular data.	construct frequency tables for grouped and ungrouped data. Interpret and draw simple inferences from tabular data

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.10 (CONTD) STATISTICS I	<p>The student will be able to:</p> <p>1.10.3 represent data on a suitable graph and interpret given graphs</p> <p>1.10.5 calculate the mean using appropriate formula</p>	<p>Graphical representation of data.</p> <p>Mean of a distribution.</p>	<p>Guide students to use appropriate graph to represent data from real life situations like test scores, rainfall, health records, imports, exports etc.</p> <p>Note Use pie charts and bar charts for ungrouped data and histograms for grouped data.</p> <p>Encourage students to use computer to do these charts.</p> <p>Assist students to interpret given graphs</p> <p>Assist students to calculate the mean using the formulae:</p> <p>(i) $\bar{x} = \frac{\sum x}{n}$ for ungrouped data</p> <p>(ii) $\bar{x} = \frac{\sum fx}{\sum f}$ for grouped data.</p> <p>Encourage students to use calculator or computer to check their results.</p>	<p>Let students represent data in frequency tables on suitable charts</p> <p>calculate the mean of a given data using the appropriate formula</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.11 RIGID MOTION I	<p>1.11.1. identify and translate an object or point by a translating vector and describe the image</p> <p>1.11.2 identify and explain the reflection of an object in a mirror line</p>	<p>Translation by a vector.</p> <p>Reflection in a line.</p>	<p>Guide students to identify translation vectors and recognise that the vector in Fig. 11.1 is $\vec{PQ} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$</p>  <p>Assist students to describe the single transformation that maps i) A onto B; ii) A onto C; and iii) B onto A; in Fig. 11.1</p> <p>Assist students to translate points and plane figures by given vectors.</p> <p>Guide students to identify some Ghanaian (or adinkra) symbols that have translation transformation</p> <p>Guide students to identify lines of reflection (mirror line) and state their equations (limit line to $x=k$; $y=k$ and $y=kx$; where k is an integer)</p>  <p>Describe the single transformation that maps T onto X; X onto Y; and X onto Z.</p>	<p>describe in Fig. 11.1 the single transformation that maps B onto C</p> <p>translate plane figures and points by given vectors and state the image points</p> <p>Draw in Fig. 11.2 the image of Y under the transformation 'reflection in the line $y=x$'.</p> <p>describe in Fig. 11.2 the two transformations that map Y onto Z;</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.11 (CONTD) RIGID MOTION	The student will be able to: 1.11.3 describe the image points of shapes in a reflection	Characteristics of reflection	Assist students to draw shapes on graph sheets and find their images under reflections in given mirror lines. Assist students to discuss the characteristics - size, orientation, angles, etc. - of reflection	Let students draw images of geometric shapes under reflection in given mirror lines and state the points
UNIT 1.12 RATIO AND RATES	1.12.1 divide a quantity in a given ratio. 1.12.2 interpret scales used in drawing plans and maps and use them to calculate distances between two points 1.12.3 convert foreign currencies into Ghana cedis and vice versa	Ratio Scales Foreign exchange	Guide students to revise the idea of ratio by finding how many times one quantity is of the other. E.g. 7 and 21 are in the ratio 1 : 3 Assist students to share given quantities in given ratios. E.g. Share GH ₵2.5m in the ratio 3 : 2. Guide students to examine maps, plans and topographical sheets and identify the scales used. E.g. a scale of 1:125000 means 1cm on the map represents 125000 cm on the ground. Guide students to use given scales to draw plans of given areas in the locality or in the school and let them draw geometric shapes using scales. Guide students to use rates obtained from Forex Bureau or banks to convert given amounts in foreign currencies to Ghana cedis and vice versa. E.g. If \$1 = GH ₵1.44, express \$25.60 in cedis	solve word problems involving division of quantities in given ratios draw plans of given places and shapes find actual distances between two points on a map for a given scale convert given amounts of foreign currencies into Ghana cedis and vice versa

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 1.12 (CONT'D) RATIO AND RATES	<p>The student will be able to:</p> <p>1.12.4 explain and use common rates such as kmh^{-1}, ms^{-1} and those used in utility bills</p> <p>1.12.5 draw travel graphs and interpret them.</p> <p>1.12.6 calculate and compare population densities</p>	<p>Rates</p> <p>Travel Graphs.</p> <p>Population Density.</p>	<p>Guide students to solve problems involving rates. E.g. speed, wages and salaries</p> <p>Guide students with samples to study population charts to explain the idea of rates.</p> <p>Guide students to draw a distance–time graph from a given data and use it to calculate average speed, total distance traveled, total time taken, etc.</p> <p>Assist students to calculate population density as population per square kilometer (collect data from statistical service department or the internet).</p>	<p>Let students solve practical problems involving rates - salaries, wages, overtime and piece-rate</p> <p>draw distance-time graphs for a given data and interpret.</p> <p>calculate and compare population densities in urban and rural areas</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 1.13</p> <p>PERCENTAGES I</p>	<p>The student will be able to:</p> <p>1.13.1 compare two amounts or quantities by expressing one as a percentage of the other.</p> <p>1.13.2 do money-making calculations that apply percentages.</p> <p>1.13.3 Do money-spending calculations that apply hire purchase.</p>	<p>Comparison by percentages</p> <p>Discount, Commission, Simple Interest.</p> <p>Hire Purchase.</p>	<p>Assist students to express one quantity as percentage of another.</p> <p>Guide students to calculate percentage increase or decrease on prices of goods and services.</p> <p>Guide students to calculate discount as money saved on goods bought and commission as money earned in a transaction.</p> <p>Assist students to calculate the price of goods when discount and commission are given.</p> <p>Guide students to use current bank rates to calculate interests on savings and loans</p> <p>Guide students to explain and perform calculations involving hire purchase.</p> <p>NB: the use of calculator to check computation should be encouraged</p>	<p>Let students:</p> <p>calculate the value of one quantity as a percentage of another.</p> <p>solve problems involving discount and commission.</p> <p>work out hire purchase payments over given periods</p>

