

### **REPUBLIC OF LIBERIA**

### **MINISTRY OF EDUCATION**



### **NATIONAL CURRICULUM FOR GRADES 10 TO 12**

# **MATHEMATICS**

February 2011

#### MESSAGE FROM THE MINISTER OF EDUCATION

I wish to extend my thanks and appreciation to ECSEL, UNESCO and all our partners for their immense contribution to this important task of revising and strengthening of the National Curriculum. Special thanks to USAID through LTTP for their funding and technical support in the harmonization or realignment of the curriculum. We extend sincere thanks and appreciation to the Bureau of Curriculum Development and Textbook Research, the National Curriculum Taskforce, and the subject specialists from various institutions for the level of professionalism that went into this exercise.

The revision and strengthening of our National Curriculum comes at a time when our nation is faced with the Herculean task or challenge of education transformation, national reconstruction, recovery and renewal in the aftermath of a devastating civil war. Hence, critical to this national challenge is the rebuilding of the education sector as Liberians can not achieve the desired socio-economic progress in the absence of a strong, vibrant and productive education and training system.

The revised national curriculum has two features which include the regular core subject areas of Mathematics, Science, Language Arts and Social Studies and emphasis is being given to the global challenge of HIV/AIDS, Peace, Citizenship, Human Rights and Environmental education. Secondly, the new curriculum is developed in line with international standards especially those practiced and enshrined in the curriculum of our sisterly Republic of Nigeria and Ghana who are also members of the West African Examinations Council (WAEC).

We wish to urge all our education partners including students, teachers, principals, proprietors of schools and members of school boards to use this curriculum in our schools to enhance quality and relevant instruction and to enable our students to be adequately prepared to take the West African Senior Secondary Certificate Examinations (WASSCE) come 2013 as envisaged by us in the education sector.

May I conclude by once again saying big thank-you to all those who contributed to make this project a success.

Hon. E. Othello Gongar

**MINISTER** 

#### INTRODUCTION

Mathematics is an indispensable tool in our modern world. We use the knowledge of mathematics in our everyday activities, and we see that knowledge applied in practically everything we see around us. It is critical to develop in our students those core skills of computation, translating problems into mathematical language and be able to solve them, and to apply mathematical concepts to everyday activities. This curriculum on Mathematics has been written precisely to develop these skills in Liberian high school students.

A student-centred approach is emphasized in this curriculum. This is based on the firm belief that learning becomes more permanent, meaningful, and exciting when students themselves take ownership of the learning process. Teachers are, therefore, urged to contrive those classroom strategies that would engage students actively in the teaching/learning process.

#### AIMS AND OBJECTIVES

Upon the completion of this course of study, students will be able to:

- 1. Become successful in the study of Algebra II, Geometry, Trigonometry, and Precalculus
- 2. Acquire the necessary skills that will allow them to become problem solvers and informed decision makers.
- 3. Make connections between Mathematics and the world around us.
- 4. Bring Mathematics to life with many real-life applications.

# **GOAL**: TO PREPARE STUDENTS TO BECOME SUCCESSFUL IN THE STUDY OF ALGEBRA II, GEOMETRY, TRIGONOMETRY AND PRECALCULUS. ALGEBRA WILL BRING MATHEMATICS TO LIFE WITH MANY REAL-LIFE APPLICATIONS.

**INTENDED LEARNING OUTCOMES:** Students will acquire the necessary skills that will allow them to become problem solvers and informed decision makers. Students will be able to make connections between mathematics and the world around us.

#### SENIOR SECONDARY SCHOOL MATHEMATICS SCOPE AND SEQUENCE SUMMARY

MARKING PERIOD	GRADE TEN(Geometry)	GRADE	GRADE TWELVE(Pre-
		ELEVEN(Trigonometry)	<u>Calculus)</u>
<u>First</u>	1. Tools to Geometry	1. Angles and their Measure	Arithmetic and algebra
	2. Investigating Geometric	2. Right Triangle	review
	Figure	Trigonometry	
	3. Transformations: Shapes in		
	Motion		
<u>Second</u>	1. Triangle Relationships	1. Graphs of Trigonometric	Exponential and
	2. Measuring in the plane and	2. Function	Logarithmic Functions, and
	in space		Cartesian Coordinates
<u>Third</u>	Reasoning and parallel	1. Trigonometric Identities	Systems of equations and
	Lines	and their Verifications	Inequalities
	2. Proving Triangles		
	Congruent		
	3. Quadrilaterals		
<b>Fourth</b>	1. Similarity	1. Inverse Trigonometric	The complex number
	2. Right Triangle	2. Functions and	system, sequences, Series,
	Trigonometry	Trigonometric Equations	and the Binomial Theorem
<u>Fifth</u>	Vectors and Circles	1. Oblique Triangles, the Sine	Probability and Statistics
		and Cosine Laws, and the	
		Complex Numbers	
<u>Sixth</u>	1. Analytic Geometry	Transformations and Vectors	Analytic geometry(Review)

PERIOD: <u>I</u>

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

**UNIT/TOPICS: 1. TOOLS TO GEOMETRY** 

2. INVESTIGATING GEOMETRIC FIGURES.
3. TRANSFORMATIONS: SHAPES IN MOTION

#### **SPECIFIC OBJECTIVES:**

Upon completion of these topics, students will be able to:

- 1. Define, draw, and to work with points, lines, planes, segments, rays, parallel lines, and planes.
- 2. Define, draw, and measure angles and segments.
- 3. Identify a good definition.
- 4. Use a compass and straightedge to construct congruent angles, congruent segments, and bisects segments and angles.
- 5. Define, draw, and to work with points, lines, planes, segments, rays, parallel lines, and planes.
- 6. Define, draw, and measure angles and segments.
- 7. Identify a good definition.
- 8. Use deductive reasoning properties of equality to solve problems and verify conjectures.
- 9. Use the distance formula to compute the distance between two points and apply the midpoint formula to find the coordinates the midpoint of a segment in a coordinate plane.
- 10. Measure the angles of a triangle and classify triangles according to angles and also according to sides.
- 11. Classify polygons and compute the sum of the measures of the interior and exterior angles of polygons.
- 12. Graph lines in the coordinate plane and recognize parallel and perpendicular lines by their shapes.
- 13. Define, draw, and classify quadrilaterals.
- 14. Measure and draw central angles and arcs of circle and display data in a circle graph.
- 15. Measure congruent and similar figures, and use properties of congruence and similarity.
- 16. Define and draw isometric and orthographic views of objects.
- 17. Identify isometrics, locate reflection images of figures.
- 18. Find translation image of figures and use vectors and matrix addition to represent transactions..

- 19. Identify and locate rotation images in figures.
- 20. Show how reflections are related to others isometrics and identify gild reflections.
- 21. Identify types of symmetry in figure.
- 22. Identify figures that tessellate and identify symmetries of tessellations.
- 23. Locate dilation (enlargement and reducing) images of figures and their applications.
- 24. Use a compass and straightedge to construct congruent angles, congruent segments, and bisects segments and angles.
- 25. Use deductive reasoning properties of equality to solve problems and verify conjectures.
- 26. Use the distance formula to compute the distance between two points and apply the midpoint formula to find the coordinates the midpoint of a segment in a coordinate plane.
- 27. Measure the angles of a triangle and classify triangles according to angles and also according to sides.
- 28. Classify polygons and compute the sum of the measures of the interior and exterior angles of polygons.
- 29. Graph lines in the coordinate plane and recognize parallel and perpendicular lines by their shapes.
- 30. Define, draw, and classify quadrilaterals.
- 31. Measure and draw central angles and arcs of circle and display data in a circle graph.
- 32. Measure congruent and similar figures, and use properties of congruence and similarity.
- 33. Define and draw isometric and orthographic views of objects.
- 34. Identify isometrics, locate reflection images of figures.
- 35. Find translation image of figures and use vectors and matrix addition to represent transactions..
- 36. Identify and locate rotation images in figures.
- 37. Show how reflections are related to others isometrics and identify gild reflections.
- 38. Identify types of symmetry in figure.
- 39. Identify figures that tessellate and identify symmetries of tessellations.
- 40. Locate dilation (enlargement and reducing) images of figures and their applications.

OUTCOMES		CONTENTS		ACTIVITIES	MATERIALS/	EVALUATION	OUTCOMES
					RESOURCES		
Students will entail	1.	Points, lines, planes,	1.	Defining, drawing,	A. Primary Text	Essential tasks	Essential tasks students
their seines with		segments, rays,		and working with	Mathematics for Senior	students should be able	should be able to do:
building blocks of many		parallel lines, and		points, lines, planes,	High School (Books 1,2 &	to do:	1. Define, draw, and
geometric figures.		planes.		segments, rays,	3) (Pearson)	1. Define, draw, and to	to work with
	2.	Measurement of		parallel lines, and	B. Secondary Texts	work with points,	points, lines,

Students will reach
valid conclusions in
geometry and in life.
Students will improve
their skills such as in
map reading.

- angles and segments.
- 3. Defined and undefined terms.
- 4. Compass and straightedge in the construction of congruent angles, congruent segments, and the bisection of segments and angles.
- 5. Deductive reasoning and properties of equality to solve problems and verify conjectures.
- 6. The distance formula and the midpoint formula.
- 7. Angle measurement and triangle classification according to angles and also according to sides.
- 8. Classification of polygons, sum of the measures of the interior and exterior angles of polygons.
- 9. Graphs of lines in the coordinate plane, parallel and perpendicular lines

planes.

- 2. Defining, drawing, and measuring angles and segments.
- 3. Identifying a good definition.
- 4. Using a compass and straightedge to construct congruent angles, congruent segments, and bisect segments and angles.
- 5. Using deductive reasoning properties of equality to solve problems and verify conjectures.
- 6. Using the distance formula to compute the distance between two points and apply the midpoint formula to find the coordinates the midpoint of a segment in a coordinate plane.
- 7. Measuring the angles of a triangle

E.B. Dogbe, K.A. Morrison & Brian Speed, *Senior*Secondary Guide – (Core)
Mathematics (Sedco, 1995)

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

# C. Other Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- lines, planes, segments, rays, parallel lines, and planes.
- 2. Define, draw, and measure angles and segments.
- 3. Use a compass and straightedge to construct congruent angles, congruent segments, and bisects segments and angles.
- 4. Define, draw, and work with points, lines, planes, segments, rays, parallel lines, and planes.
- 5. Define, draw, and measure angles and segments.
- 6. Use deductive reasoning properties of equality to solve problems and verify conjectures.
- 7. Use the distance formula to compute the distance between two points and apply the midpoint formula to find the coordinates the midpoint of a segment in a

- planes, segments, rays, parallel lines, and planes.
- 2. Define, draw, and measure angles and segments.
- 3. Use a compass and straightedge to construct congruent angles, congruent segments, and bisects segments and angles.
- 4. Define, draw, and work with points, lines, planes, segments, rays, parallel lines, and planes.
- 5. Define, draw, and measure angles and segments.
- 6. Use deductive reasoning properties of equality to solve problems and verify conjectures.
- 7. Use the distance formula to compute the distance between two points and apply the midpoint formula

- and their shapes.
- 10. Classification and definition of quadrilaterals.
- 11. Central angles and arcs of circle.
- 12. Congruent and similar figures, and use properties of congruence and similarity.
- 13. Isometric and orthographic views of objects.
- 14. Isometrics, reflection images of figures.
- 15. Translation of image of figures and use of vectors and matrix addition to represent transactions..
- 16. Rotation images in figures.
- 17. Reflections related to other isometrics and gild reflections.
- **18.** Types of symmetry in figure.
- 19. Figures that tessellate and symmetries of tessellations.
- 20. Dilation (enlargement and reducing) images of

- and classify triangles according to angles and also according to sides.
- 8. Classifying polygons and computing the sum of the measures of the interior and exterior angles of polygons.
- 9. Graphing lines in the coordinate plane and recognizing parallel and perpendicular lines by their shapes.
- 10. Defining, drawing, and classifying quadrilaterals.
- 11. Measuring and drawing central angles and arcs of circle and displaying data in a circle graph.
- 12. Measuring congruent and similar figures, and using properties of congruence and similarity.

8. Measure the angles of a triangle and

coordinate plane.

- classify triangles
  according to angles
  and also according to
  sides.
- 9. Classify polygons and compute the sum of the measures of the interior and exterior angles of polygons.
- 10. Graph lines in the coordinate plane and recognize parallel and perpendicular lines by their shapes.
- 11. Define, draw, and classify quadrilaterals.
- 12. Measure and draw central angles and arcs of circle and display data in a circle graph.
- 13. Measure congruent and similar figures, and use properties of congruence and similarity.

## Other essential evaluation tools:

- Quizzes
- Tests
- Homework

- to find the coordinates the midpoint of a segment in a coordinate plane.
- 8. Measure the angles of a triangle and classify triangles according to angles and also according to sides.
- 9. Classify polygons and compute the sum of the measures of the interior and exterior angles of polygons.
- 10. Graph lines in the coordinate plane and recognize parallel and perpendicular lines by their shapes.
- 11. Define, draw, and classify quadrilaterals.
- 12. Measure and draw central angles and arcs of circle and display data in a circle graph.
- 13. Measure

figures and their applications.	13. Defining and drawing isometric and orthographic views of objects.	<ul><li> Group assignments</li><li> Projects</li></ul>	congruent and similar figures, and use properties of congruence and similarity.
	<ul> <li>14. Identifying isometrics, locating reflection images of figures.</li> <li>15. Finding translation image of figures and using vectors and matrix addition to represent transactions</li> <li>16. Identifying and locating rotation images in figures.</li> <li>17. Showing how reflections are related to others isometrics and identifying gild reflections.</li> <li>18. Identifying types of symmetry in figure.</li> <li>19. Identifying figures that tessellate and</li> </ul>		Other essential evaluation tools:
	identifying		

symmetries of tessellations.		
20. Locating dilation (enlargement and reducing) images of figures and their applications.		

