



**REPUBLIC OF KENYA  
MINISTRY OF EDUCATION**

## **JUNIOR SECONDARY SCHOOL CURRICULUM DESIGN**

### **MATHEMATICS GRADE 9**



**KENYA INSTITUTE OF CURRICULUM DEVELOPMENT**

First Published in 2023

All rights reserved. No part of this book may be reproduced, stored in a retrieval system or transcribed, in any form or by any means, electronic, mechanical, photocopy, recording or otherwise, without the prior written permission of the publisher.

**ISBN: 978-9914-43-431-6**

Published and printed by Kenya Institute of Curriculum Development

## **FOREWORD**

The Government of Kenya is committed to ensuring that policy objectives for Education, Training and Research meet the aspirations of the Kenya Constitution 2010, the Kenya Vision 2030, National Curriculum Policy 2019, the United Nations Sustainable Development Goals (SDGs) and the Regional and Global conventions to which Kenya is a signatory. Towards achieving the mission of Basic Education, the Ministry of Education (MoE) has successfully and progressively rolled out the implementation of the Competency Based Curriculum (CBC) at Pre-Primary and Primary School levels. The roll out of Junior Secondary School (Grade 7-9) will subsequently follow as from 2023-2025.

The Grade 9 curriculum designs build on competencies attained by learners at the end of Grade 8. Further, they provide opportunities for learners to continue exploring and nurturing their potentials as they prepare to transit to Senior Secondary School.

The curriculum designs present National Goals of Education, essence statements, general and specific expected learning outcomes for the learning areas (subjects) as well as strands and sub strands. The designs also outline suggested learning experiences, key inquiry questions, core competencies, Pertinent and Contemporary Issues (PCIs), values, Community Service Learning (CSL) activities and assessment rubric.

It is my hope that all Government agencies and other stakeholders in Education will use the designs to plan for effective and efficient implementation of the CBC.

**HON. EZEKIEL OMBAKI MACHOGU, CBS**  
**CABINET SECRETARY,**  
**MINISTRY OF EDUCATION**

## **PREFACE**

The Ministry of Education (MoE) is implementing the second phase of the curriculum reforms with the national roll out of the Competency Based Curriculum (CBC) having been implemented in 2019. Grade 9 is the final level of the Junior Secondary School (JSS) in the new education structure.

Grade 9 curriculum furthers implementation of the CBC from Grade 8. The main feature of this level is a broad curriculum for the learner to explore talents, interests and abilities before selection of pathways and tracks at the Senior Secondary education level. This is very critical in the realisation of the Vision and Mission of the on-going curriculum reforms as enshrined in the Sessional Paper No. I of 2019 whose title is: *Towards Realizing Quality, Relevant and Inclusive Education and Training for Sustainable Development* in Kenya. The Sessional Paper explains the shift from a Content - Focused Curriculum to a focus on **Nurturing every Learner's potential**.

Therefore, the Grade 9 curriculum designs are intended to enhance the learners' development in the CBC core competencies, namely: Communication and Collaboration, Critical Thinking and Problem Solving, Creativity and Imagination, Citizenship, Digital Literacy, Learning to Learn and Self-efficacy.

The curriculum designs provide suggestions for interactive and differentiated learning experiences linked to the various sub strands and the other aspects of the CBC. The curriculum designs also offer several suggested learning resources and a variety of assessment techniques. It is expected that the designs will guide teachers to effectively facilitate learners to attain the expected learning outcomes for Grade 9 and prepare them for smooth transition to Senior Secondary School. Furthermore, it is my hope that teachers will use the designs to make learning interesting, exciting and enjoyable.

**DR. BELIO KIPSANG', CBS**  
**PRINCIPAL SECRETARY**  
**STATE DEPARTMENT FOR BASIC EDUCATION**  
**MINISTRY OF EDUCATION**

## **ACKNOWLEDGEMENT**

The Kenya Institute of Curriculum Development (KICD) Act Number 4 of 2013 (Revised 2019) mandates the Institute to develop curricula and curriculum support materials for basic and tertiary education and training. The curriculum development process for any level of education involves thorough research, international benchmarking and robust stakeholder engagement. Through a systematic and consultative process, the KICD conceptualised the Competency Based Curriculum (CBC) as captured in the *Basic Education Curriculum Framework (BECF)*, that responds to the demands of the 21<sup>st</sup> Century and the aspirations captured in the Kenya Constitution 2010, the Kenya Vision 2030, East African Community Protocol and the United Nations Sustainable Development Goals (SDGs).