SENIOR HIGH SCHOOL 2

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p style="text-align: center;">UNIT 2.1</p> <p style="text-align: center;">MODULAR ARITHMETIC</p>	<p>The student will be able to:</p> <p>2.1.1 calculate the value of numbers for a given modulo.</p> <p>2.1.2 add and multiply numbers in a given modulo.</p>	<p>Calculation of a number for a given modulo.</p> <p>Addition (\oplus) and multiplication (\otimes) tables in given modulo.</p>	<p>Guide students to use the clock face to determine the modulus of a number.</p> <p>Use the idea of remainders to assist students to determine the modulo of a number. E.g. $27 = 2 \text{ mod } 5$ $8 = 2 \text{ mod } 6$</p> <p>Guide students to construct addition \oplus and multiplication (\otimes) tables in a given modulo.</p>	<p>Let students:</p> <p>calculate the value of numbers for a given modulo.</p> <p>find the sum and product of any two given numbers in given modulo</p> <p>construct addition (\oplus) and multiplication (\otimes) tables in given modulo; use the tables to find the truth sets of statements</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.2 INDICES AND LOGARITHMS	<p>The student will be able to:</p> <p>2.2.1 write in exponent form the repeated factors of a number</p> <p>2.2.2 solve equations involving indices.</p>	<p>Laws of indices.</p> <p>Solving equations involving indices.</p>	<p>Revise with students the first two laws of indices</p> $\text{i.e. } a^x \times a^y = a^{(x+y)}$ $a^x \div a^y = a^{(x-y)}$ <p>Guide students to discover further rules governing indices</p> $\text{i.e. } (a^m)^n = a^{mn}$ $a^{-m} = \frac{1}{a^m}$ $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ <p>Guide students to deduce the value for a non-zero number with zero exponent</p> <p>i.e. $a^0 = 1$</p> <p>Assist students to solve simple equations involving indices.</p> <p>E.g.</p> $8^x = 32$ $2^{3x} = 2^5$ $3x = 5$ $x = \frac{5}{3}$	<p>Let students:</p> <p>solve problems involving repeated factors</p> <p>solve equations involving indices.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
2.2 (CONT'D) INDICES AND LOGARITHMS	<p>The student will be able to:</p> <p>2.2.3 relate indices to logarithms in base ten.</p> <p>2.2.4 deduce the rules of logarithms and apply them.</p>	<p>Relating indices to logarithms in base ten</p> <p>Rules of logarithms and their applications</p>	<p>Guide students to express given numbers as powers of 10.</p> <p>E.g. $100 = 10^2$ $10,000 = 10^4$</p> <p>Guide students to identify the relation between indices and logarithms.</p> <p>i.e. $x = 10^n \Leftrightarrow \log_{10} x = n$ Guide students to discover the rules of logarithms.</p> <p>E.g. $\log_{10} (A \times B) = \log_{10} A + \log_{10} B$</p> $\log_{10} \frac{A}{B} = \log_{10} A - \log_{10} B$ $\log_{10} A^x = x \log_{10} A$ <p>Assist students to use the rules to simplify logarithmic expressions and solve problems.</p>	<p>Let students:</p> <p>write an expression in indices using logarithm</p> <p>E.g. $x = 10^y \Rightarrow \log_{10} x = y$</p> <p>use the rules to solve logarithmic problems.</p>
UNIT 2.2 (CONT'D) INDICES AND LOGARITHMS	<p>2.2.5 find the anti-logarithm of a given number.</p>	<p>Anti-logarithms of given numbers.</p>	<p>Guide students to explain anti-logarithm of a given number</p> <p>i.e. if the log of 2 in base 10, (i.e. $\log_{10} 2$) is 0.3010, then the antilog of 0.3010 in base 10, (i.e. $\text{antilog}_{10} 0.3010 = 10^{0.3010} = 2$).</p> <p>Assist students to read the anti-logarithm of given numbers using</p> <ol style="list-style-type: none"> (i) tables (ii) calculators 	<p>find the anti-logarithms of given numbers using tables and calculators.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.3 SIMULTANEOUS LINEAR EQUATION	<p>The student will be able to:</p> <p>2.3.1 use graphical method to find solution sets of two given linear equations in two variables</p> <p>2.3.2 use elimination and substitution methods to find solution sets of two given linear equations in two variables</p> <p>2.3.3 solve word problems involving simultaneous linear equations</p>	<p>Graphical method for solving linear equations in two variables</p> <p>Elimination and substitution methods for solving linear equations in two variables</p> <p>Solving word problems involving simultaneous linear equations in two variables</p>	<p>Guide students to use the graphical method to find the solution sets of two linear equations in two variables; E.g.</p> <p>(I) $2x + 5y = 10$ $x = 4$</p> <p>(II) $2x + 5y = 10$ $y = 3$</p> <p>(III) $2x + 5y = 10$ $x - 2y = 4$</p> <p>Guide students to find the solution set of pairs of linear equations in two variables using</p> <p>(i) the elimination method and</p> <p>(ii) the substitution method.</p> <p>Pose word problems involving simultaneous linear equations in two variables for students to solve.</p> <p>E.g. A family of three adults and two children paid GH¢8.00 for a journey. Another family of four adults and three children paid GH¢11.00 as the fare for the same journey. Calculate the fare for</p> <p>(i) an adult</p> <p>(ii) a child</p> <p>(iii) a family of four adults and five children</p>	<p>Let students</p> <p>use graphical method to find the solution set of two linear equations in two variables</p> <p>find the solution set of two linear equations in two variables</p> <p>solve word problems involving simultaneous linear equations</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.4 PERCENTAGES II	<p>The student will be able to:</p> <p>2.4.1 solve real life problems involving compound interest</p> <p>2.4.2 determine the depreciation of an item over a specified period</p>	<p>Compound interest for a given period. (up to 4 years)</p> <p>Depreciation.</p>	<p>Guide the students to revise simple interest and other applications of percentages with students</p> <p>Guide students to calculate compound interest of any given amount. (formula is accepted but not required)</p> <p>Discuss with students examples of things that lose their values with passage of time. E.g. cars, fridges(i.e. depreciated assets)</p> <p>Calculate the depreciation of an item for a given period.</p> <p>Use of a calculator or a computer to check computation should be encouraged</p> <p>Note Formula is accepted but not required</p>	<p>Let students:</p> <p>calculate the compound interest on a given amount for a given number of years</p> <p>solve practical problems: E.g. A car bought for GH¢5000.00 depreciates at 10% per annum. Calculate the value after 4 years.</p>