PERIOD: II

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

**UNIT/TOPICS: 1. TRIANGLE RELATIONSHIPS** 

2. MEASURING IN THE PLANE AND IN SPACE

**GENERAL OBJECTIVES:** Students will analyze situations and become better problem solvers; visualize the faces of space figures that they encounter in everyday life.

**SPECIFIC OBJECTIVES:** Upon the completion of these topics, students will be able to:

- 1. Write and interpret different types of conditional statements
- 2. Use and apply properties of isosceles triangles.
- 3. Use different styles of proofs to write convincing arguments.
- 4. Use properties of mid segments to solve problems.
- 5. Write convincing arguments by using indirect reasoning.
- 6. Use inequalities involving triangle side lengths and angle measures to solve problems.
- 7. Use properties of angles bisectors and perpendicular bisectors and to solve locus problems.
- 8. Identify properties of perpendicular bisectors, angle bisector, altitudes, and medians of a triangle.

- 9. Find area and perimeter of squares, rectangle's, parallelograms and triangles
- 10. Use the Pythagorean Theorem and its converse
- 11. Use the properties of  $45^{\circ}$   $45^{\circ}$   $90^{\circ}$  and  $30^{\circ}$   $60^{\circ}$   $90^{\circ}$  triangles.
- 12. Find the areas of a trapezoid.
- 13. Find the areas of regular polygons.
- 14. Find the circumferences of a circle and the e length of an arc.
- 15. Calculate the areas of circles, sectors, and segments of circles.
- 16. Recognize nets of various space figures.
- 17. Find the surface areas and lateral areas of prisms and cylinders.
- 18. Find the surface areas and lateral areas of pyramids and cones.
- 19. Find the surface volumes of "prisms" and "cylinders".
- 20. Find the volume pyramids and cones.
- 21. Compute the surface areas and volumes of spheres.
- 22. Recognize composite surface figures, which combine two or more simple figures.
- 23. Use geometry to find the probability of events.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will describe and	1. Logical reasoning	1. Writing and	A. Primary Text	Essential tasks students
explain the kinds of motions	(conditional, hypothesis,	interpreting different	Mathematics for Senior High	should be able to do:
they will encounter in their	conclusion, truth value,	types of conditional	School (Books 1,2 & 3)	1. Use and apply properties
daily lives	biconditional, negation,	statements.	(Pearson)	of isosceles triangles.
	inverse and		B. Secondary Texts	2. Use properties of mid
	contrapositive)	2. Using and applying	E.B. Dogbe, K.A. Morrison &	segments to solve
	2. Isosceles triangles (	properties of isosceles	Brian Speed, Senior Secondary	problems.
	vertex angle, base angles)	triangle.	Guide – (Core) Mathematics	3. Use inequalities involving
	3. Preparing for proofs.		(Sedco, 1995)	triangle side lengths and
	4. Measurements of	3. Reviewing and		angle measures to solve
	triangles	discussing Properties of	Laurie E. Bass, Et al. Geometry:	problems.
	5. Indirect reasoning	equalities and	Tools for a Changing World	4. Use properties of angles
	6. Bisectors and locus	inequalities,	(Prentice Hall 1998).	bisectors and
	(perpendicular bisector	congruence, etc.		perpendicular bisectors
	theorem and its	<del>-</del>	C. Other	and to solve locus
	converse).	4. Measuring angles and	Resources/Supplementary	problems.

- 7. Concurrent points and lines(point of concurrency)
- 8. Inequalities and triangles (median and altitude/height of a triangle)
- 9. Area and perimeter of squares, rectangle's, parallelograms and triangles
- 10. The Pythagorean Theorem and its converse
- 11. Properties of  $45^{\circ}$   $45^{\circ}$   $90^{\circ}$  and  $30^{\circ}$   $60^{\circ}$   $90^{\circ}$  triangles.
- 12. Find the areas of a trapezoid.
- 13. Areas of regular polygons.
- 14. Circumference of a circle and the e length of an arc.
- 15. Areas of circles, sectors, and segments of circles.
- **16.** Nets of various space figures.
- 17. Surface areas and lateral areas of prisms and cylinders.
- 18. Surface areas and lateral areas of pyramids and cones.
- 19. Surface volumes of "prisms" and "cylinders".

- sides of triangles. Using properties of measurements to solve problems.
- 5. Writing convincing arguments by using indirect reasoning.
  Using different styles of proofs to write convincing arguments.
- 6. Bisecting lines and angles; using bisectors and locus properties
- 7. Using properties of Concurrent points and lines; discussing point of locus properties
- 8. Using inequalities involving triangle side lengths and angle measures to solve problems
- 9. Finding area and perimeter of squares, rectangle's, parallelograms and triangles
- 10. Using the Pythagorean Theorem and its converse in problem solving.

#### **Readings**

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- 5. Identify properties of perpendicular bisectors, angle bisector, altitudes, and medians of a triangle.
- 6. Find area and perimeter of squares, rectangle's, parallelograms and triangles
- 7. Use the Pythagorean Theorem and its converse
- 8. Use the properties of  $45^{\circ}$   $45^{\circ}$   $90^{\circ}$  and  $30^{\circ}$   $60^{\circ}$   $90^{\circ}$  triangles.

## Other essential evaluation tools:

- Ouizzes
- Tests
- Homework
- Group assignments
- Projects

20. Volume pyramids and	11. Using the properties of
cones.	$45^{0} - 45^{0} - 90^{0}$ and $30^{0} -$
21. Surface areas and	60 <sup>0</sup> - 90 <sup>0</sup> triangles
volumes of spheres.	10.77
22. Composite surface	12. Finding the areas of a
figures, which combine	trapezoid.
two or more simple	
figures.	13. Finding the areas of
23. Geometry to find the	regular polygons.
probability of events.	14. Finding the
	circumference of a
	circle and the e length
	of an arc.
	15. Calculating the areas of
	circles, sectors, and
	segments of circles.
	16. Recognize nets of
	various space figures.
	17. Find the surface areas
	and lateral areas of
	prisms and cylinders.
	Measuring how much
	material (cloth or
	paper) can cover a
	prism or cylindrical
	18. Find the surface areas
	and lateral areas of
	pyramids and cones.
	Pyramias and concer
	19. Finding the surface
	volumes of "prisms"
	and "cylinders".

Measuring how much liquid a prism or cylindrical container can hold.
20. Calculating the volume pyramids and cones. Measuring how much liquid a pyramidal or conical container can hold. Computing the surface areas and volumes of spheres. Measuring how much liquid a spherical container can hold.
21. Defining and Indentifying composite surface figures, which combine two or more simple figures.  22. Using geometry to find the probability of events.

**SEMESTER: TWO** 

PERIOD: III

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

UNIT/TOPICS: 1. REASONING AND PARALLEL LINES

2. PROVING TRIANGLES CONGRUENT

3. QUADRILATERALS

GENERAL OBJECTIVES: Students will understand how parallel lines are used in building, city planning, and construction

#### **SPECIFIC OBJECTIVES:** Upon the completion of these topics, students will be able to:

- 1. Identify pairs of angles formed by two lines and a transverse and relate the measures of angles formed by parallel lines and a transversal.
- 2. Recognize conditions that result in parallel lines, and write proofs that involve parallel lines.
- 3. Construct parallel and perpendicular lines.
- 4. Draw objects in one-point perspective.
- 5. Use some of the basis ideas of spherical geometry.
- 6. Prove two triangles congruent using the SSS and SAS postulates.
- 7. Prove two triangles congruent using the SSS and SAS postulates.
- 8. Prove two triangles congruent using the HL Theorem.
- 9. Use triangle congruence and "corresponding parts of congruent Triangles we congruent (CPCTC) to prove that parts of two triangles are congruent.
- 10. Identify congruent overlapping triangles and prove two triangles congruent by first proving two other triangles congruent.
- 11. Find relationships among angles, and diagonals of parallelograms.
- 12. Find characteristics of quadrilateral that indicate that they are parallelograms.
- 13. Find the properties of rectangles, rhombuses, and squares.
- 14. Find the properties of trapezoids and kites.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
Students will compute distances indirectly in a variety of real world settings  Students will model peal-world situations such as those involving velocity  Students will become investigators in situation in which equators of circles can be used, such as expressing the range of collection phone towers.	<ol> <li>Pairs of angles formed by two lines and transverse and related measures of angles formed by parallel lines and a transversal.</li> <li>Conditions that result in parallel lines and proofs that involve parallel lines.</li> <li>Construction of parallel and perpendicular lines.</li> <li>Objects in one-point perspective.</li> <li>Some of the basis ideas of spherical geometry.</li> <li>Two triangles congruence using the SSS and SAS postulates.</li> <li>Proof of two triangles congruent using the SSS and SAS postulates.</li> <li>Proof of two triangles congruent using the HL Theorem.</li> <li>Triangle congruence and "corresponding parts of congruent Triangles congruent (CPCTC) and proofs that parts of two triangles are congruent.</li> <li>Congruent overlapping triangles and proof of two triangles congruent by first proving two other triangles congruent.</li> </ol>	<ol> <li>Identifying pairs of angles formed by two lines and a transverse and relating the measures of angles formed by parallel lines and a transversal.</li> <li>Recognizing conditions that result in parallel lines and writing proofs that involve parallel lines.</li> <li>Constructing parallel and perpendicular lines.</li> <li>Drawing objects in one-point perspective.</li> <li>Using some of the basis ideas of spherical geometry.</li> <li>Proving two triangles congruent using the SSS and SAS postulates.</li> <li>Proving two triangles congruent using the SSS and SAS postulates.</li> <li>Proving two triangles congruent using the HL Theorem.</li> <li>Using triangle congruence</li> </ol>	A. Primary Text Mathematics for Senior High School (Books 1,2 & 3) (Pearson) B. Secondary Texts E.B. Dogbe, K.A. Morrison & Brian Speed, Senior Secondary Guide — (Core) Mathematics (Sedco, 1995)  Laurie E. Bass, Et al. Geometry: Tools for a Changing World (Prentice Hall 1998).  C. Other Resources/Supplementary Readings Mathematical Association of Ghana, Effective Elective Mathematics for (Books 1,2 & 3) (Pearson)  Graph paper, Geo-board, Colored pencils, Tape. Protractor rules Compass, Tracing papers	Essential tasks students should be able to do:  1. Identify pairs of angles formed by two lines and a transverse and relate the measures of angles formed by parallel lines and a transversal.  2. Recognize conditions that result in parallel lines, and write proofs that involve parallel lines.  3. Construct parallel and perpendicular lines.  4. Draw objects in one-point perspective.  5. Use some of the basis ideas of spherical geometry.  6. Prove two triangles congruent using the SSS and SAS postulates.  7. Prove two triangles congruent using the SSS and SAS postulates.  8. Prove two triangles congruent using the HL Theorem.  9. Use triangle congruence and "corresponding parts of congruent Triangles we congruent (CPCTC) to prove that parts of two triangles are congruent.
	by first proving two other	Theorem.		prove that parts of two

	overlapping triangles and
` ,	prove two triangles
	congruent by first proving
triangles are congruent.	two other triangles
	congruent.
10. Identifying congruent	11. Find relationships among
overlapping triangles and	angles, and diagonals of
prove two triangles	parallelograms.
congruent by first proving	12. Find characteristics of
two other triangles	quadrilateral that indicate
congruent.	that they are
	parallelograms.
11. Finding relationships	13. Find the properties of
among angles, and	rectangles, rhombuses,
	and squares.
	14. Find the properties of
	trapezoids and kites.
<ul> <li>12. Using the characteristics of quadrilateral that indicate that they are parallelograms.</li> <li>13. Applying the properties of rectangles, rhombuses, and squares in problem solving</li> <li>14. Finding the properties of trapezoids and kites.</li> </ul>	Other essential evaluation tools:
	prove two triangles congruent by first proving two other triangles congruent.  11. Finding relationships among angles, and diagonals of parallelograms.  12. Using the characteristics of quadrilateral that indicate that they are parallelograms.  13. Applying the properties of rectangles, rhombuses, and squares in problem solving  14. Finding the properties of

SEMESTER: TWO

PERIOD: <u>IV</u>

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

**UNIT/TOPICS: 1. SIMILARITY** 

2. RIGHT TRIANGLE TRIGONOMETRY

GENERAL OBJECTIVES: Students will apply properties of perpendicularity and seminaries in designing and construction.