KICD receives its funding from the Government of Kenya to enable the successful achievement of the stipulated mandate and implementation of the Government and Sector (Ministry of Education (MoE) plans. The Institute also receives support from development partners targeting specific programmes. The Grade 9 curriculum designs have been developed with the support of the World Bank through the Kenya Secondary Education Quality Improvement Program (SEQIP) commissioned by the MoE. Therefore, the Institute is very grateful for the support of the Government of Kenya, through the MoE and the development partners for the policy, resource and logistical support. Specifically, special thanks to the Cabinet Secretary MoE and the Principal Secretary – State Department of Early Learning and Basic Education,

We also wish to acknowledge the KICD curriculum developers and other staff, all teachers, educators who took part as panelists; the Semi-Autonomous Government Agencies (SAGAs) and representatives of various stakeholders for their roles in the development of the Grade 9 curriculum designs. In relation to this, we acknowledge the support of the Chief Executive Officers of the Teachers Service Commission (TSC) and the Kenya National Examinations Council (KNEC) for their support in the process of developing these designs.

Finally, we are very grateful to the KICD Council Chairperson Prof. Elishiba Kimani and other members of the Council for very consistent guidance in the process. We assure all teachers, parents and other stakeholders that these curriculum designs will effectively guide the implementation of the CBC at Grade 9 and preparation of learners for transition to Senior Secondary School.

**PROF. CHARLES O. ONG’ONDO, PhD, MBS**  
**DIRECTOR/CHIEF EXECUTIVE OFFICER**  
**KENYA INSTITUTE OF CURRICULUM DEVELOPMENT**

## TABLE OF CONTENTS

FOREWORD .....	i
PREFACE .....	ii
ACKNOWLEDGEMENT .....	iii
LESSON ALLOCATION .....	v
NATIONAL GOALS OF EDUCATION .....	vi
LEVEL LEARNING OUTCOMES FOR MIDDLE SCHOOL .....	viii
ESSENCE STATEMENT .....	viii
SUBJECT GENERAL LEARNING OUTCOMES .....	ix
STRAND 1.0: NUMBERS .....	1
STRAND 2.0: ALGEBRA .....	10
STRAND 3.0: MEASUREMENTS .....	18
STRAND 4.0: GEOMETRY .....	34
STRAND 5.0: DATA HANDLING AND PROBABILITY .....	44
COMMUNITY SERVICE LEARNING PROJECT .....	49
APPENDIX 1: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES .....	53
APPENDIX 2: USE OF ICT TOOLS .....	58

## LESSON ALLOCATION

	<b>Subject</b>	<b>Number of Lessons Per Week (40 minutes per lesson)</b>
1.	English	5
2.	Kiswahili/KSL	4
3.	Mathematics	5
4.	Integrated Science	5
5.	Pre-Technical Studies	4
6.	Social Studies	4
7.	Religious Education (CRE/IRE/HRE)	3
8.	Business Studies	3
9.	Agriculture	3
10.	Physical Education and Sports	2
11.	Optional Subject	3
12.	Optional Subject	3
	<b>Total</b>	<b>44</b>

## NATIONAL GOALS OF EDUCATION

Education in Kenya should:

**i) Foster nationalism and patriotism and promote national unity.**

Kenya's people belong to different communities, races and religions, but these differences need not divide them. They must be able to live and interact as Kenyans. It is a paramount duty of education to help young people acquire this sense of nationhood by removing conflicts and promoting positive attitudes of mutual respect which enable them to live together in harmony and foster patriotism in order to make a positive contribution to the life of the nation.

**ii) Promote the social, economic, technological and industrial needs for national development.**

Education should prepare the youth of the country to play an effective and productive role in the life of the nation.

**a) Social Needs**

Education in Kenya must prepare children for changes in attitudes and relationships which are necessary for the smooth progress of a rapidly developing modern economy. There is bound to be a silent social revolution following in the wake of rapid modernization. Education should assist our youth to adapt to this change.

**b) Economic Needs**

Education in Kenya should produce citizens with the skills, knowledge, expertise and personal qualities that are required to support a growing economy. Kenya is building up a modern and independent economy which is in need of an adequate and relevant domestic workforce.

**c) Technological and Industrial Needs**

Education in Kenya should provide learners with the necessary skills and attitudes for industrial development. Kenya recognizes the rapid industrial and technological changes taking place, especially in the developed world. We can only be part of this development if our education system is deliberately focused on the knowledge, skills and attitudes that will prepare our young people for these changing global trends.

**iii) Promote individual development and self-fulfillment**

Education should provide opportunities for the fullest development of individual talents and personality. It should help children to develop their potential interests and abilities. A vital aspect of individual development is the building of character.