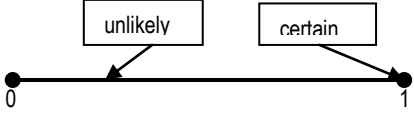
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.4 (CONT'D)</p> <p>PERCENTAGES II</p>	<p>The student will be able to:</p> <p>2.4.3 identify business partnerships and the way they function.</p> <p>2.4.4 calculate and share interest or profit in a given ratio.</p> <p>2.4.5 calculate interest on savings and loans.</p>	<p>Financial Partnership</p> <p>Interest (Profit) on capital.</p> <p>Banking</p>	<p>Guide students to discover how partnership businesses are formed between two or more persons. i.e. equal capital and by ratio.</p> <p>Guide students to calculate profits shared at the end of a given period in the ratios of their initial capitals.</p> <p>Assist students to discover the typical transactions, services provided and bank charges; e.g.</p> <ul style="list-style-type: none"> - savings/loans - treasury bill/fixed deposit - bank transfers - cot; etc. <p>Guide students to identify specimen copies of forms used in bank transactions and assist students to fill them; e.g.</p> <ul style="list-style-type: none"> - payment cheques and - pay-in-slips. <p>Guide students to calculate interest on savings and loans with current interest rates.</p>	<p>Let students:</p> <p>list different forms of business partnerships</p> <p>calculate profit(s) in a given ratio</p> <p>describe different types of transactions done at the banks</p> <p>complete specimens of pay-in-slip and cheques</p> <p>calculate simple interest on a given amount of savings/loans</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.4 (CONT'D)</p> <p>PERCENTAGES II</p>	<p>The student will be able to:</p> <p>2.4.6 calculate taxes paid on goods and services.</p> <p>2.4.7 calculate and explain the value added tax. (VAT)</p> <p>2.4.8 calculate electricity, water and telephone bills.</p>	<p>Income Tax</p> <p>Value Added Tax (VAT)</p> <p>Household bills</p>	<p>Guide students to identify the government agencies responsible for collecting income taxes.</p> <p>NB.: Encourage students to appreciate the need for people to pay taxes.</p> <p>Assist students to calculate income tax using a given tax schedule.</p> <p>Assist students to identify some goods and services that attract VAT and calculate the VAT on them.</p> <p>Guide students to identify the various household bills such as electricity bills, water bills and telephone bills.</p> <p>Assist students with samples to use the Public Utility Regulatory Committee Approved Tariffs to calculate water and electricity bills.</p> <p>Note: Emphasize the need for students to be prudent in the use of these utilities.</p>	<p>Let students:</p> <p>calculate the income tax for a given income.</p> <p>find the VAT on a bill for services or sales</p> <p>calculate the total bill paid by a household at the end of the month at a given rate</p>

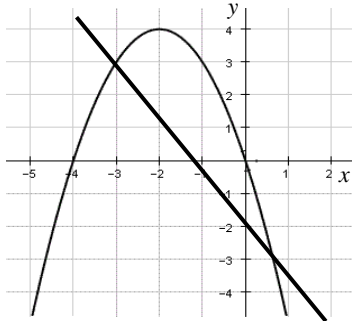
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION												
UNIT 2.5 VARIATION	<p>The student will be able to:</p> <p>2.5.1 write direct variations in symbols for given proportional relations</p> <p>2.5.2 solve problems involving direct variation.</p> <p>2.5.3 solve problems involving indirect variations</p> <p>2.5.4 solve problems involving joint variations.</p>	<p>Direct variation</p> <p>Solving problems involving direct variations</p> <p>Indirect variations (inverse variations)</p> <p>Solving problems involving joint variations.</p>	<p>Guide students to express direct variations in symbols for the proportional relations.</p> <table border="1" data-bbox="1136 500 1612 558"> <tr> <td>Number (n)</td> <td>1</td> <td>2</td> <td>3</td> <td>10</td> <td>25</td> </tr> <tr> <td>Cost (c)</td> <td>3p</td> <td>6p</td> <td>9p</td> <td>30p</td> <td>75p</td> </tr> </table> <p>E.g. In the table the variation relation between the number of items (n) and cost (c) is $c \propto n \Rightarrow c = kn$ where k is the constant of variation.</p> <p>Guide students to solve problems involving direct variations.</p> <p>Assist students to (i) express word problems involving inverse variation in mathematical symbols E.g. p varies inversely as t written as $p \propto \frac{1}{t} \Rightarrow p = \frac{k}{t}$</p> <p>(ii) solve problems involving inverse (indirect) variation</p> <p>Assist students to solve real life problems involving joint variations.</p> $p \propto \frac{x}{y} \Rightarrow p = \frac{kx}{y}$	Number (n)	1	2	3	10	25	Cost (c)	3p	6p	9p	30p	75p	<p>Let students:</p> <p>use symbols to write mathematical statements for direct variations</p> <p>solve everyday life problems involving direct variations</p> <p>write word problems involving indirect variations in mathematical symbols and solve them</p> <p>solve word problems involving joint variations.</p>
Number (n)	1	2	3	10	25											
Cost (c)	3p	6p	9p	30p	75p											

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
2.5 (CONT'D) VARIATION	The student will be able to: 2.5.5 solve problems involving partial variations.	Partial variations.	Guide students to recognise partial variation. Guide students to write an equation involving partial variation. E.g. y is partly constant and partly varies inversely as t is written as $y = k + \frac{c}{t}$ where k and c are constants Guide students to solve problems involving partial variations.	Let students: solve problems involving partial variations.
UNIT 2.6 STATISTICS II	2.6.1 draw a histogram for given data 2.6.2 calculate the mean of a given data	Histogram Mean	Guide students to revise the drawing of frequency table for ungrouped and grouped data; use it to draw histogram and estimate the mode from the histogram. (Restrict to groups of equal intervals). Guide students to find the mean of ungrouped and grouped data using; $\bar{x} = \frac{\sum x}{n}$ and $\bar{x} = \frac{\sum fx}{\sum f}$ respectively where x is the class mid-point (in case of grouped data) (accept assumed mean method but not required)	represent a given data by a histogram estimate the mode from a histogram calculate mean of given data