**SPECIFIC OBJECTIVES:** Upon the completion of these topics, students will be able to:

- 1. Choose convenient placement of coordinate axes on figures.
- 2. Prove theorems using figures in the coordinate plane.
- 3. Find how to use ratio and proportion with similar polygons.
- 4. Prove two triangles similar using the AA-postulate and the SAS-and SS-Theorems; and use similarity in indirect measurement to find distances.
- 5. Find relationship among the lengths of the sides of a right triangle and the attitude to the hypotenuse.
- 6. Investigate proportional relationship in triangle.
- 7. Find the relationship between the similarity ratio and the perpendicular and areas of similar angles.
- 8. Find the relationships between the ratio and the ratios of the areas and volumes of similar solids.
- 9. Calculate tangent of acute angles in a right triangle and use tangents to determine side lengths in triangles.
- 10. Compute lines and cosines of acute angles in right triangles, and use sine and cosine to find unknown measures in right triangles.
- 11. Define and identify angles of devotion and depression, and use them and trigonometric ratios to solve problems.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will become	1. Relationships among	1. Finding relationships	A. Primary Text	Essential tasks students
builders/city planers	angles, and diagonals of	among angles, and	Mathematics for Senior High	should be able to do:
	parallelograms.	diagonals of	School (Books 1,2 & 3)	1. Choose convenient
Students will become	2. Characteristics of	parallelograms.	(Pearson)	placement of coordinate
constructors or graphic artists	quadrilateral that		B. Secondary Texts	axes on figures.
Students will become	indicate that they are	2. Finding characteristics of	E.B. Dogbe, K.A. Morrison &	2. Prove theorems using
professionals in arts and	parallelograms.	quadrilateral that indicate	Brian Speed, Senior Secondary	figures in the coordinate
analyst	3. Properties of rectangles,	that they are	Guide – (Core) Mathematics	plane.
anaryst	rhombuses, and squares.	parallelograms.	(Sedco, 1995)	3. Find how to use ratio and
	4. Properties of trapezoids			proportion with similar

- and kites.
- 5. Convenient placement of coordinate axes on figures.
- 6. Proofs of theorems using figures in the coordinate plane.
- 7. Use of ratio and proportion with similar polygons.
- 8. Triangles similarity using the AA-postulate and the SAS-and SS-Theorems; and use similarity in indirect measurement to find distances.
- 9. Relationship among the lengths of the sides of a right triangle and the attitude to the hypotenuse.
- 10. Investigation of proportional relationship in triangles.
- 11. Relationship between the similarity ratio and the perpendicular and areas of similar triangles.
- 12. Relationships between the ratios of the areas and volumes of similar solids.
- 13. Tangent of acute angles in a right triangle and use tangents to determine side lengths in triangles.
- 14. Sines and cosines of acute

- 3. Finding the properties of rectangles, rhombuses, and squares.
- 4. Finding the properties of trapezoids and kites.
- 5. Choosing convenient placement of coordinate axes on figures.
- 6. Proving theorems using figures in the coordinate plane.
- 7. Finding how to use ratio and proportion with similar polygons.
- 8. Proving two triangles similar using the AA-postulate and the SAS-and SS-Theorems; and use similarity in indirect measurement to find distances.
- 9. Finding relationship among the lengths of the sides of a right triangle and the attitude to the hypotenuse.
- 10. Investigating proportional relationship in triangle.
- 11. Finding the relationship

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

#### C. Other Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- polygons.
- 4. Prove two triangles similar using the AA-postulate and the SAS-and SS-Theorems; and use similarity in indirect measurement to find distances.
- 5. Find relationship among the lengths of the sides of a right triangle and the attitude to the hypotenuse.
- 6. Investigate proportional relationship in triangle.
- 7. Find the relationship between the similarity ratio and the perpendicular and areas of similar angles.
- 8. Find the relationships between the ratio and the ratios of the areas and volumes of similar solids.
- 9. Calculate tangent of acute angles in a right triangle and use tangents to determine side lengths in triangles.
- 10. Compute lines and cosines of acute angles in right triangles, and use sine and cosine to find unknown measures in right triangles.
- 11. Define and identify angles of devotion and depression, and use the

1	1	4
angles in right triangles,	between the similarity	them and trigonometric
and their use to find	ratio and the perpendicular	ratios to solve problems.
unknown measures in	and areas of similar	
right triangles.	angles.	Other essential evaluation
15. Definition, identification		tools:
and application of angles	12. Finding the relationships	<ul> <li>Quizzes</li> </ul>
of devotion and	between the ratio and the	• Tests
depression, and their use	ratios of the areas and	<ul> <li>Homework</li> </ul>
in trigonometric ratios to	volumes of similar solids.	<ul> <li>Group assignments</li> </ul>
solve problems.		• Projects
F 1.1. F	13. Calculating tangent of	- <b>J</b>
	acute angles in a right	
	triangle and using tangents	
	to determine sides' lengths	
	in triangles.	
	in triangles.	
	14. Computing sines and	
	cosines of acute angles in	
	right triangles, and finding	
	unknown measures in	
	right triangles.	
	15. Defining and identifying	
	angles of elevation and	
	depression, and using	
	them and trigonometric	
	ratios to solve problems.	

**SEMESTER: TWO** 

PERIOD: <u>V</u>

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

**UMIT/TOPIC: VECTORS AND CIRCLES** 

**GENERAL OBJECTIVE:** Students will model real-world situations such as those involving velocity; use tangents to circles in real-world situations, such as working in a

machine shop.

**SPECIFIC OBJECTIVES:** Upon the completion of this topic, students will be able to:

- 1. Describe and define vectors using ordered pair notation;
- 2. Describe, define, and compute the magnitude and direction of vectors.
- 3. Solve Problems that involve vector addition.
- 4. Use vector to describe translation,
- 5. Use trigonometry to find the areas of regular polygons; use the sine ratio to find the areas of acute triangles.
- 6. Write the equation of a circle and use it to solve real-world problems.
- 7. Find the relationship between a radius and a tangent, and between two triangles drawn from the same point; circumscribe a circle
- 8. Find the lengths of chords and measures of a circle; locate the center of a circle using chords.
- 9. Find the measure of inscribed angles and the arcs they intercept.
- 10. Find the measures of angles formed by chords, secants, and tangents.
- 11. Find the measures of segments associated with circles.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will be problem	1. Describe and define	1. Describing and defining	A. Primary Text	Essential tasks students
solvers in construction and	vectors using ordered	vectors using ordered pair	Mathematics for Senior High	should be able to do:
design.	pair notation;	notation;	School (Books 1,2 & 3)	1. Describe and define
	2. Describe, define, and		(Pearson)	vectors using ordered pair
Students will be problem	, ,			

- compute the magnitude and direction of vectors.
- 3. Solve Problems that involve vector addition.
- 4. Use vector to describe translation,
- 5. Use trigonometry to find the areas of regular polygons; use the sine ratio to find the areas of acute triangles.
- 6. Write the equation of a circle and use it to solve real-world problems.
- 7. Find the relationship between a radius and a tangent, and between two triangles drawn from the same point; circumscribe a circle
- 8. Find the lengths of chords and measures of a circle; locate the center of a circle using chords.
- 9. Measures of inscribed angles and the arcs they intercept.
- 10. Measures of angles formed by chords, secants, and tangents.
- 11. Measures of segments associated with circles.

- 2. Describing, defining, and computing the magnitude and direction of vectors.
- 3. Solving Problems that involve vector addition.
- 4. Using vector to describe translation,
- 5. Using trigonometry to find the areas of regular polygons; use the sine ratio to find the areas of acute triangles.
- 6. Writing the equation of a circle and using it to solve real-world problems.
- 7. Finding the relationship between a radius and a tangent, and between two triangles drawn from the same point; circumscribe a circle
- 8. Finding the lengths of chords and measures of a circle; locate the center of a circle using chords.
- 9. Finding the measure of inscribed angles and the arcs they intercept.

#### **B. Secondary Texts**

E.B. Dogbe, K.A. Morrison & Brian Speed, *Senior Secondary Guide* – (*Core*) *Mathematics* (Sedco, 1995)

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

#### C. Other Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- notation;
- 2. Describe, define, and compute the magnitude and direction of vectors.
- 3. Solve Problems that involve vector addition.
- 4. Use vector to describe translation,
- 5. Use trigonometry to find the areas of regular polygons; use the sine ratio to find the areas of acute triangles.
- 6. Write the equation of a circle and use it to solve real-world problems.
- 7. Find the relationship between a radius and a tangent, and between two triangles drawn from the same point; circumscribe a circle
- 8. Find the lengths of chords and measures of a circle; locate the center of a circle using chords.
- 9. Find the measure of inscribed angles and the arcs they intercept.
- 10. Find the measures of angles formed by chords, secants, and tangents.
- 11. Find the measures of segments associated with circles.

#### Other essential evaluation

	tools:
10. Finding the measures of	• Quizzes
angles formed by chords, secants, and tangents.	• Tests
securits, and tangents.	<ul><li>Homework</li><li>Group assignments</li></ul>
11. Measuring segments associated with circles.	• Projects
associated with circles.	

**SEMESTER: TWO** 

PERIOD: VI

**GRADE:** <u>10</u>

**SUBJECT: GEOMETRY** 

**UNIT/TOPIC: ANALYTIC GEOMETRY** 

**GENERAL OBJECTIVE:** Students will become technicians using ratios to complete the sizes of objects of planets

#### **SPECIFIC OBJECTIVES:**

Upon the completion of this topic, students will be able to:

- 1. Compute and interpret the slope of a line.
- 2. Use the distance formula to find the distance between two points.
- 3. Apply the midpoint formula to find the coordinates of the midpoint between two points.
- 4. Find and graph the equation given: a. two points; b. points and slope; c. slope and y-intercept; d. general form; e. parallel form or perpendicular form.
- 5. Define, discuss, and work with a circle and its parts (formula, center, radius, diameter, circumference, chord, secant, sector, arc, arc length) with its center at (0, 0) or at (h, k) and solve applied problems involving circles.
- 6. Define, discuss, and work with a parabola and its parts (vertex, focus, axis of symmetry, standard form of its equation, and directrix) with center at (0, 0) or at (h, k).
- 7. Define, discuss, and work with an ellipse and its parts (vertices, foci, major and minor axes of symmetry, standard form of its equation, and formula of its area) with center at (0, 0) or at (h, k).

8. Define, discuss, and work with an hyperbola and its parts (vertices, foci, transverse and conjugate axes, standard form of its equation, and equations of asymptotes) with center at (0, 0) or at (h, k).

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will acquire skills of	1. Computation and	1. Computing and	A. Primary Text	Essential tasks students
technicians using ratios to	interpretation of the	interpreting the slope of a	Mathematics for Senior High	should be able to do:
complete the sizes of objects	slope of a line.	line.	School (Books 1,2 & 3)	1. Compute and interpret the
of planets	2. The distance formula to		(Pearson)	slope of a line.
	find the distance between	2. Using the distance		2. Use the distance formula
	two points and the	formula to find the	B. Secondary Texts	to find the distance
	midpoint formula to find	distance between two	E.B. Dogbe, K.A. Morrison &	between two points.
	the coordinates of the	points and the midpoint	Brian Speed, Senior Secondary	3. Apply the midpoint
	midpoint between two	formula to find the	Guide – (Core) Mathematics	formula to find the
	points.	coordinates of the	(Sedco, 1995)	coordinates of the
	3. Graph of the equation	midpoint between two		midpoint between two
	given: a. two points; b.	points.	Laurie E. Bass, Et al. Geometry:	points.
	points and slope; c. slope		Tools for a Changing World	4. Find and graph the
	and y-intercept; d.	3. Finding and graphing the	(Prentice Hall 1998).	equation given: a. two
	general form; e. parallel	equation given: a. two		points; b. points and slope
	form or perpendicular	points; b. points and slope	C. Other	; c. slope and y-intercept;
	form.	; c. slope and y-intercept;	Resources/Supplementary	d. general form; e. parallel
	4. The circle and its parts	d. general form; e. parallel	Readings	form or perpendicular
	(formula, center, radius,	form or perpendicular	Mathematical Association of	form.
	diameter, circumference,	form.	Ghana, Effective Elective	5. Define, discuss, and work
	chord, secant, sector, arc,		Mathematics for (Books 1,2 &	with a circle and its
	arc length} with its	4. Defining, discussing, and	3) (Pearson)	parts(formula, center,
	center at $(0, 0)$ or at $(h,$	working with a circle and	• Graph paper,	radius, diameter,
	k) and solve applied	its parts(formula, center,	• Geo-board,	circumference, chord,
	problems involving	radius, diameter,	• Colored pencils,	secant, sector, arc, arc
	circles.	circumference, chord,	• Tape.	length} with its center at
	5. The parabola and its	secant, sector, arc, arc	Protractor rules	(0,0) or at $(h,k)$ and solve
	parts (vertex, focus, axis	length} with its center at	• Compass,	applied problems
	of symmetry, standard	(0,0) or at $(h,k)$ and solve	Tracing papers	involving circles.
	form of its equation, and	applied problems		6. Define, discuss, and work
	directrix) with center at	involving circles.		with a parabola and its

- (0,0) or at (h,k).
- 6. The ellipse and its parts (vertices, foci, major and minor axes of symmetry, standard form of its equation, and formula of its area) with center at (0, 0) or at (h, k).
- 7. The hyperbola and its parts (vertices, foci, transverse and conjugate axes, standard form of its equation, and equations of asymptotes) with center at (0, 0) or at (h, k).
- 5. Defining, discussing, and working with a parabola and its parts (vertex, focus, axis of symmetry, standard form of its equation, and directrix) with center at (0, 0) or at (h, k).
- 6. Defining, discussing, and working with an ellipse and its parts (vertices, foci, major and minor axes of symmetry, standard form of its equation, and formula of its area) with center at (0, 0) or at (h, k).
- 7. Defining, discussing, and working with a hyperbola and its parts (vertices, foci, transverse and conjugate axes, standard form of its equation, and equations of asymptotes) with center at (0, 0) or at (h, k).

- parts (vertex, focus, axis of symmetry, standard form of its equation, and directrix) with center at (0, 0) or at (h, k).
- 7. Define, discuss, and work with an ellipse and its parts (vertices, foci, major and minor axes of symmetry, standard form of its equation, and formula of its area) with center at (0, 0) or at (h, k).
- 8. Define, discuss, and work with an hyperbola and its parts (vertices, foci, transverse and conjugate axes, standard form of its equation, and equations of asymptotes) with center at (0, 0) or at (h, k).

### Other essential evaluation tools:

- Quizzes
- Tests
- Homework
- Group assignments
- Projects

PERIOD: I

**GRADE:** <u>11</u>

UNIT/TOPICS: 1. ANGLES AND THEIR MEASURE

2. RIGHT TRIANGLE TRIGONOMETRY

**GENERAL OBJECTIVE:** Students will measure angles and solve real-life problems, such as calculating the height of a mountain.

#### **SPECIFIC OBJECTIVES:**

Upon the completion of these topics, students will be able to:

- 1. Define and give examples of close half line, ray, angle, initial and terminal sides of angles, positive and negative angles, acute angle, right angle, obtuse angle, straight angle, reflex angle, and angles in standard position.
- 2. Convert between degrees, minutes, seconds, and decimal.
- 3. Find the arc length of a circle.
- 4. Convert from degree to radian, and conversely.
- 5. Find the area of a sector.
- 6. Find the linear speed of an object traveling in circular motion.