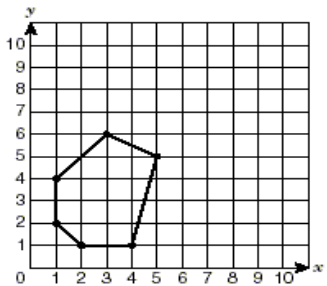
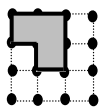
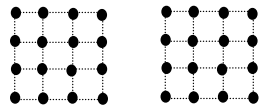
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.6 (CONT'D) STATISTICS II	<p>The student will be able to:</p> <p>2.6.3 draw cumulative frequency curves (Ogive) and interpret them.</p> <p>2.6.4 calculate and interpret standard deviation and variance of ungrouped data.</p>	<p>Cumulative Frequency Curves (Ogive).</p> <p>Standard deviation and Variance</p>	<p>Guide students to draw cumulative frequency curves using data and use the curves to estimate:</p> <p>(i) lower and upper quartiles; (ii) median; (iii) deciles and percentiles, etc</p> <p>Guide students to calculate and interpret standard deviation and variance of an ungrouped data.</p> <p>Eg method of ungrouped data</p> $Sd = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$ <p>Variance = (Sd)²</p> <p>E.g. The scores from an English test are: 30, 50, 70, 76, 26, 60, 42, 38, 92, and 49, with $\bar{x} = 53.3$: Sd = 21.1 The scores from a Mathematics test are: 80, 48, 60, 40, 32, 54, 62, 31, 86 and 55, with $\bar{x} = 53.0$ and Sd = 15.7 Therefore, English scores are more spread around the mean.</p> <p>Encourage students to use spreadsheet or computers to draw graphs and calculate mean, mode, median and standard deviation and compare with their own results.</p>	<p>Let students:</p> <p>draw a cumulative frequency curve and use it to estimate;</p> <p>(i) lower and upper quartiles; (ii) median; (iii) given deciles and percentiles;</p> <p>calculate and interpret standard deviation and variance</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.7 PROBABILITY	<p>The student will be able to:</p> <p>2.7.1 determine the sample space of a simple experiment.</p> <p>2.7.2 determine the sample space of a compound experiment.</p> <p>2.7.3 calculate the probability of an event</p> <p>2.7.4 interpret 'or' in probability as addition.</p> <p>2.7.5 interpret 'and' in probability as multiplication.</p>	<p>Sample Space of simple experiments</p> <p>Sample Space of compound experiment.</p> <p>Probability of an event</p> <p>Addition law for mutually exclusive events.</p> <p>Multiplication law for independent events.</p>	<p>Guide students to perform simple experiments such as tossing a coin once, throwing a die once, etc. and list the sample spaces as the set of all possible outcomes, E.g. sample space for throwing a die once is $S = \{1, 2, 3, 4, 5, 6\}$</p> <p>Guide students to perform compound experiments such as tossing two coins, tossing a coin and throwing a die, etc. and list the sample spaces.</p> <p>Assist students to calculate the probability of an event; i.e. $P(E) = \frac{n(E)}{n(S)}$</p> <p>Guide students to establish the following facts: $P(S) = 1$; $P(\phi) = 0$; $0 \leq P(A) \leq 1$; $P(A') = 1 - P(A)$</p> <p>Assist students to put probability vocabulary in order of likeliness on a probability scale – impossible, likely, unlikely, equally likely, certain, very likely etc.</p>  <p>Guide students to realize that mutually exclusive events do not have anything in common. i.e. $P(A \text{ or } B) = P(A) + P(B)$</p> <p>Guide students to realize that for two independent events, the probability of event A and event B happening together is $P(A \text{ and } B) = P(A) \times P(B)$</p>	<p>Let students:</p> <p>make a list of all possible outcomes of a simple experiment</p> <p>make a list of all possible outcomes of a compound experiment</p> <p>calculate the probability of given events</p> <p>estimate the probability of given events/statements and place these on a probability scale E.g. i) The day after Monday will be Tuesday ii) A new born baby will be a girl</p> <p>apply the addition law to calculate probabilities of mutually exclusive events</p> <p>apply the multiplication law to calculate the probability of independent events</p>

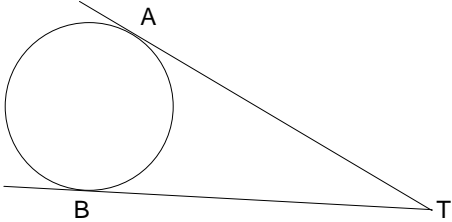
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.8 QUADRATIC FUNCTIONS AND EQUATIONS	<p>The student will be able to:</p> <p>2.8.1 identify and solve quadratic equations by factorization</p> <p>2.8.2 identify and solve quadratic equations by graphical method</p> <p>2.8.3 find the minimum and maximum values and points from graphs.</p> <p>2.8.4 identify the line of symmetry and write its equation.</p>	<p>Solving quadratic equations by factorization</p> <p>Graphical solution of quadratic equations</p> <p>Minimum and maximum values and points of quadratic graphs.</p> <p>Equation of line of symmetry.</p>	<p>Guide students to solve quadratic equations by factorization. E.g. for the truth set of $2x^2 + 5x - 12 = 0$, $(x + 4)(2x - 3) = 0$ $T = \{x : x = -4, \frac{3}{2}\}$</p> <p>Guide students to complete tables of values for given quadratic functions and draw graphs of the functions on graph sheets.</p> <p>Assist students to find the truth sets of quadratic equations from graphs.</p> <p>Guide students to find the maximum and minimum values from graphs and state the coordinates of the points where these occurs</p> <p>Assist students to establish that the quadratic graph is symmetrical about a vertical line and write its equation as $x = k$, where k is a real number.</p>	<p>Let students:</p> <p>solve given quadratic equations by factorization.</p> <p>solve given quadratic equations graphically.</p> <p>find and state the maximum/minimum points and values of graphs they draw.</p> <p>find the line of symmetry from a quadratic graph and write its equation</p>