Define and compute the values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of acute angles ( $\frac{\pi}{4} = 45^{\circ}$ ,  $\frac{\pi}{6} = 30^{\circ}$ ,  $\frac{\pi}{3} = 60^{\circ}$ ) using the right triangle ratios approach.

- 1. Define and compute the values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles (
  - $\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$  )and their co-terminal angles , using the Cartesian plane approach .
- 2. Define and compute the values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles (
  - $\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$  ) and their co-terminal angles, using the unit circle approach.
- 3. Find the remaining trigonometric function value, given the value of one of those functions.
- 4. Compute the exact values of the trigonometric functions for general angles.

- 5. Define and use co- terminal angles to find exact values of trigonometric functions.6. Define and find the reference angle and reference triangle of a general angle.
- 7. Determine the signs of the trigonometric functions of an angle, in a given quadrant.
- Use calculator to compute the value of any trigonometric function.
   Model and Solve right triangles and their applications, such as indirect measurements using angles of depression and elevation.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will become problem solvers.  Students will become informed decision makers. Students will become lifelong learners.	<ol> <li>Close half line, ray, angle, initial and terminal sides of angles, positive and negative angles, acute angle, right angle, obtuse angle, straight angle, reflex angle, and angles in standard position.</li> <li>Degrees, minutes, seconds, and decimal.</li> </ol>	<ol> <li>Defining and giving examples of close half line, ray, angle, initial and terminal sides of angles, positive and negative angles, acute angle, right angle, obtuse angle, straight angle, reflex angle, and angles in standard position.</li> <li>Converting between</li> </ol>	A. Primary Text  Mathematics for Senior High School (Books 1,2 & 3) (Pearson)  B. Secondary Texts E.B. Dogbe, K.A. Morrison & Brian Speed, Senior Secondary Guide – (Core) Mathematics (Sedco, 1995)	Essential tasks students should be able to do:  1. Define and give examples of close half line, ray, angle, initial and terminal sides of angles, positive and negative angles, acute angle, right angle, obtuse angle, straight angle, reflex angle, and angles
	<ul><li>3. Arc length of a circle.</li><li>4. Conversion from degree to radian, and conversely.</li><li>5. Area of a sector.</li></ul>	degrees, minutes, seconds, and decimal.	Laurie E. Bass, Et al. Geometry: Tools for a Changing World (Prentice Hall 1998).  C. Other Resources/Supplementary	<ul> <li>in standard position.</li> <li>2. Convert between degrees, minutes, seconds, and decimal.</li> <li>3. Find the arc length of a circle.</li> </ul>
	6. Linear speed of an object traveling in circular motion.	<ul><li>4. Converting from degree to radian, and conversely.</li><li>5. Finding the area of a sector.</li></ul>	Readings Mathematical Association of Ghana, Effective Elective Mathematics for (Books 1,2 & 3) (Pearson)	<ul><li>4. Convert from degree to radian, and conversely.</li><li>5. Find the area of a sector.</li><li>6. Find the linear speed of an object traveling in</li></ul>
	7. Values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of acute angles ( $\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$ )	<ul><li>6. Finding the linear speed of an object traveling in circular motion.</li><li>7. Defining and computing the values of trigonometric functions (sine, cosine, tangent, cosecant, secant,</li></ul>	<ul> <li>Graph paper,</li> <li>Geo-board,</li> <li>Colored pencils,</li> <li>Tape.</li> <li>Protractor rules</li> <li>Compass,</li> </ul>	circular motion.  Other essential evaluation tools:  • Quizzes • Tests • Homework

using the right triangle
ratios approach .

8. Values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles(

$$\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$$
)and their co-terminal angles , using the

Cartesian plane approach.

9. Values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles(

$$\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$$
) and their co-terminal angles, using the unit circle approach.

- 10. Finding the remaining trigonometric function value, given the value of one of those functions.
- 11. Exact values of the trigonometric functions for general angles.
- 12. Definition of and use of co-terminal angles to find

and cotangent) of acute angles

• Tracing papers

$$(\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ})$$
  
using the right triangle ratios approach.

8. Defining and computing the values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles(

$$\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$$
  
)and their co-terminal angles, using the Cartesian plane approach.

9. Defining and computing the values of trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent) of special acute angles(

$$\frac{\pi}{4} = 45^{\circ}, \frac{\pi}{6} = 30^{\circ}, \frac{\pi}{3} = 60^{\circ}$$
) and their co-terminal angles, using the unit circle approach.

- 10. Finding the remaining trigonometric function value, given the value of one of those functions.
- 11. Computing the exact values

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Projects

exact values of	of the trigonometric	
trigonometric functions.	functions for general angles.	
G		
13. Reference angle and	12. Defining and using co-	
reference triangle of a	terminal angles to find exact	
general angle.	values of trigonometric	
0	functions.	
14. The signs of the		
trigonometric functions of	13. Defining and finding the	
an angle, in a given	reference angle and	
quadrant.	reference triangle of a	
quaurant.	general angle.	
15. The use of calculator to	general angle.	
compute the value of any	14. Determining the signs of the	
trigonometric function.	trigonometric functions of	
16 M. 1.1 1 C.1 4 6	an angle, in a given	
16. Models and Solution of	quadrant.	
right triangles and their	15 77 1 1 1	
applications, such as	15. Using calculator to compute	
indirect measurements	the value of any	
using angles of depression	trigonometric function.	
and elevation.		
	16. Modeling and Solving right	
	triangles and their	
	applications, such as indirect	
	measurements using angles of	
	depression and elevation.	

PERIOD: II

**GRADE:** <u>11</u>

UNIT/TOPIC: GRAPHS OF TRIGONOMETRIC FUNCTION

**GENERAL OBJECTIVE:** Students will solve problems involving Graphs of Trigonometric Function.

#### **SPECIFIC OBJECTIVES:**

Upon the completion of this topic, students will be able to:

- 1. Graph the sine and cosine functions
- 2. Determine the domain and range of sine and cosine functions.
- 3. Relate angles to the x coordinates and values of the trigonometric functions to the y coordinates.
- 4. Determine the amplitude and period of sinusoidal functions.
- 5. Explain why the graphs of sine and cosine are called sinusoidal graphs.
- 6. Explain the cyclic nature of periodic functions.
- 7. Determine the phase shift of a sinusoidal function.
- 8. Model harmonic motion with sinusoidal functions.
- 9. Solve harmonic motion problems.
- 10. Determine the domain and range of tangent, cotangent, secant, and cosecant functions.
- 11. Relate domain restrictions to vertical asymptotes.
- 12. Graph basic tangent, cotangent, secant, and cosecant functions.
- 13. Analyze the pattern that vertical asymptotes follow.
- 14. Determine the period of tangent, cotangent, secant, and cosecant functions.
- 15. Use translation to graph tangent, cotangent, secant, and cosecant functions.
- 16. Explain the relationship between the graphs of cosine/secant and sine/cosecant.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will become	1. Graph the sine and	1. Graphing the sine and	A. Primary Text	Essential tasks students
problem solvers.	cosine functions.	cosine functions.	Mathematics for Senior High	should be able to do:

Students will become informed decision makers.

Students will become lifelong learners.

- 2. Determination of the domain and range of sine and cosine functions.
- 3. Relationship of angles to the x coordinates and values of the trigonometric functions to the y coordinates.
- 4. Amplitude and period of sinusoidal functions.
- 5. Understand why the graphs of sine and cosine are called sinusoidal graphs.
- 6. Understand the cyclic nature of periodic functions.
- 7. The phase shift of a sinusoidal function.
- 8. Models of harmonic motion with sinusoidal functions.
- 9. Solution of harmonic motion problems.
- 10. The domain and range of tangent, cotangent, secant, and cosecant functions.

- 2. Determining the domain and range of sine and cosine functions.
- 3. Associating angles to the x coordinates and values of the trigonometric functions to the y coordinates.
- 4. Determining the amplitude and period of sinusoidal functions.
- 5. Activities to show why the graphs of sine and cosine are called sinusoidal graphs.
- 6. Activities to show why the cyclic nature of periodic functions.
- 7. Determining the phase shift of a sinusoidal function.
- 8. Modeling harmonic motion with sinusoidal functions.
- 9. Solving harmonic motion problems.
- 10. Determining the domain and range of tangent, cotangent, secant, and

School (Books 1,2 & 3) (Pearson)

#### **B. Secondary Texts**

E.B. Dogbe, K.A. Morrison & Brian Speed, *Senior Secondary Guide* – (*Core*) *Mathematics* (Sedco, 1995)

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

#### C. Other

## Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- 1. Graph the sine and cosine functions
- 2. Determine the domain and range of sine and cosine functions.
- 3. Relate angles to the x coordinates and values of the trigonometric functions to the y coordinates.
- 4. Determine the amplitude and period of sinusoidal functions.
- 5. Explain why the graphs of sine and cosine are called sinusoidal graphs.
- 6. Explain the cyclic nature of periodic functions.
- 7. Determine the phase shift of a sinusoidal function.
- 8. Model harmonic motion with sinusoidal functions.
- 9. Solve harmonic motion problems.
- 10. Determine the domain and range of tangent, cotangent, secant, and cosecant functions.
- 11. Relate domain restrictions to vertical asymptotes.
- 12. Graph basic tangent, cotangent, secant, and cosecant functions.
- 13. Analyze the pattern that vertical asymptotes follow.
- 14. Determine the period of

	cosecant functions.		tangent, cotangent,
11. Relationship between			secant, and cosecant
domain restrictions and	11. Relating domain		functions.
vertical asymptotes.	restrictions to vertical	1	15. Use translation to graph
	asymptotes.		tangent, cotangent, secant,
12. Graphs of basic tangent,	• •		and cosecant functions.
cotangent, secant, and	12. Graphing basic tangent,	1	16. Explain the relationship
cosecant functions.	cotangent, secant, and		between the graphs of
	cosecant functions.		cosine/secant and
13. Pattern that vertical			sine/cosecant.
asymptotes follow.	13. Understanding the pattern		Sille, Coscount
asymptotes follow:	that vertical asymptotes		Other essential evaluation
14. The period of tangent,	follow.	$ \bar{t} $	tools:
cotangent, secant, and	follow.		Quizzes
cosecant functions.	14 Determining the named of	•	
cosecant functions.	14. Determining the period of		**
15 TI	tangent, cotangent,		
15. Using translation to	secant, and cosecant	•	oroup assignments
graph tangent, cotangent,	functions.	•	Projects
secant, and cosecant			
functions.	<b>15</b> . Using translation to graph		
	tangent, cotangent, secant,		
16. The relationship between	and cosecant functions.		
the graphs of			
cosine/secant and	16. Understanding the		
sine/cosecant.	relationship between the		
	graphs of cosine/secant		
	and sine/cosecant.		

PERIOD: III

**GRADE:** <u>11</u>

UNIT/TOPIC: TRIGONOMETRIC IDENTITIES AND THEIR VERIFICATIONS

**GENERAL OBJECTIVE:** Students will solve problems involving Trigonometric Identities and their Verifications.

#### **SPECIFIC OBJECTIVES:**

Upon the completion of this topic, students will be able to:

- 1. Explain the reciprocal, quotient, and Pythagorean identities.
- 2. Argue that the reciprocal and quotient identities are not always defined.
- 3. Use the basic identities to simplify trigonometric expressions, and demonstrate that there is more than one way to verify an identity..
- 4. Demonstrate that identities must hold for all values in the domain of the functions.
- 5. Find exact values of functions for rational multiples of Type equation here.  $\pi$  by using the sum and difference identities.
- 6. Develop new identities from the sum and difference identities.
- 7. Derive the sum and difference identities for the cosine function by using the distance formula.
- 8. Use the sum and difference identities for the cosine function to obtain the co function identities.
- 9. Use the co function identities and the sum and difference identities for the cosine function to derive the sum and difference identities for the sine function.
- 10. Use the cosine and sine sum and difference identities with the quotient identity to obtain the tangent sum and difference identities.
- 11. Use the double-angle identities to find exact values of trigonometric functions.
- 12. Use the double-angle identities to simplify or verify identities.
- 13. Derive the double-angle identities from the sum identities.
- 14. Use the half-angle identities to find the exact values of trigonometric functions.
- 15. Use the half-angle identities to verify other trigonometric identities.
- 16. Derive the half-angle identities from the double-angle identities.
- 17. Express products of trigonometric functions as sums of trigonometric functions.
- 18. Express sums of trigonometric functions as products of trigonometric functions.
- 19. Use the sum and difference identities to derive product-to-sum identities.
- 20. Use the product-to-sum identities to derive sum-to-product identities.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will become	1. The reciprocal, quotient,	1. Learning the reciprocal,	A. Primary Text	Essential tasks students
problem solvers.	and Pythagorean	quotient, and Pythagorean	Mathematics for Senior High	should be able to do:
	identities.	identities.	School (Books 1,2 & 3)	1. Explain the reciprocal,
Students will become			(Pearson)	quotient, and Pythagorean
informed decision makers.	2. Understand that the	2. Understanding that the		identities.
	reciprocal and quotient	reciprocal and quotient	B. Secondary Texts	2. Argue that the reciprocal
Students will become life-	identities are not always	identities are not always	E.B. Dogbe, K.A. Morrison &	and quotient identities are
long learners.	defined.	defined.	Brian Speed, Senior Secondary	not always defined.
			Guide – (Core) Mathematics	3. Use the basic identities to
	3. The use of the basic	3. Using the basic identities	(Sedco, 1995)	simplify trigonometric
	identities to simplify	to simplify trigonometric		expressions, and
	trigonometric	expressions, and	Laurie E. Bass, Et al. Geometry:	demonstrate that there is
	expressions, and	understand that there is	Tools for a Changing World	more than one way to
	understand that there is	more than one way to	(Prentice Hall 1998).	verify an identity
	more than one way to	verify an identity		4. Demonstrate that identities
	verify an identity.		C. Other	must hold for all values in
		4. Understanding that	Resources/Supplementary	the domain of the
	4. Understand that	identities must hold for all	Readings	functions.
	identities must hold for	values in the domain of the	Mathematical Association of	5. Find exact values of
	all values in the domain	functions.	Ghana, Effective Elective	functions for rational
	of the functions.		Mathematics for (Books 1,2 &	multiples of
		5. Finding exact values of	3) (Pearson)	Type equation here. $\pi$ by
	5. Exact values of functions	functions for rational	• Graph paper,	using the sum and
	for rational multiples of	multiples of	• Geo-board,	difference identities.
	$\pi$ by using the sum and	Type equation here. $\pi$ by	• Colored pencils,	6. Develop new identities
	difference identities.	using the sum and	• Tape.	from the sum and
		difference identities.	Protractor rules	difference identities.
	6. Development of new		• Compass,	7. Derive the sum and
	identities from the sum	6. Developing new identities	Tracing papers	difference identities for the
	and difference identities.	from the sum and		cosine function by using
		difference identities.		the distance formula.
	7. Derivation the sum and	7. Deriving the sum and		8. Use the sum and difference
	difference identities for	difference identities for the		identities for the cosine
	the cosine function by	cosine function by using		function to obtain the co
	using the distance	the distance formula.		function identities.

#### formula.

- 8. The use of the sum and difference identities for the cosine function to obtain the co-function identities.
- 9. The use the co-function identities and the sum and difference identities for the cosine function to derive the sum and difference identities for the sine function.
- 10. The use of the cosine and sine sum and difference identities with the quotient identity to obtain the tangent sum and difference identities.
- 11. The use of the doubleangle identities to find exact values of trigonometric functions.
- 12. The use of the doubleangle identities to simplify or verify identities.
- 13. Derivation of the doubleangle identities from the sum identities.

- 8. Using the sum and difference identities for the cosine function to obtain the co-function identities.
- 9. Using the co-function identities and the sum and difference identities for the cosine function to derive the sum and difference identities for the sine function.
- 10. Using the cosine and sine sum and difference identities with the quotient identity to obtain the tangent sum and difference identities.
- 11. Using the double-angle identities to find exact values of trigonometric functions.
- 12. Using the double-angle identities to simplify or verify identities.
- 13. Deriving the double-angle identities from the sum identities.
- 14. Using the half-angle identities to find the exact values of trigonometric functions.

- 9. Use the co function identities and the sum and difference identities for the cosine function to derive the sum and difference identities for the sine function.
- 10. Use the cosine and sine sum and difference identities with the quotient identity to obtain the tangent sum and difference identities.
- 11. Use the double-angle identities to find exact values of trigonometric functions.
- 12. Use the double-angle identities to simplify or verify identities.
- 13. Derive the double-angle identities from the sum identities.
- 14. Use the half-angle identities to find the exact values of trigonometric functions.
- 15. Use the half-angle identities to verify other trigonometric identities.
- 16. Derive the half-angle identities from the doubleangle identities.
- 17. Express products of trigonometric functions as sums of trigonometric functions.

14. The use of the half-angle identities to find the exact values of trigonometric functions.
15. The use of the half-angle identities to verify other trigonometric identities.

- 16. Derivation of the halfangle identities from the double-angle identities.
- 17. The products of trigonometric functions as sums of trigonometric functions.
- 18. The sums of trigonometric functions as products of trigonometric functions.
- 19. Use of the sum and difference identities to derive product-to-sum identities.
- 20. Use of the product-tosum identities to derive sum-to-product identities.

- 15. Using the half-angle identities to verify other trigonometric identities.
- 16. Deriving the half-angle identities from the doubleangle identities.
- 17. Expressing products of trigonometric functions as sums of trigonometric functions.
- 18. Expressing sums of trigonometric functions as products of trigonometric functions.
- 19. Using the sum and difference identities to derive product-to-sum identities.
- 20. Using the product-to-sum identities to derive sum-to-product identities.

- 18. Express sums of trigonometric functions as products of trigonometric functions.
- 19. Use the sum and difference identities to derive product-to-sum identities.
- 20. Use the product-to-sum identities to derive sum-to-product identities.

### Other essential evaluation tools:

- Quizzes
- Tests
- Homework
- Group assignments
- Projects

PERIOD: <u>IV</u>

**GRADE:** <u>11</u>

UNIT/TOPIC: 1. INVERSE TRIGONOMETRIC FUNCTIONS AND TRIGONOMETRIC EQUATIONS

**GENERAL OBJECTIVE:** Students will solve real-life problems involving Trigonometric Identities and their Verifications

#### **SPECIFIC OBJECTIVES:**

Upon the completion of this topic, students will be able to:

- 1. Define and develop inverse trigonometric functions.
- 2. Use the different notations for inverse trigonometric functions.
- 3. Graph inverse trigonometric functions.
- 4. Explain why domain restrictions on trigonometric functions are needed for inverse trigonometric functions to exist.
- 5. Extend properties of inverse of functions to develop inverse trigonometric functions.
- 6. Solve trigonometric equations by inspection.
- 7. Solve trigonometric equations using algebraic techniques.
- 8. Demonstrate that solving trigonometric equations is similar to solving algebraic equations.
- 9. Solve trigonometric equations using inverse functions.
- 10. Solve trigonometric equations (involving more than one trigonometric functions) using trigonometric identities.
- 11. Realize that the goal in solving trigonometric equations is to find the value(s) for the independent variable that makes the equation true.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will become	1. Definition and	1. Defining and developing	A. Primary Text	Essential tasks students
problem solvers.	development inverse	inverse trigonometric	Mathematics for Senior High	should be able to do:
	trigonometric functions.	functions.	School (Books 1,2 & 3)	1. Define and develop
Students will become			(Pearson)	inverse trigonometric
informed decision makers.	2. Different notations for	2. Using the different		functions.
	inverse trigonometric	notations for inverse	B. Secondary Texts	2. Use the different notations
Students will become life-	functions.	trigonometric functions.	E.B. Dogbe, K.A. Morrison &	for inverse trigonometric
long learners.			Brian Speed, Senior Secondary	functions.

- **3.** Graphs of inverse trigonometric functions.
- 4. Understand why domain restrictions on trigonometric functions are needed for inverse trigonometric functions to exist.
- 5. Extension of properties of inverse of functions to develop inverse trigonometric functions.
- 6. Solution of trigonometric equations by inspection.
- 7. Solution of trigonometric equations using algebraic techniques.
- 8. Understand that solving trigonometric equations is similar to solving algebraic equations.
- 9. Solution of trigonometric equations using inverse functions.
- 10. Solution of trigonometric equations (involving more than one trigonometric function)

- 3. Graphing inverse trigonometric functions.
- 4. Understanding why domain restrictions on trigonometric functions are needed for inverse trigonometric functions to exist.
- 5. Extending properties of inverse of functions to develop inverse trigonometric functions.
- 6. Solving trigonometric equations by inspection.
- 7. Solving trigonometric equations using algebraic techniques.
- 8. Discussing the fact that solving trigonometric equations is similar to solving algebraic equations.
- 9. Solving trigonometric equations using inverse functions.
- 10. Solving trigonometric equations (involving more than one trigonometric function) using trigonometric identities.

*Guide* – (*Core*) *Mathematics* (Sedco, 1995)

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

# C. Other Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- 3. Graph inverse trigonometric functions.
- 4. Explain why domain restrictions on trigonometric functions are needed for inverse trigonometric functions to exist.
- Extend properties of inverse of functions to develop inverse trigonometric functions.
- 6. Solve trigonometric equations by inspection.
- 7. Solve trigonometric equations using algebraic techniques.
- 8. Demonstrate that solving trigonometric equations is similar to solving algebraic equations.
- 9. Solve trigonometric equations using inverse functions.
- 10. Solve trigonometric equations (involving more than one trigonometric functions) using trigonometric identities.
- 11. Argue that the goal in solving trigonometric equations is to find the value(s) for the independent variable that makes the equation true.

Other essential evaluation

using trigonometric identities.  11. Realize that the goal in solving trigonometric equations is to find the value(s) for the independent variable that makes the equation true.	11. Discussing that the goal in solving trigonometric equations is to find the value(s) for the independent variable that makes the equation true.		<ul> <li>tools:</li> <li>Quizzes</li> <li>Tests</li> <li>Homework</li> <li>Group assignments</li> <li>Projects</li> </ul>
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PERIOD: <u>V</u>

**GRADE:** <u>11</u>

UNIT/TOPIC: OBLIQUE TRIANGLES, THE SINE AND COSINE LAWS, AND THE COMPLEX NUMBERS

**GENERAL OBJECTIVE:** Students will use the laws of sines and cosines in problem solving; and use the complex plane to illustrate relationships between complex numbers,

such as fractal geometry.

**SPECIFIC OBJECTIVES:** Upon the completion of this unit, students will be able to:

- 1. Solve application problems involving bearing and heading.
- 2. Derive the law of sines.
- 3. Derive the law of cosines.
- 4. Develop a strategy for which angles to select (longer or shorter) and which (the law of sines or law of cosines) to use to solve oblique triangles.
- 5. Classify the ambiguous case as "no triangle", one triangle or "two triangles".
- 6. Solve SAA or ASA triangle problems using the law of sines or cosines
- 7. Solve SSA triangles problems, applying the law of sines or cosines.
- 8. Solve SAS problems using the law of cosines or sines.

- 9. Use the law of sines to derive a formula for an area of a triangle (SAS case).
- 10. Use the law of cosines to derive a formula for an area of a triangle (SSS case: Heron's formula).
- 11. Solve ambiguous SSA triangle cases.
- 12. Classify an oblique triangle as one of four cases.
- 13. Solve application problems involving oblique triangles.
- 14. Define, identify, add, subtract, and multiply imaginary and complex numbers.
- 15. Plot complex numbers in the complex plane.
- 16. Identify the imaginary and real axes and graph on a coordinate grid or Argand diagram.
- 17. Express a complex number in trigonometric and standard forms.
- 18. Find the product of two complex numbers in trigonometric form.
- 19. Divide complex numbers in trigonometric form.
- 20. Find the power of a complex number using Demoivre's Theorem.
- 21. Find complex roots.
- 22. Use the properties of the conjugate and modulus in problem solving.
- 23. Convert from polar coordinate to rectangular coordinate.
- 24. Transformation of equations from polar to rectangular form and conversely.

OUTCOMES	CONT	ENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will become problem solvers.	1. Angle of ele depression		. Solving angle of elevation and angle of depression problem.	A. Primary Text  Mathematics for Senior High School (Books 1,2 & 3)	Essential tasks students should be able to do: 1. Solve application problems
Students will become informed decision makers.	2. Application involving b	ns problems earing and or 2	•	(Pearson)	involving bearing and heading.
Students will become life-	heading		problem involving bearing and /or heading	B. Secondary Texts E.B. Dogbe, K.A. Morrison &	<ul><li>2. Derive the law of sines.</li><li>3. Derive the law of cosines.</li></ul>
long learners.	3. AAS and A and the law	O	3. Solving applications using the law of sines or cosines	Brian Speed, Senior Secondary Guide – (Core) Mathematics (Sedco, 1995)	4. Develop a strategy for which angles to select (longer or shorter) and
	4. SAS and th cosine prob		Defining, identifying, adding, subtracting, and	Laurie E. Bass, Et al. Geometry: Tools for a Changing World	which (the law of sines or law of cosines) to use to solve oblique triangles.
	5. Addition, so and multiple	′	multiplying imaginary and complex numbers.	(Prentice Hall 1998).	5. Classify the ambiguous case as "no triangle", one

- 6. Complex numbers in the complex plane.
- 7. The imaginary and real axes and graph on a coordinate grid or Argand diagram.
- 8. Complex number in trigonometric and standard forms.
- 9. Product of two complex numbers in trigonometric form.
- 10. Division of complex numbers in trigonometric form.
- 11. Power of a complex number using Demoivre's Theorem.
- 12. Complex roots.

- 5. Plotting complex numbers in the complex plane.
- 6. Identifying the imaginary and real axes and graph on a coordinate grid or Argand diagram.
- 7. Expressing a complex number in trigonometric and standard forms.
- 8. Finding the product of two complec numbers in trigonometric form.
- 9. Dividing complex numbers in trigonometric form.
- 10. Finding the power of a complex number using Demoivre's Theorem.
- 11. Finding complex roots.

### C. Other

## Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- triangle or "two triangles".
- 6. Solve SAA or ASA triangle problems using the law of sines or cosines
- 7. Solve SSA triangles problems, applying the law of sines or cosines.
- 8. Solve SAS problems using the law of cosines or sines.
- 9. Use the law of sines to derive a formula for an area of a triangle (SAS case).
- 10. Use the law of cosines to derive a formula for an area of a triangle (SSS case: Heron's formula).
- 11. Solve ambiguous SSA triangle cases.
- 12. Classify an oblique triangle as one of four cases.
- 13. Solve application problems involving oblique triangles.
- 14. Define, identify, add, subtract, and multiply imaginary and complex numbers.
- 15. Plot complex numbers in the complex plane.
- 16. Identify the imaginary and real axes and graph on a coordinate grid or Argand diagram.
- 17. Express a complex number in trigonometric and

		standard forms.  18. Find the product of two complex numbers in trigonometric form.  19. Divide complex numbers in trigonometric form.  20. Find the power of a complex number using Demoivre's Theorem.  21. Find complex roots.  22. Use the properties of the conjugate and modulus in problem solving.  23. Convert from polar coordinate to rectangular coordinate.  24. Transformation of
		equations from polar to rectangular form and conversely.  Other essential evaluation tools:  Quizzes Tests Homework Group assignments Projects

PERIOD: <u>VI</u>

**GRADE:** <u>11</u>

UNIT/TOPIC: TRANSFORMATIONS AND VECTORS

**GENERAL OBJECTIVE:** To describe and explain the various kinds of motions one encounters in daily life, such as arts, computer graphics, navigation, manufacturing, music and other fields one endeavor as a citizen. To model real-world situations such as those involving velocity.