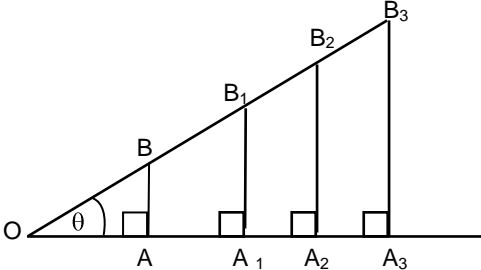
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.8 (CONTD)</p> <p>QUADRATIC FUNCTIONS AND EQUATIONS</p>	<p>The student will be able to:</p> <p>2.8.5 solve simultaneous equations involving one linear and one quadratic using graphs</p> <p>2.8.6 use quadratic graph to solve related equations</p> <p>2.8.7 find the range of values of x for which y is increasing or decreasing.</p> <p>2.8.8 find the range of values of x for which y is positive or negative</p>	<p>Solving linear and quadratic equations using graphs.</p> <p>Solving related quadratic equations</p> <p>Increasing/Decreasing values of quadratic graphs.</p> <p>Positive/Negative values of quadratic graph.</p>	<p>Guide students to solve simultaneous equations, one linear, one quadratic by drawing the two graphs on the same axes.</p>  <p>Encourage the use of computers to investigate the shapes of quadratic graphs as the values of the constants change.</p> <p>Assist students to solve related equations using the quadratic graph;</p> <p>i.e. use the graph of $y = ax^2 + bx + c$ to solve $ax^2 + dx + k = 0$ where a, b, c, d and k are constants.</p> <p>Assist students to determine the range of values of x for which the graph is increasing or decreasing.</p> <p>Guide students to determine the range of values of x for which a quadratic graph is positive or negative. (i.e. above or below the x-axis).</p>	<p>Let students:</p> <p>find on the graph the values of x and y which satisfy the two equations simultaneously.</p> <p>use graph of $y = ax^2 + bx + c$ to solve $ax^2 + dx + k = 0$ for various values of k</p> <p>find the range of values of x for which a given graph is increasing or decreasing.</p> <p>find the range of values of x for which y is positive or negative.</p>

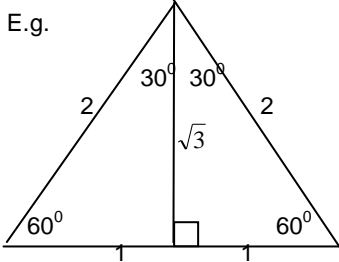
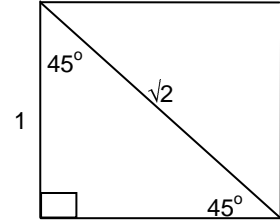
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p style="text-align: center;">UNIT 2.9</p> <p style="text-align: center;">MENSURATION I</p>	<p>The student will be able to:</p> <p>2.9.1 find the length of an arc of a circle</p> <p>2.9.2 calculate the perimeter of plane figures.</p>	<p>Length of an arc.</p> <p>Perimeter of plane figures</p>	<p>Revise parts of the circle with students.</p> <p>Guide students to deduce the formula for the length of an arc of a circle.</p> <p>i.e. $\frac{\theta}{360} \times 2\pi r$ where θ is the angle subtended at the centre of the circle by the arc; and r is the radius of the circle.</p> <p>Revise the perimeters of rectangles and squares with students</p> <p>Guide students to deduce the formula for the perimeter of sectors i.e. $\frac{\theta}{360} \times 2\pi r + 2r$</p> <p>Guide students to find the perimeter of other plane figures with various sides.</p>	<p>Let students:</p> <p>calculate the length of arcs of given circles</p> <p>find the perimeter of given plane figures</p> <p>calculate the perimeter of the shape in Figure 2.9.2 leaving your answer in surds</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>2.9 (CONT'D) MENSURATION I</p>	<p>The student will be able to:</p> <p>2.9.3 calculate the areas of sectors and segments</p> <p>2.9.4 find the areas of quadrilaterals</p>	<p>Areas of sectors and segments.</p> <p>Areas of quadrilaterals</p>	<p>Guide students to revise the area of a circle and triangle.</p> <p>Guides students to establish the formulae for the areas of a sector and a segment.</p> <p>i.e. Area of sector = $\frac{\theta}{360} \times \pi r^2$</p> <p>Area of segment = (area of sector – area of triangle).</p> <p>Guide students to find the areas of given quadrilaterals. E.g. trapezium, rhombus, etc.</p> <p>Assist students to find the areas of given polygons in a grid.</p> <p>E.g. If the squares in the coordinate plane are 1cm by 1cm, the area of the shape can be calculated by dividing the shape into quadrilaterals and triangles</p>  <p>Fig. 2.9.2</p>	<p>Let students:</p> <p>draw shapes that have the same area as another given shape in square grids.</p> <p>calculate the areas of sectors and segments of given circles</p> <p>find the areas of given quadrilaterals.</p> <p>given that the area of each square in this 3 by 3 grid is 1cm²,</p> <p>i. how many triangles can be drawn having the same area as this hexagon,</p>  <p>using the points at the corners of the squares as vertices? [draw 3 by 3 grids and investigate]</p> <p>ii. which of the triangles has the largest perimeter?</p> 

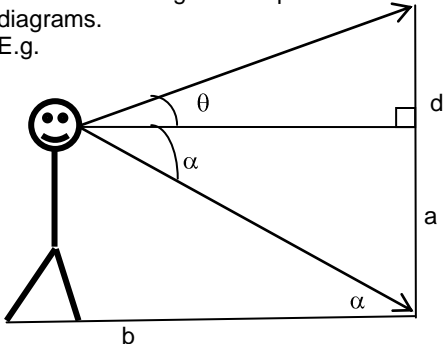
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.10</p> <p>PLANE GEOMETRY II (CIRCLES)</p>	<p>The student will be able to:</p> <p>2.10.1 draw circles for given radii.</p> <p>2.10.2 state and use the circle theorems</p> <p>2.10.3 identify the tangent as perpendicular to the radius at the point of contact.</p> <p>2.10.4 verify that the angle between the tangent and the chord at the point of contact is equal to the angle in the alternate segment.</p>	<p>The Circle as a Locus.</p> <p>Circle Theorems</p> <p>Perpendicularity of Tangent and Radius of a Circle</p> <p>Angle between Tangent and a Chord.</p>	<p>Guide students to find all points which are a given distance from a fixed point. E.g. fix a point O and find all points which are 5cm from O.</p> <p>Assist students to find the relationship between the angle subtended at the centre and that at the circumference by an arc.</p> <p>Guide students to find the value of the angle subtended by a diameter at the circumference.</p> <p>Guide students to find the relationship between opposite angles of a cyclic quadrilateral.</p> <p>Guide students to verify that the tangent is perpendicular to the radius at the point of contact.</p> <p>Assist students to verify the alternate angle theorem by drawing.</p>	<p>Let students:</p> <p>draw circles of varying radii.</p> <p>find missing angles using circle theorems.</p> <p>construct a tangent to a circle using the property of the tangent and radius.</p> <p>find missing angles using the alternate angle theorem</p>




UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.9 (CONT'D) PLANE GEOMETRY II (CIRCLES)	<p>The student will be able to:</p> <p>2.10.5 verify that tangents drawn from an external point to the same circle are equal when measured from their point of contact</p>	<p>Tangents from an External Point.</p>	<p>Guide students to verify that two tangents drawn from an external point, T, to a circle at points A and B are equal in length</p> <p>i.e. $AT = BT$</p> 	<p>Let students:</p> <p>solve for missing angles in a given diagram.</p>

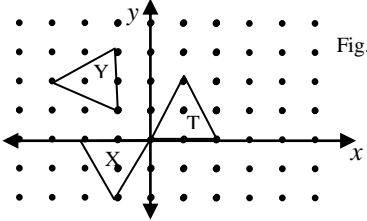
UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.11</p> <p>TRIGONOMETRY I</p>	<p>The student will be able to:</p> <p>2.11.1 define and compute the tangent, sine and cosine of an acute angle in degrees.</p>	<p>Tangent, sine and cosine of acute angles.</p>	<p>Guide students to use appropriate diagrams to define trigonometric ratios.</p> <p>E.g.</p>  <p> $\tan \theta = \frac{AB}{OA} = \frac{A_1B_1}{OA_1} = \frac{A_2B_2}{OA_2} = \frac{A_3B_3}{OA_3}$ $\sin \theta = \frac{AB}{OB} = \frac{A_1B_1}{OB_1} = \frac{A_2B_2}{OB_2} = \frac{A_3B_3}{OB_3}$ $\cos \theta = \frac{OA}{OB} = \frac{OA_1}{OB_1} = \frac{OA_2}{OB_2} = \frac{OA_3}{OB_3}$ </p> <p>Guide students to read the values of given trigonometric ratios of acute angles from tables and calculators.</p>	<p>Let students:</p> <p>express the tangent, sine and cosine in relation to the sides of a given acute angle in a right-angled triangle</p> <p>read values of given trigonometric ratios of acute angles from tables and calculators</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.11 (CONT'D)</p> <p>TRIGONOMETRY I</p>	<p>The student will be able to:</p> <p>2.11.2 calculate the values of trigonometric ratios of 30° 45° and 60°</p>	<p>The trigonometric ratios of 30°, 45° and 60°.</p>	<p>Guide the students to draw an equilateral triangle of dimensions (e.g. 2-units) and use it to derive the trigonometric ratios for 30° and 60°.</p> <p>E.g.</p>  $\sin 30^\circ = \frac{1}{2} \qquad \cos 30^\circ = \frac{\sqrt{3}}{2}$ $\sin 60^\circ = \frac{\sqrt{3}}{2} \qquad \cos 60^\circ = \frac{1}{2}$ <p>Assist students to draw a square of side one unit, draw one of the diagonals and use the diagonal and two sides to derive the value of trigonometric ratios of 45°</p>  $\sin 45^\circ = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\cos 45^\circ = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\tan 45^\circ = 1$	<p>Let students:</p> <p>find the trigonometric ratios of the angles 30°, 60° and 45°</p>

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UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.10 (CONT'D) TRIGONOMETRY I	<p>The student will be able to:</p> <p>2.11.3 use the calculator to read the values of sine, cosine and tangent of angles up to 360°</p> <p>2.11.4 find the inverse of trigonometric ratios</p> <p>2.11.5 calculate angles of elevation and angles of depression</p> <p>2.11.6 apply the use of trigonometric ratios to calculate distances and heights</p>	<p>The use of calculators to read sine, cosine and tangent of angles between 0° and 360°.</p> <p>Inverse of trigonometric ratios.</p> <p>Angles of elevation and depression.</p> <p>Application of trigonometric ratios.</p>	<p>Guide the students to use their calculators to find trigonometric ratios for given angles from 0° and 360°.</p> <p>Assist students to find the inverse of given trigonometric ratios using tables or calculators.</p> <p>Discuss with students what angles of elevation and angles of depression are using diagrams. E.g.</p>  <p>θ is the angle of elevation = $\tan^{-1}\left(\frac{d}{b}\right)$</p> <p>$\alpha$ is the angle of depression = $\tan^{-1}\left(\frac{a}{b}\right)$</p> <p>Pose problems of real life situations involving trigonometric ratios for students to solve.</p>	<p>Let students:</p> <p>find the values of sine, cosine and tangent of given angles using calculators</p> <p>find the inverse of given angles</p> <p>explain what angles of elevation and depression are</p> <p>solve problems involving angles of elevation and angles of depression.</p> <p>apply trigonometric ratios to solve problems on real life situations</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.12</p> <p>SEQUENCES AND SERIES</p>	<p>The student will be able to:</p> <p>2.12.1 continue a sequence with more terms.</p> <p>2.12.2 recognize an arithmetic progression (AP) and find the nth term or general term</p> <p>2.12.3 find the sum of the first n terms of an AP</p> <p>2.12.4 recognise a geometric progression (GP) or Exponential sequence</p> <p>2.12.5 find an expression for the general term of a GP</p>	<p>Patterns of sequence</p> <p>Arithmetic Progression</p> <p>Sum of the first n terms of an AP.</p> <p>Geometric Progression (or Exponential sequence)</p> <p>General term of a GP</p>	<p>Guide students to examine and continue a sequence of numbers.</p> <p>E.g. Sticks of equal length are arranged as shown in the Fig. 2.12.</p> <div style="text-align: center;">   </div> <p>Figure 1 Figure 2</p> <p>Fig 2.12. </p> <p>Figure 3</p> <p>If the pattern is continued, how many sticks will be used to make Figure 10?</p> <p>Guide students to identify common (or constant) difference and find the nth term of an A.P.</p> <p>i.e. $U_n = a + (n - 1)d$</p> <p>Assist students to deduce and use the rule for finding the sum (S_n) of the first n terms an AP.</p> <p>i.e. $S_n = \frac{n}{2} \{a + U_n\}$ $= \frac{n}{2} \{2a + (n - 1)d\}$</p> <p>E.g. In Fig. 2.12 above, how many sticks will be used to make the nth Figure?</p> <p>Guide students to use real situations to illustrate a GP. E.g. Depreciation,</p> <p>Guide students to deduce the general term of a GP as $U_n = ar^{n-1}$; where a is the first term and r, the common ratio</p>	<p>Let students:</p> <p>write the next two or more terms of a given sequence.</p> <p>write the nth term of given arithmetic progressions for given values of n.</p> <p>find the sum of n terms of an AP.</p> <p>solve everyday problems using the concept of GP</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p>UNIT 2.13</p> <p>RIGID MOTION II AND ENLARGEMENT</p>	<p>The student will be able to:</p> <p>2.13.1. identify shapes with rotational symmetry</p> <p>2.13.2. identify the image of an object (or point) after a rotation about the origin (or point)</p>	<p>Rotational symmetry</p> <p>Rotation</p>	<p>Assist students to sort plane shapes according to their order of rotational symmetry.</p> <p>Guide students to identify the image of a plane figure after a rotation about the origin,</p>  <p>Fig. 13.1</p> <p>Assist students to describe in Fig. 13.1 the single transformation that maps T onto X and T onto Y.</p> <p>Guide students to derive the rules for rotation using graphical method E.g. Anticlockwise about the origin (0,0) through 90° ; $(x, y) \rightarrow (-y, x)$ 180° ; $(x, y) \rightarrow (-x, -y)$, etc.</p> <p>Include clockwise rotation about the origin and rotation about a point other than the origin</p>	<p>Let students:</p> <p>identify some Ghanaian (or adinkra) symbols that have rotational symmetry and state the order of rotational symmetry.</p> <p>identify a rotation among a set of movements</p> <p>draw a given plane figure on a graph paper and rotate it through given angles about the origin and about a given point</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 2.13 RIGID MOTION II AND ENLARGEMENT	<p>The student will be able to:</p> <p>2.13.3 carry out an enlargement of a plane shape given a scale factor</p> <p>2.13.4 identify a scale drawing as an enlargement/reduction of a plane figure (shape).</p> <p>2.13.5 establish the relationship between the areas and volumes of plane figures and solids and their images</p>	<p>Enlargement</p> <p>Scale drawing</p> <p>Areas and Volumes of similar figures.</p>	<p>Revise examples of turning in everyday life situation to explain rotation</p> <p>Guide students through construction to find the images of plane figures under rotation.</p> <p>Guide students to find images of plane figures under enlargement from the origin for given scale factors.</p> <p>Guide students to use scale drawing to enlarge or reduce plane figures.</p> <p>Assist students to discover the relationship between the areas and volumes of similar figures and solids. i.e. Area of image : Area of object = K^2:1 and Volume of Image : Vol. of solid = K^3 : 1 where k is the scale factor</p>	<p>Let students:</p> <p>draw the images of plane figures under enlargement from the origin for given scale factors.</p> <p>use scale drawing to enlarge or reduce plane figures given the scale and calculate their areas and volumes</p>