#### **SPECIFIC OBJECTIVES:** Upon the completion of this unit, students will be able to:

- 1. Identify isometries.
- 2. Locate reflection images of figures.
- 3. Find translation images of figures.
- 4. Use vectors and matrix addition to represent translation.
- 5. Identify and locate rotation images of figures.
- 6. Show how reflections are related to other isometries.
- 7. Identify glide reflections.
- 8. Identify types of symmetry in figures.
- 9. Locate dilation images of figures.
- 10. Describe vector using ordered pair notation
- 11. Describe the magnitude and direction of vectors.
- 12. Solve problems that involve vector addition and subtraction (resultant).
- 13. Multiply vectors by a number (scalar product).
- 14. Define and use unit vector and position vector.
- 15. Determine a vector from its direction and magnitude of vector.
- 16. Work with objects in static equilibrium.
- 17. Find the angle between two vectors.
- 18. Determine whether two vectors are parallel or orthogonal.
- 19. Determine Latitudes, longitudes, and bearings.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will become	1. Reflections(transformation,	1. Identifying isometries.	A. Primary Text	Essential tasks students
problem solvers.	isometries, image, pre-		Mathematics for Senior High	should be able to do:
	image prime notation ,	2. Locating reflection	School (Books 1,2 & 3)	1. Identify isometries.
Students will become	orientation,	images of figures.	(Pearson)	2. Locate reflection images
informed decision makers.				of figures.
	2. Translations (Locate	3. Finding translation	B. Secondary Texts	3. Find translation images of
Students will become life-	reflection images of figures.	images of figures.	E.B. Dogbe, K.A. Morrison &	figures.
long learners.			Brian Speed, Senior Secondary	4. Use vectors and matrix
	3. Rotations	4. Using vectors and matrix	Guide – (Core) Mathematics	addition to represent
		addition to represent	(Sedco, 1995)	translation.
	4. Composition of	translation.		5. Identify and locate
	reflections(glide reflection)		Laurie E. Bass, Et al. <i>Geometry:</i>	rotation images of
		5. Identifying and locating	Tools for a Changing World	figures.
	5. Symmetry(reflectional	rotation images of	(Prentice Hall 1998).	6. Show how reflections are
	symmetry)	figures.		related to other isometries
			C. Other	
	6. Tessellations(tiling, pure	6. Show ing how reflections	Resources/Supplementary	7. Identify glide reflections.
	tessellation, translational	are related to other	Readings	8. Identify types of
	symmetry, glide reflectional	isometries.	Mathematical Association of	symmetry in figures.
	symmetry)		Ghana, Effective Elective	9. Locate dilation images of
		7. Identify ing glide	Mathematics for (Books 1,2 &	figures.
	7. Dilations (scale factor,	reflections.	3) (Pearson)	10. Describe vector using
	dilation, enlarge3ment,		Graph paper,	ordered pair notation
	reduction, scalar	8. Identifying types of	Geo-board,	11. Describe the magnitude
	multiplication)	symmetry in figures.	<ul> <li>Colored pencils,</li> </ul>	and direction of vectors.
	•		• Tape.	12. Solve problems that
	8. Vectors and trigonometry	9. Locating dilation images	Protractor rules	involve vector addition
	·	of figures.	• Compass,	and subtraction
	9. Find translation images of		<ul><li>Tracing papers</li></ul>	(resultant).
	figures.	10. Describing vector using	Trueing pupers	13. Multiply vectors by a
		ordered pair notation.		number (scalar product).
	10. Use vectors and matrix			14. Define and use unit
	addition to represent	11. Describing the magnitude		vector and position
	translation.	and direction of vectors.		vector.
				15. Determine a vector from

11.	<b>Identify and locate rotation</b>
	images of figures.
12.	Show how reflections are related to other isometries.
13.	Identify glide reflections.

- 14. Identify types of symmetry in figures.
- 15. Locate dilation images of figures.
- 16. Describe vector using ordered pair notation
- 17. Describe the magnitude and direction of vectors.
- 18. Solve problems that involve vector addition and subtraction.
- 19. Multiply vectors by a number (scalar product).
- 20. Define and use unit vector and position vector.
- 21. Determine a vector from its direction and magnitude of vector.
- 22. Work with objects in static equilibrium.

- 12. Solving problems that involve vector addition and subtraction.
- 13. Multiplying vectors by a number (scalar product).
- 14. Defining and using unit vector and position vector.
- 15. Determining a vector from its direction and magnitude of vector.
- 16. Working with objects in static equilibrium.
- 17. Finding the angle between two vectors.
- 18. Determining whether two vectors are parallel or orthogonal.
- 19. Identifying isometries.
- 20. Locating reflection images of figures.
- 21. Finding translation images of figures.
- 22. Using vectors and matrix addition to represent translation.
- 23. Identifying and locating

- its direction and magnitude of vector.
- 16. Work with objects in static equilibrium.
- 17. Find the angle between two vectors.
- 18. Determine whether two vectors are parallel or orthogonal.
- 19. Define Latitudes, longitudes, and bearings.

#### Other essential evaluation tools:

- Ouizzes
- Tests
- Homework
- Group assignments
- Projects

23. Find the angle between two	rotation images of
vectors.	figures.
24. Determine whether two vectors are parallel or orthogonal.	24. Showing how reflections are related to other isometrics.
25. Latitudes, longitudes, and bearings.	25. Identifying glide reflections.
	26. Identifying types of symmetry in figures.
	27. Locating dilation images of figures.
	28. Describing vector, using ordered pair notation
	29. Describing the magnitude and direction of vectors.
	30. Solving problems that involve vector addition and subtraction.
	31. Multiplying vectors by a number (scalar product).
	32. Defining and using unit vector and position vector.
	33. Determining a vector from its direction and magnitude of vector.
	34. Working with objects in

static equilibrium.	
35. Finding the angle between two vectors.	
36. Determining whether two vectors are parallel or orthogonal.	
26. Defining and finding Latitudes, longitudes, and bearings and distance along lines of latitudes, longitudes, and bearings.	
27. Latitudes, longitudes, and bearings.	

**SEMESTER: ONE** 

PERIOD: <u>I</u>

**GRADE:** <u>12</u>

UNIT/TOPIC: ARITHMETIC AND ALGEBRA REVIEW

**GENERAL OBJECTIVES:** Students will sharpen their skills at manipulating numeric and algebraic expressions. Students will concentrate on concepts rather than computations when studying arithmetic and algebra.

**SPECIFIC OBJECTIVES:** Upon completion of this Unit, students will be able to:

- 1. Discuss and work with the system of real numbers and their properties (reflexive, symmetric, transitive, substitution, commutative, associative, distributive, additive and multiplicative identities, additive and multiplicative inverse, etc.)
- 2. Solve and graph inequalities.
- 3. Evaluate numerical expressions.
- 4. Define and perform operation on functions,

- Define and perform operations on polynomials.
  Factor polynomials.
  Define and solve equations and inequalities. 5.
- 6.
- 7.

OUTCOMES		CONTENTS		ACTIVITIES		MATERIALS/ RESOURCES		EVALUATION
Students will become	1.	The real Number System	Ac	tivities involving:	1	A. Primary Text	E	ssential tasks students
problem solvers			1.	Properties of Addition	1	Mathematics for Senior High		ould be able to do:
	2.	<b>Exponents Radical</b>		and Multiplication	1	School (Books 1,2 & 3)	1.	Discuss and work with the
Students will become		(surd) and Scientific			(	(Pearson)		system of real numbers
informed decision makers.		Notation	2.	Properties of Quotients				and their properties
						B. Secondary Texts		(reflexive, symmetric,
Students will become lifelong	3.	Algebraic Expressions,	3.	The order Relation and	1	E.B. Dogbe, K.A. Morrison &		transitive, substitution,
learners.		Polynomials, and		Arithmetic	]	Brian Speed, Senior Secondary		commutative, associative,
		Factoring Rational and			(	Guide – (Core) Mathematics		distributive, additive and
		other Fractional	4.	Properties of the Absolute	(	(Sedco, 1995)		multiplicative identities,
		Expressions		value				additive and multiplicative
			5.	Distance between Two	I	Laurie E. Bass, Et al. <i>Geometry:</i>		inverse, etc.)
	4.	Composition of		Points on the Real	7	Tools for a Changing World		
		Algebraic Expressions		Number Line	(	(Prentice Hall 1998).	2.	Solve and graph
								inequalities.
	5.	Solving Equations	6.	Properties of Integral of	9	<u>C. Other</u>		
				Exponents	]	Resources/Supplementary	3.	Evaluate numerical
	6.	Linear and Absolute			]	<u>Readings</u>		expressions.
		Value inequalities:	7.	Properties of Radicals	1	Mathematical Association of		
		Interval and set builder			(	Ghana, <i>Effective Elective</i>	4.	Define and perform
		Notations	8.	Procedure for simplifying	1	Mathematics for (Books 1,2 &		operation on functions,
				Expressions involving	1	3) (Pearson)		
	7.	Quadratic and Other		Radicals	•	• Graph paper,	5.	Define and perform
		Inequalities			•	• Geo-board,		operations on
			9.	Converting from Standard		<ul> <li>Colored pencils,</li> </ul>		polynomials.
				to Scientific Notation and		• Tape.		
				Vice Versa		Protractor rules	6.	Factor polynomials.
						• Compass,		
			10	. Products of Polynomials		<ul><li>Tracing papers</li></ul>	7.	Define and solve
					]	Fracing pupers		equations and inequalities.
			11	. Procedure for finding a				

least Common	Other essential evaluation
Denominator	tools:
12. Composition of s(y) with r(x)  13. Factoring	<ul><li> Quizzes</li><li> Test</li><li> Homework</li><li> Graded assignments</li><li> Project</li></ul>
14. Completing the square	<ul><li> Individual</li><li> Assessment</li><li> Group assessment</li></ul>
15. The Quadratic Equation Formula	Informal assessment
16. Making decision from the discriminate 17. Solving Quadratic and other inequalities	

SEMESTER: ONE

PERIOD: II

**GRADE: 12** 

#### UNIT/TOPIC: EXPONENTIAL & LOGARITHMIC FUNCTIONS, AND CARTESIAN COORDINATES

**GENERAL OBJECTIVES:** Students will use coordinate to plane to visualize the relationship between two variables and computations when studying composition of functions. Their applications to real-life situations (such as profits from sales of two different items, etc.)

#### **SPECIFIC OBJECTIVES**: Upon completion of this Unit, students will be able to:

- 1. Evaluate exponential functions.
- 2. Graph exponential functions.
- 3. Solve application problems involving exponential functions (doubling time growth model, radioactive decay, compound interest).
- 4. Distinguish between algebraic and exponential functions.
- 5. Define base e.
- 6. Graph exponential functions with base e.
- 7. Review growth and decay with base e.
- 8. Solve application problems involving interest compounding continuously.
- 9. Change expressions to logarithmic expressions, and conversely.
- 10. Evaluate logarithmic functions.
- 11. Evaluate common and natural logarithms using calculator.
- 12. Graph logarithmic functions.
- 13. Interpret logarithmic functions as inverse of exponential functions.
- 14. Determine domain restrictions on logarithmic functions.
- 15. Express a single logarithm as a sum or difference of logarithms.
- 16. Express a logarithmic expression as a single logarithm.
- 17. Evaluate logarithms of a general base (other than base 10 or e).
- 18. Derive the seven basic logarithmic properties.
- 19. Derive the change-of-base formula.
- 20. Solve exponential and logarithmic equations.
- 21. Solve application problems using exponential and logarithmic equations.
- 22. Demonstrate how exponential and logarithmic equations are solved using properties of one-to-one functions and inverses.
- 23. Plot points in the Cartesian plane. Use distance and midpoint formulas to solve problems

24. Find the slope find a equation of a line: a. given two points; b. given a point and a slope; c. given a slope and the y intercept.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will become problem solvers	1. Evaluation exponential functions.	Evaluating exponential functions.	A. Primary Text  Mathematics for Senior High School (Books 1,2 & 3)	Essential tasks students should be able to do: 1. Graph exponential
Students will become informed makers students will become	2. Graph of exponential functions.	2. Graphing exponential functions.	(Pearson)	functions.
will become	3. Solution of application problems involving exponential functions (doubling time growth model, radioactive decay, compound interest).	3. Solving application problems involving exponential functions (doubling time growth model, radioactive decay, compound interest).	B. Secondary Texts E.B. Dogbe, K.A. Morrison & Brian Speed, Senior Secondary Guide – (Core) Mathematics (Sedco, 1995)  Laurie E. Bass, Et al. Geometry: Tools for a Changing World	<ul><li>2. Solve application problems involving exponential functions (doubling time growth model, radioactive decay, compound interest).</li><li>3. Distinguish between</li></ul>
	4. Distinguish between algebraic and exponential functions.	4. Distinguishing between algebraic and exponential functions.	(Prentice Hall 1998).  C. Other	algebraic and exponential functions.
	5. Definition of base e.	5. Defining base e.	Resources/Supplementary Readings Mathematical Association of	<ul><li>4. Define base e.</li><li>5. Graph exponential</li></ul>
	6. Graph of exponential functions with base e.	6. Graphing exponential functions with base e.	Ghana, Effective Elective  Mathematics for (Books 1,2 &	functions with base e.
	7. Review of growth and decay with base e.	7. Reviewing growth and decay with base e.	<ul><li>3) (Pearson)</li><li>Graph paper,</li><li>Geo-board,</li></ul>	<ul><li>6. Review growth and decay with base e.</li><li>7. Solve application</li></ul>
	8. Solution of application problems involving interest compounding continuously.	<ul><li>8. Solving application problems involving interest compounding continuously.</li><li>9. Changing expressions to</li></ul>	<ul><li>Colored pencils,</li><li>Tape.</li><li>Protractor rules</li><li>Compass,</li><li>Tracing papers</li></ul>	problems involving interest compounding continuously.  8. Change expressions to
	9. Change of exponential expressions to logarithmic expressions,	logarithmic expressions, and conversely.  10. Evaluating logarithmic		logarithmic expressions, and conversely.

1 1	C	0 0 1 4 1 14 1
and conversely.	functions.	9. Evaluate logarithmic
10 73 1 4 6		functions.
10. Evaluation of	11. Evaluating common and	
logarithmic functions.	natural logarithms using	10. Evaluate common and
	calculator.	natural logarithms using
11. Evaluation of common		calculator.
and natural logarithms	12. Graphing logarithmic	
using calculator.	functions.	11. Graph logarithmic
		functions.
12. Graph of logarithmic	13. Interpreting logarithmic	
functions.	functions as inverse of	Other essential evaluation
	exponential functions.	tools:
13. Interpretation of		• Quizzes
logarithmic functions as	14. Determining domain	• Test
inverse of exponential	restrictions on logarithmic	Homework
functions.	functions.	Graded Assignments
		Project
14. Domain restrictions on	15. Expressing a single	Individual
logarithmic functions.	logarithm as a sum or	Assessment
	difference of logarithms.	
15. Expression of a single		<ul><li>Group Assessment</li><li>8. Informal Assessment</li></ul>
logarithm as a sum or	16. Expressing a logarithmic	o. Illiorinai Assessment
difference of logarithms.	expression as a single	
	logarithm.	
16. Expression of a		
logarithmic expression as	17. Evaluating logarithms of a	
a single logarithm.	general base (other than	
	base 10 or e).	
17. Evaluation of logarithms	,	
of a general base (other	18. Deriving the seven basic	
than base 10 or	logarithmic properties.	
e).Derivation and use of	Property Property	
the seven basic	19. Deriving the change-of-	
logarithmic properties.	base formula.	
Togulium properties.	,	
18. Derivation and use of the	20. Solving exponential and	
change-of-base formula.	logarithmic equations.	
enunge of Superformula.	-ogarianino equations.	

·		
19. Solution of exponential and logarithmic equations.	21. Solving application problems using exponential and logarithmic equations.	
20. Solution of application		
problems using	22. Investigating how	
exponential and	exponential and	
logarithmic equations.	logarithmic equations are	
1.00	solved using properties of	
21. Investigation of how	one-to-one functions and	
exponential and	inverses.	
logarithmic equations	m verses.	
are solved using	23. Plotting points in the	
properties of one-to-one	Cartesian plane. Use	
functions and inverses.	distance and midpoint	
Tunctions and myerses.	formulas to solve	
22. Points in the Cartesian	problems	
plane.	problems	
plane.	24. Finding the slope find a	
23. Distance and midpoint	equation of a line: a. given	
formulas in solving	two points; b. given a	
problems	point and a slope; c. given	
problems	a slope and the y intercept.	
24. The slope and equation	a stope and the y intercept.	
of a line: a. given two		
points; b. given a point		
and a slope; c. given a		
slope and the y intercept.		

**SEMESTER: ONE** 

PERIOD: III

**GRADE:** <u>12</u>

UNIT/TOPIC: SYSTEMS OF EQUATIONS AND INEQUALITIES

**GENERAL OBJECTIVES:** Students will use coordinate to plane to visualize the relationship between two variables and computations when studying systems of equations and inequalities and their applications to everyday issues.

#### **SPECIFIC OBJECTIVES:** Upon completion of this unit, students will be able to:

- 1. Solve and graph systems of linear equations in two variables algebraically (substitution and elimination) or graphically.
- 2. Solve applications involving systems of linear equations.
- 3. Discuss the fact that a system of linear equations has either one solution, no solution, or infinitely many solutions.
- 4. Discuss the fact that two lines intersect at one point, no points(parallel lines), or infinitely many points (same line).
- 5. Solve and graph systems of three (or more) equations using matrices or determinants.ve application problems using systems of multivariable linear equations.
- 6. Identify three types of solutions: one solution, no solution, or infinitely many solutions.
- 7. Decompose rational expressions into sums of partial fractions when the denominator contains: distinct linear factors; repeated linear factors; distinct irreducible quadratic factors; repeated irreducible quadratic factors.
- 8. Associate between partial fraction and systems of linear equations.
- 9. Solve a system of nonlinear equations, using elimination or substitution method (and eliminate extraneous solutions).
- 10. Graph a linear inequality in two variables.
- 11. Graph a nonlinear inequality in two variables.
- 12. Graph a system of inequalities in two variables.
- 13. Interpret the difference between solid lines and dashed lines, overlapping shaded region as a solution.
- 14. Write an objective function that represents a quantity to be minimized or maximized.
- 15. Use inequalities to describe constraints.
- 16. Solve optimization problem, which combine minimizing or maximizing a function subject to constraints, using linear programming.
- 17. Interpret the vertices as maxima or minima.
- 18. Write the augmented matrix of a system of linear equations and conversely.
- 19. Perform row operations on a matrix.
- 20. Solve and graph systems of inequalities.
- 21. Evaluates two by two determine.
- 22. Use Cramer's rule to sole systems in two or three variables.

### 23. Apply or use properties of determine in solving real-life problems.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will use coordinate	1. Solutions and graphs of	1. Solving and graphing	A. Primary Text	<b>Essential tasks students</b>
to plane to visualize the	systems of linear	systems of linear	Mathematics for Senior High	should be able to do:
relationship between two	equations in two	equations in two variables	School (Books 1,2 & 3)	1. Solve and graph
variables and computations	variables algebraically	algebraically (substitution	(Pearson)	systems of linear
when studying systems of	(substitution and	and elimination) or		equations in two
equations and	elimination) or	graphically.	<b>B. Secondary Texts</b>	variables algebraically
inequalities and their	graphically.		E.B. Dogbe, K.A. Morrison &	(substitution and
applications to everyday		2. Solving applications	Brian Speed, Senior Secondary	elimination) or
issues.	2. Solutions of applications	involving systems of	Guide – (Core) Mathematics	graphically.
	involving systems of	linear equations.	(Sedco, 1995)	
	linear equations.	_		2. Solve applications
	_	3. Discussing the fact that a	Laurie E. Bass, Et al. Geometry:	involving systems of
	3. Discussion regarding the	system of linear equations	Tools for a Changing World	linear equations.
	fact that a system of	has either one solution, no	(Prentice Hall 1998).	_
	linear equations has	solution, or infinitely		3. Discuss the fact that a
	either one solution, no	many solutions.	C. Other	system of linear
	solution, or infinitely		Resources/Supplementary	equations has either
	many solutions.	4. Investigating the fact that	Readings	one solution, no
		two lines intersect at one	Mathematical Association of	solution, or infinitely
	4. Discussion of the fact	point, no points (parallel	Ghana, Effective Elective	many solutions.
	that two lines intersect at	lines), or infinitely many	Mathematics for (Books 1,2 &	·
	one point, no points	points (same line).	3) (Pearson)	4. Discuss the fact that
	(parallel lines), or		• Graph paper,	two lines intersect at
	infinitely many points	5. Solving and graphing	• Geo-board,	one point, no
	(same line).	systems of three (or more)	<ul> <li>Colored pencils,</li> </ul>	points(parallel lines),
		equations using matrices	• Tape.	or infinitely many
	5. Solution and graph of	or determinants.ve	<ul><li>Protractor rules</li></ul>	points (same line).
	systems of three (or	application problems	<ul><li>Compass,</li></ul>	
	more) equations using	using systems of	<ul><li> Compass,</li><li> Tracing papers</li></ul>	5. Solve and graph
	matrices or	multivariable linear	Tracing papers	systems of three (or
	determinants.ve	equations.		more) equations using
	application problems	_		matrices or
	using systems of	6. Identifying three types of		determinants.ve

multivariable linear
equations.

- 6. Identification of three types of solutions: one solution, no solution, or infinitely many solutions.
- 7. Decomposition of rational expressions into sums of partial fractions when the denominator contains: distinct linear factors; repeated linear factors; distinct irreducible quadratic factors; repeated irreducible quadratic factors.
- 8. Association between partial fraction and systems of linear equations.
- 9. Solution of a system of nonlinear equations, using elimination or substitution method (and eliminate extraneous solutions).
- 10. Graph of a linear inequality in two variables.
- 11. Graph of a nonlinear

- solutions: one solution, no solution, or infinitely many solutions.
- 7. Decomposing rational expressions into sums of partial fractions when the denominator contains: distinct linear factors; repeated linear factors; distinct irreducible quadratic factors; repeated irreducible quadratic factors.
- 8. Associating between partial fraction and systems of linear equations.
- 9. Solving a system of nonlinear equations, using elimination or substitution method (and eliminate extraneous solutions).
- 10. Graphing a linear inequality in two variables.
- 11. Graphing a nonlinear inequality in two variables.
- 12. Graphing a system of inequalities in two variables.

- application problems using systems of multivariable linear equations.
- 6. Identify three types of solutions: one solution, no solution, or infinitely many solutions.
- 7. Decompose rational expressions into sums of partial fractions when the denominator contains: distinct linear factors; repeated linear factors; distinct irreducible quadratic factors; repeated irreducible quadratic factors.
- 8. Associate between partial fraction and systems of linear equations.
- 9. Solve a system of nonlinear equations, using elimination or substitution method (and eliminate extraneous solutions).
- 10. Graph a linear inequality in two

inequality in two	13. Interpreting the difference	variables.
variables.  12. Graph of a system of inequalities in two	between solid lines and dashed lines, overlapping shaded region as a solution.	Other essential evaluation tools:  • Quizzes
variables.  13. Interpretation of the difference between solid lines and dashed lines, overlapping shaded	14. Writing an objective function that represents a quantity to be minimized or maximized.	<ul> <li>Test</li> <li>Homework</li> <li>Graded Assignments</li> <li>Project</li> <li>Individual</li> </ul>
region as a solution.  14. Objective function that	15. Using inequalities to describe constraints.	<ul><li>Assessment</li><li>Group assessment</li><li>Informal assessment</li></ul>
represents a quantity to be minimized or maximized.	16. Solving optimization problem, which combine minimizing or maximizing a function subject to	
15. Inequalities that describe constraints.	constraints, using linear programming.	
16. Solution optimization problem, which combine minimizing or maximizing a function subject to constraints, using linear programming.	<ul><li>17. Interpreting the vertices as maxima or minima.</li><li>18. Writing the augmented matrix of a system of linear equations and conversely.</li></ul>	
17. Vertices as maxima or minima.	19. Performing row operations on a matrix.	
18. Augmented matrix of a system of linear equations and conversely.	<ul><li>20. Solving and graphing systems of inequalities.</li><li>21. Evaluating two by two determine.</li></ul>	

<ul> <li>19. Row operations on a matrix.</li> <li>20. Solutions and graphs systems of inequalities.</li> <li>21. Evaluation of two by two determines.</li> <li>22. Cramer's rule to sole systems in two or three variables.</li> <li>23. Properties of determinants in solving real-life problems.</li> </ul>	<ul><li>22. Using Cramer's rule to sole systems in two or three variables.</li><li>23. Applying or use properties of determine in solving real-life problems.</li></ul>		
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PERIOD: IV

**GRADE: 12** 

UNIT/TOPIC: THE COMPLEX NUMBER SYSTEM, SEQUENCES, SERIES, AND THE BINOMIAL THEOREM

**GENERAL OBJECTIVES:** Students will use coordinate to plane to visualize the relationship between two variables and computations when studying USE THE COMPLEX plane to illustrate relations between complex numbers, such as fractal geometry.

**SPECIFIC OBJECTIVES:** Upon completion of this period, students will be able to:

- 1. State the arithmetic of complex numbers
- 2. State the conjugate of a complex number and complex division
- 3. Compute complex solution to quadratic equations
- 4. State the trigonometric form of a complex number

- 5. Demonstrate De Moivre's Roots of a Complex Number
- 6. Solve quadratic equations with negative discriminates
- 7. Define a sequence and find a sequence given the general term.
- 8. Look for a pattern in a sequence and find the general term.
- 9. Use factorial notation'.
- 10. Use recursive formulas.
- 11. Use summation (sigma) notation to represent a series.
- 12. Find the sum of a series.
- 13. Differentiate between a sequence and a series.
- 14. Recognize a geometric sequence.
- 15. Find the general, nth term, of a geometric sequence.
- 16. Compute the sum of a finite geometric series.
- 17. Find the sum of an infinite geometric series, if it exists.
- 18. Use geometric sequences and series to model real-world problems.
- 19. Differentiate between a geometric sequence and a geometric series.
- 20. Differentiate between an arithmetic sequence and a geometric sequence.
- 21. Identify the steps required to prove mathematical induction.

OUTCOMES		CONTENTS		ACTIVITIES	MATERIALS/		EVALUATION
					RESOURCES		
Students will become	1.	The Arithmetic of	1.	The Arithmetic of	A. Primary Text	$\mathbf{E}_{i}$	ssential tasks students
problem solvers.		Complex Numbers		Complex Numbers	Mathematics for Senior High	sh	ould be able to do:
		•		•	School (Books 1,2 & 3)	1.	State the arithmetic of
Students will become	2.	The Conjugate of a	2.	The Conjugate of a	(Pearson)		complex numbers
informed decision makers.		Complex Number and		Complex Number and		2.	State the conjugate of a
		Complex Division		Complex Division	B. Secondary Texts		complex number and
Students will become life					E.B. Dogbe, K.A. Morrison &		complex division
long learner.	3.	<b>Complex Solution to</b>	3.	Complex Solution to	Brian Speed, Senior Secondary	3.	Compute complex solution
		<b>Quadratic Equations</b>		Quadratic Equations	Guide – (Core) Mathematics		to quadratic equations
					(Sedco, 1995)	4.	State the trigonometric
	4.	The Trigonometric form	4.	The Trigonometric form			form of a complex number
		of a Complex Number		of a Complex Number	Laurie E. Bass, Et al. <i>Geometry:</i>	5.	Demonstrate De Moivre's
					Tools for a Changing World		Roots of a Complex
	5.	De Moivre's Roots of a	5.	De Moivre's Roots of a	(Prentice Hall 1998).		Number
		Complex Number		Complex Number		6.	Solve quadratic equations
					C. Other		with negative
	6.	<b>Quadratic equations</b>	6.	Solve quadratic equations	Resources/Supplementary		discriminates

with negative	
discriminates	

- 7. Definition of a sequence and calculation of a sequence given the general term.
- 8. Patterns in a sequence and find the general term.
- 9. Factorial notation'.
- 10. Recursive formulas.
- 11. Summation (sigma) notation to represent a series.
- 12. The sum of a series.
- 13. The difference between a sequence and a series.
- 14. Recognize a geometric sequence.
- 15. Find the general, nth term, of a geometric sequence.
- 16. Compute the sum of a finite geometric series.
- 17. Find the sum of an infinite geometric series, if it exists.