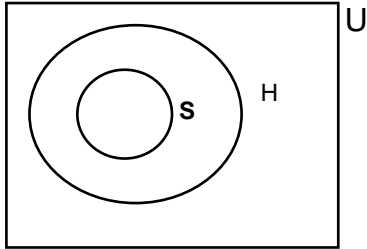
SENIOR HIGH SCHOOL 3

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.1 CONSTRUCTION	<p>The student will be able to:</p> <p>3.1.1 construct 75° 105° 135° and 150°</p> <p>3.1.2 construct a triangle or quadrilateral under given conditions</p> <p>3.1.3 construct a particular loci</p>	<p>Construction of 75° 105° 135° and 150°.</p> <p>Construction of Triangles and Quadrilaterals.</p> <p>Constructing loci</p>	<p>Review the construction of 30°, 45°, 60° and 90° with the students.</p> <p>Guide students to construct angles 75°, 105°, and 135°.</p> <p>Assist students to use a pair of compasses and ruler only to construct;</p> <ol style="list-style-type: none"> 1. a triangle, given two sides and an included angle; 2. a triangle, given two angles and a side. 3. a quadrilateral under given conditions. <p>Guide students to construct the locus of points equidistant from two or more fixed points and two or more intersecting straight lines</p>	<p>Let students:</p> <p>construct some given angles.</p> <p>construct triangles and quadrilaterals under given conditions</p> <p>solve loci related problems through construction</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.2 MENSURATION II (SURFACE AREA, VOLUME OF SOLIDS AND THE EARTH AS A EARTH)	<p>The student will be able to:</p> <p>3.2.1 draw nets of prisms</p> <p>3.2.2 calculate surface areas of prisms</p> <p>3.2.3 calculate volumes of prisms</p> <p>3.2.4 calculate the total surface area of a cone.</p>	<p>Nets of prisms.</p> <p>Surface Areas of Prisms.</p> <p>Volume of prisms</p> <p>Surface Area of a Cone</p>	<p>Guide students to identify solids with uniform cross-section as prisms E.g. triangular prisms, rectangular prism, square prism, etc.</p> <p>Guide students to use cut-out shapes to form the nets of open/close prisms and identify the faces.</p> <p>Guide students to discover that the total surface area is the sum of the areas of all the faces. E.g. Cuboid - Area = $2bl + 2bh + 2lh$ Closed cylinder - $A = 2\pi r (r + h)$</p> <p>Assist students to calculate volume of prisms by multiplying the area of uniform cross-section by the height or length.</p> <p>Let students open a cone and examine the net.</p> <p>Guide students to draw the net and measure the angle of the sector.</p> <p>Guide students to deduce the formula for finding the surface area of a cone as $A = \text{Curved Surface} + \text{Base Area}$ $\frac{\theta}{360} \times \pi l^2 + \pi r^2$ $= \pi \left(\frac{\theta}{360} \times l^2 + r^2 \right)$</p>	<p>Let students:</p> <p>draw nets of given prisms</p> <p>find the perimeter of the largest rectangle that can be made with 24 square cut-outs</p> <p>calculate the total surface area of prisms of given dimensions.</p> <p>calculate the volume of prisms of given dimensions.</p> <p>calculate the total surface area of a cone of given dimensions.</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.2 (CONT'D) MENSURATION II	<p>The student will be able to:</p> <p>3.2.5 calculate the volume of a cone</p> <p>3.2.6 calculate the total surface area of a pyramid</p> <p>3.2.7 calculate the volumes of Pyramids</p> <p>3.2.8 calculate surface area of a sphere</p> <p>3.2.9 calculate the volume of a Sphere</p> <p>3.2.10 calculate distance along a given latitude and longitude</p>	<p>Volume of a Cone.</p> <p>Surface Area of a Pyramid.</p> <p>Volume of a pyramid.</p> <p>Surface area of a sphere</p> <p>Volume of a sphere</p> <p>Distances of arcs of spheres</p>	<p>Guide students to:</p> <p>Assist student to establish the formula for finding the volume of a cone. i.e. $V = \frac{1}{3} \pi r^2 h$</p> <p>Guide students to calculate the total surface area of a pyramid as the sum of the areas of the triangular faces and the base.</p> <p>Guide students to deduce the formula for the volume of a pyramid i.e. Volume = $\frac{1}{3} \times \text{base Area} \times h$</p> <p>Guide students to find the surface areas of spheres of given radii using the formula $A = 4\pi r^2$</p> <p>Guide students to establish the formula for finding the volume of a sphere. i.e. $V = \frac{4}{3} \pi r^3$</p> <p>Guide students to draw a sphere and indicate two points on the same latitude or the same longitudes (great circles).</p> <p>Guide students to draw a sphere and illustrate two points on the same latitude but different longitudes</p> <p>Guide students to calculate distances between two towns on the earth surface.</p>	<p>Let students:</p> <p>use the formula to find volume of a given cone.</p> <p>calculate the total surface areas of pyramids of given dimensions</p> <p>calculate the volumes of given pyramids</p> <p>calculate surface area of given radii</p> <p>calculate the volume of spheres of given radii</p> <p>solve real life application problems E. g .time taken for aeroplanes to fly between two towns etc</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.3 LOGICAL REASONING	<p>The student will be able to:</p> <p>3.3.1 identify and form true or false statements.</p> <p>3.3.2 form the negation of simple statements.</p> <p>3.3.3 draw conclusions using the implication sign statements made.</p>	<p>Statements</p> <p>.</p> <p>Negation of statements</p> <p>Implications \Rightarrow , \Leftrightarrow</p>	<p>Guide students to identify true or false statements.</p> <p>Guide students to write statements in negation form. E.g. Kofi is not a lazy boy is the negation of Kofi is a lazy boy.</p> <p>Assist students to use the implication sign to draw conclusions from statements made. E.g. $3x - 2 = 10 \Rightarrow x = 4$ Discuss the use of the symbol, \Leftrightarrow with students E.g. $3x - 2 = 10 \Rightarrow x = 4$ and if $x = 4 \Rightarrow 3x - 2 = 10$ so, $3x - 2 = 10 \Leftrightarrow x = 4$</p>	<p>Let students:</p> <p>identify true or false statements.</p> <p>negate given statements</p> <p>draw conclusion from statements made using the implication sign</p> <p>use the symbol \Leftrightarrow, iff (if and only if) to draw conclusions from given statements</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
UNIT 3.3 (CONT'D) LOGICAL REASONING	<p>The student will be able to:</p> <p>3.3.4 use Venn diagrams to determine the validity or otherwise of implications or conclusions.</p>	<p>Validity of implications</p>	<p>:</p> <p>Guide students to draw Venn diagrams to illustrate given statements E.g. consider the statement: P : All students are hardworking $S = \{\text{students}\}$ $H = \{\text{hardworking people}\}$ $U = \{\text{People}\}$</p>  <p>Assist students to determine whether given conclusions are valid or not</p>	<p>Let students:</p> <p>use Venn diagrams to determine the validity or otherwise of given statements</p>

UNIT	SPECIFIC OBJECTIVES	CONTENT	TEACHING AND LEARNING ACTIVITIES	EVALUATION
<p align="center">UNIT 3.4</p> <p>TRIGONOMETRY II</p>	<p>The student will be able to:</p> <p>3.4.1 draw the graphs of simple trigonometric functions and identify maximum and minimum values</p> <p>3.4.2 draw the graphs of trigonometric functions and use them to solve trigonometric equations</p>	<p>Graphs of trigonometric functions</p> <p>Trigonometric equations</p>	<p>Guide students to prepare tables for given trigonometric functions for : $y = a \sin x$ and $y = b \cos x$ in the range $0^\circ \leq x \leq 360^\circ$</p> <p>Guide students to use their tables to draw the graphs of the functions and find the maximum and minimum values.</p> <p>Guide students to draw simple graphs of trigonometric functions of the form : $f(x) = a \sin x + b \cos x$ in the range where $0^\circ \leq x \leq 360^\circ$</p> <p>Guide students to use their graphs to solve equations such as : $a \sin x + b \cos x = 0$, $a \sin x + b \cos x = k$, etc.</p>	<p>Let students:</p> <p>draw graphs of given trigonometric functions and use them to solve related problems</p> <p>find on graphs of trigonometric functions the values of x which satisfy the two functions simultaneously.</p>

REFERENCES

1. Mathematical Association of Ghana (2009) Core Mathematics for Senior High Schools Books 1, 2, 3 & 4
2. Allotey, G., (2005), Core Mathematics for West Africa Senior High Schools. Anest Co. Ltd., Accra Newtown, Ghana
3. Solomon, B., Buckwell, G.etal (2006), Macmillan Senior Secondary Mathematics for West Africa. (Books 1, 2 & 3)
4. Asiedu, P., () Core Mathematics for Senior Secondary Schools
5. J.E. Ankrah,, E. Harrison Nuarthey Quarcoo, Global Series and Approacher's Series Joint Core Mathematics for Senior High Schools
Publisher: Approacher's Ghana Ltd.