### with negative discriminates

- 7. Define a sequence and find a sequence given the general term.
- 8. Look for a pattern in a sequence and find the general term.
- 9. Use factorial notation'.
- 10. Use recursive formulas.
- 11. Use summation (sigma) notation to represent a series.
- 12. Find the sum of a series.
- 13. Differentiate between a sequence and a series.
- 14. Recognize a geometric sequence.
- 15. Find the general, nth term, of a geometric sequence.
- 16. Compute the sum of a finite geometric series.
- 17. Find the sum of an infinite geometric series, if it exists.

#### Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- 7. Define a sequence and find a sequence given the general term.
- 8. Look for a pattern in a sequence and find the general term.
- 9. Use factorial notation'.
- 10. Use recursive formulas.

### Other essential evaluation tools:

- Ouizzes
- Test
- Homework
- Graded Assignments
- Project
- Individual
- Assessment
- Group Assessment
- 8. Informal Assessment

	10 II	
10.77	18. Use geometric sequences	
18. Use geometric sequences	and series to model real-	
and series to model real-	world problems.	
world problems.		
	19. Differentiate between a	
19. Differentiate between a	geometric sequence and a	
geometric sequence and	geometric series.	
a geometric series.		
3	20. Differentiate between an	
20. Differentiate between an	arithmetic sequence and a	
arithmetic sequence and	geometric sequence.	
a geometric sequence.	8	
a goomowie sequence.	21. Identify the steps required	
21. Identify the steps	to prove mathematical	
required to prove	induction.	
mathematical induction.	madetion.	
mathematical muticum.	22. Prove mathematical	
22. Prove mathematical		
	statements using	
statements using	mathematical induction.	
mathematical induction.		
	23. Evaluate a binomial	
23. Evaluate a binomial	coefficient using the	
coefficient using the	binomial theorem or	
binomial theorem or	Pascal's triangle.	
Pascal's triangle.		
	24. Expand a binomial raised	
24. Expand a binomial	to a power.	
raised to a power.		
	25. Find a specific term of a	
25. Find a specific term of a	binomial expansion.	
binomial expansion.	_	
_	26. Recognize patterns in a	
26. Recognize patterns in a	binomial expansion.	
binomial expansion.		
•	27. Write the first several	
27. Write the first several	terms of sequence	
terms of sequence	1	

	28. Write terms defined by a
28. Write terms defined by a	recursive formula
recursive formula	
	29. Solve annuity and
29. Solve annuity and	amortization problems.
amortization problems.	
	30. Find the Partial Sums of a
30. Find the Partial Sums of	Sequence
a Sequence	
	31. Apply the infinite Series an
31. Apply the infinite Series	introduction to Limits.
an introduction to	
Limits.	

PERIOD: <u>V</u>

**GRADE:** <u>12</u>

UNIT/TOPIC: PROBABILITY AND STATISTICS

**GENERAL OBJECTIVES:** Students will sharpen their skills in probability and statistics to answer questions about real-life estimations. Students will concentrate on concepts rather than computations.

**SPECIFIC OBJECTIVES**: Upon completion of this unit, students will be able to:

- 1. Use the fundamental counting principle to solve counting problems.
- 2. Compute factorials, permutations, and combinations.
- 3. Differentiate between permutations and combinations.
- 4. Review the basic concepts of sets, Venn, tree diagrams, and contingency tables.
- 5. Define a sample space and events of an experiment
- 6. Define and find the probability of an event, complementary events, mutually exclusive events, independent events, and conditional events.
- 7. Find the odds of an event.
- 8. Calculate the expected value.

- 9. Collect and display data using frequency tables, cumulative frequency histogram, cumulative percentage polygon or ogive charts, stem plot, etc.
- 10. Classified sample and pop data as measures of central tendency (mean/averages, mode, median) and
- 11. Compute measures of variability (range, variance, standard deviation) and apply then to problem solving
- 12. Compute percentiles, quartiles, the five numbers summery and box plot, inter quartile range, mid-hinge, mid-range, etc.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/ RESOURCES	EVALUATION
Students will become problem solvers using probability and statistics	1. The fundamental counting principle and applications.	Using the fundamental counting principle to solve counting problems.	A. Primary Text  Mathematics for Senior High School (Books 1,2 & 3) (Pearson)	Essential tasks students should be able to do:  1. Use the fundamental counting principle to
Students will become informed decision makers  1. Students will become	2. Factorials, permutations, and combinations.	2. Computing factorials, permutations, and combinations.	B. Secondary Texts E.B. Dogbe, K.A. Morrison & Brian Speed, Senior Secondary	solve counting problems.  2. Compute factorials, permutations, and
lifelong learners	3. Differentiation between permutations and combinations.	3. Differentiating between permutations and combinations.	Guide – (Core) Mathematics (Sedco, 1995)  Laurie E. Bass, Et al. Geometry:	combinations.  3. Differentiate between permutations and combinations.
	4. Review of the basic concepts of sets, Venn, tree diagrams, and contingency tables.	4. Reviewing the basic concepts of sets, Venn, tree diagrams, and contingency tables.	Tools for a Changing World (Prentice Hall 1998).  C. Other Resources/Supplementary	<ul> <li>4. Review the basic concepts of sets, Venn, tree diagrams, and contingency tables.</li> <li>5. Define a sample space</li> </ul>
	5. Sample space and events of an experiment.	5. Defining a sample space and events of an experiment	Readings  Mathematical Association of Ghana, Effective Elective Mathematics for (Books 1,2 &	and events of an experiment 6. Define and find the probability of an event,
	<ul> <li>6. The probability of an event, complementary events, mutually exclusive events, independent events, and conditional events.</li> <li>7. The odds of an event.</li> </ul>	<ul><li>6. Defining and finding the probability of an event, complementary events, mutually exclusive events, independent events, and conditional events.</li><li>7. Finding the odds of an event.</li></ul>	<ul> <li>3) (Pearson)</li> <li>Graph paper,</li> <li>Geo-board,</li> <li>Colored pencils,</li> <li>Tape.</li> <li>Protractor rules</li> <li>Compass,</li> <li>Tracing papers</li> </ul>	complementary events, mutually exclusive events, independent events, and conditional events.  7. Find the odds of an event.  8. Calculate the expected value.

- 8. Expected values.
- 9. Collect and display data using frequency tables, cumulative frequency histogram, cumulative percentage polygon or ogive charts, stem plot, etc.
- 10. Sample and population data as measures of central tendency (mean/averages, mode, median).
- 11. Measures of variability (range, variance, standard deviation) and apply then to problem solving.
- 12. Percentiles, quartiles, the five numbers summery and box plot, inter quartile range, mid-hinge, mid-range, etc.

- 8. Calculating the expected value.
- 9. Collecting and displaying data using frequency tables, cumulative frequency histogram, cumulative percentage polygon or ogive charts, stem plot, etc.
- 10. Classifying sample and population data as measures of central tendency (mean/averages, mode, median) and
- 11. Computing measures of variability (range, variance, standard deviation) and apply then to problem solving
- 12. Computing percentiles, quartiles, the five numbers summery and box plot, inter quartile range, midhinge, mid-range, etc.

- 9. Collect and display data using frequency tables, cumulative frequency histogram, cumulative percentage polygon or ogive charts, stem plot, etc.
- 10. Classified sample and pop data as measures of central tendency (mean/averages, mode, median) and
- 11. Compute measures of variability (range, variance, standard deviation) and apply then to problem solving
- 12. Compute percentiles, quartiles, the five numbers summery and box plot, inter quartile range, mid-hinge, midrange, etc.

## Other essential evaluation tools:

- Quizzes
- Test
- Homework
- Graded Assignments
- Project
- Individual
- Assessment
- Group Assessment
- 8. Informal Assessment

PERIOD: VI

**GRADE: 12** 

UNIT/TOPIC: PROBABILITY AND STATISTICS

**UNIT: ANALYTIC GEOMETRY (REVIEW)** 

**GENERAL OBJECTIVES**: Students will sharpen their skills at manipulating algebraic expressions. Students will concentrate on concepts rather than computations when

studying Cartesian geometry use the conics model to solve real-life problems.

#### **SPECIFIC OBJECTIVES:** Upon completion of this Unit, students will be able to:

- 1. Calculate and interpret the slope of a line; Find and graph the equation of a line given:
  - A. Two points, B. Point and the slope C. Slope and y-intercept; D. General form, E. Parallel and perpendicular forms, Distance and midpoint formula.
- 2. Define, and discuss and work with circle and its parts (center, radius, diameter, and circumference) with the center at the origin or at (h, k) and solve applied problems involving circles.
- 3. Define discuss and work with the parabola and its part (vertex, locus, axis, and directrix with the vertex at (0,0) or (h, k) and solve applied problems involving parabolas.
- 4. Define, discuss and work with the ellipse and its parts (center, verticals and foci, major and minor axes and eccentricity) with the center at (0,0) or (h, k) and solve applied problems involving ellipse.
- 5. Define, discuss, and work with the hyperbola and its parts (center, vertices, foci, transverse and conjugate axes and their length, eccentricity, equations of asymptotes with center at (0,0) or (h, k) and solve applied problems involving hyperbolas.

OUTCOMES	CONTENTS	ACTIVITIES	MATERIALS/	EVALUATION
			RESOURCES	
Students will become	1. Graph and write an	Finding graphing and	A. Primary Text	1. Essential tasks students
problem solvers.	equation of lines, given	interpreting the slope of a line	Mathematics for Senior High	should be able to do:
	a) a point and slope b)	given two points.	School (Books 1,2 & 3)	1. Calculate and interpret the
Students will become	vertical or horizontal c)		(Pearson)	slope of a line; Find and
informed decision makers.	slope and y-intercept d)	1. Find and graphing an		graph the equation of a
	general former x- and y-	equation of a line, given:	B. Secondary Texts	line given:
Students will become	intercepts f) parallel	a) a point and a slope	E.B. Dogbe, K.A. Morrison &	a) Two points

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- lines g) perpendicular lines.
- 2. The distance and midpoint formulas of graph.
- 3. Definition and discussion of a circle, center at (0,0) or (h, k) radius, equation, diameter, and graph.
- 4. Definition and discussion of a parabolas equation and its parts vertex at (0,0) or (h, k) vertical or horizontal axis forms and directrix of equations, graph, and applications.
- 5. Definition and discussion of an ellipse, its equation and parts (center at (0,0) or (h, k) vertices, foci, lengths of major and minor axis) graph and its applications to real life situations.
- 6. Definition and discussions of a hyperbola, its equation and parts (center at (0,

- b) vertical or horizontal
- c) slope and y-intercept
- d) x- and y- intercept
- e) parallel
- f) Perpendicular lines.
- 2. Finding and graphing the distance and coordinates of midpoint.
- 3. Writing the standard equation, calculating the area, circumference he area, circumference, radius, diameter, center, intercepts and graphing a circle
- 4. Working and graphing a parabola with vertex at (0,) or (h, k), foci, directrix, and solving applied problems involving parabolas.
- 5. Working and graphing a hyperbola, its equations, and part (center at (0,0) or (h, k), vertices, foci, lengths at axes. asymptotes and solving problems involving hyperbolas.

Brian Speed, Senior Secondary Guide – (Core) Mathematics (Sedco, 1995)

Laurie E. Bass, Et al. *Geometry: Tools for a Changing World* (Prentice Hall 1998).

# C. Other Resources/Supplementary Readings

Mathematical Association of Ghana, *Effective Elective Mathematics for (Books 1,2 & 3)* (Pearson)

- Graph paper,
- Geo-board,
- Colored pencils,
- Tape.
- Protractor rules
- Compass,
- Tracing papers

- b) Point and the slope
- c) Slope and y-intercept
- d) General form
- e) Parallel and perpendicular forms.
  Distance and midpoint formula.
- 2. Define, and discuss and work with circle and its parts (center, radius, diameter, and circumference) with the center at the origin or at (h, k) and solve applied problems involving circles.
- 3. Define discuss and work with the parabola and its part (vertex, locus, axis, and directrix with the vertex at (0,0) or (h, k) and solve applied problems involving parabolas.
- 4. Define, discuss and work with the ellipse and its parts (center, verticals and foci, major and minor axes and eccentricity) with the center at (0,0) or (h, k) and solve applied problems involving ellipse.
- 5. Define, discuss, and work with the hyperbola and its parts (center, vertices, foci, transverse and conjugate axes and their length, eccentricity, equations of

0) or (h, k), vertices, foci, lengths of transverse and	$ \begin{array}{c c} (0,0) \\ \text{appli} \end{array} $	or (h, k) and solve ed problems
conjugate axes,		lving hyperbolas. ssential evaluation
asymptotes), graph, and solving applied	tools:	ssenuai evaluation
problems involving	• Quiz	zes
hyperbolas.	• Test	
	• Hom	ework
	• Grad	ed Assignments
	• Proje	ect
	• Indiv	ridual
	• Asse	ssment
		ew of WAEC
		n. Papers
	• 8. I	nformal Assessment