- iv) Promote sound moral and religious values.**  
Education should provide for the development of knowledge, skills and attitudes that will enhance the acquisition of sound moral values and help children to grow up into self-disciplined, self-reliant and integrated citizens.
- v) Promote social equality and responsibility.**  
Education should promote social equality and foster a sense of social responsibility within an education system which provides equal educational opportunities for all. It should give all children varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment.
- vi) Promote respect for and development of Kenya's rich and varied cultures.**  
Education should instill in the youth of Kenya an understanding of past and present cultures and their valid place in contemporary society. Children should be able to blend the best of traditional values with the changing requirements that must follow rapid development in order to build a stable and modern society.
- vii) Promote international consciousness and foster positive attitudes towards other nations.**  
Kenya is part of the international community. It is part of the complicated and interdependent network of peoples and nations. Education should therefore lead the youth of the country to accept membership of this international community with all the obligations and responsibilities, rights and benefits that this membership entails.
- viii. Promote positive attitudes towards good health and environmental protection.**  
Education should inculcate in young people the value of good health in order for them to avoid indulging in activities that will lead to physical or mental ill health. It should foster positive attitudes towards environmental development and conservation. It should lead the youth of Kenya to appreciate the need for a healthy environment.

## **LEVEL LEARNING OUTCOMES FOR MIDDLE SCHOOL**

By end of Middle School, the learner should be able to:

1. Apply literacy, numeracy and logical thinking skills for appropriate self-expression.
2. Communicate effectively, verbally and non-verbally, in diverse contexts.
3. Demonstrate social skills, spiritual and moral values for peaceful co-existence.
4. Explore, manipulate, manage and conserve the environment effectively for learning and sustainable development.
5. Practise relevant hygiene, sanitation and nutrition skills to promote health.
6. Demonstrate ethical behaviour and exhibit good citizenship as a civic responsibility.
7. Appreciate the country's rich and diverse cultural heritage for harmonious co-existence.
8. Manage pertinent and contemporary issues in society effectively.
9. Apply digital literacy skills for communication and learning.

## **ESSENCE STATEMENT**

We live in a world of Mathematics whereby we count, add, subtract, multiply or divide quantities and substances throughout our daily interactions. Mathematics involves understanding numbers and the numerical operations used to develop strategies for mental mathematical problem solving skills, estimation and computational fluency. We live in a world of space, shape and structures. It is impossible to think of a world without Mathematics. It is applied in the economic activities, scientific, social, religious and political worlds. It is therefore imperative that children are taught Mathematics from early years.

In Junior Secondary, Mathematics builds on the competencies acquired by the learner from primary school. It enhances the learner's competencies in mathematical skills as a foundation for Science, Technology, Engineering and Mathematics (STEM) and other pathways at Senior School. Mathematics also prepares the learner to have sufficient skills and competencies for application in solving problems in real life situations. This is in line with vision 2030 and sessional paper number 1 of 2019 which emphasizes on STEM areas.

## **SUBJECT GENERAL LEARNING OUTCOMES**

By the end of the Junior Secondary, the learner should be able to:-

- 1) demonstrate mastery of number concepts by working out problems in day to day life;
- 2) represent and apply algebraic expressions in different ways;
- 3) apply measurement skills to find solutions to problems in a variety of contexts;
- 4) use money and carry out financial transactions in real life situations;
- 5) generate geometrical shapes and describe spatial relationships in different contexts
- 6) collect and organize data to inform and solve problems in real life situations
- 7) develop logical thinking, reasoning, communication and application skills through a mathematical approach to problem solving
- 8) apply mathematical ideas and concepts to other learning areas or subjects and in real life contexts.
- 9) develop confidence and interest in mathematics for further training and enjoyment.

## STRAND 1.0: NUMBERS

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
1.0 Numbers	1.1 Integers (5 lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>a) perform operations on integers in different situations.</li> <li>b) work out combined operations on integers in different situations.</li> <li>c) apply operations on integers to real life situations.</li> <li>d) promote use of integers in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● work out basic operations on integers using number cards and charts.</li> <li>● play games involving numbers and their operations.</li> <li>● carry out combined operations of integers in the correct order</li> <li>● carry out activities involving positive and negative integers such as reading temperature changes in a thermometer and discuss how to record it.</li> <li>● record temperature above zero Degrees Celsius for positive integers, where possible, record temperatures below zero in Degrees Celsius for negative integers.</li> <li>● use IT or other resources such as print to carry out operations on integers.</li> <li>● play creative games that involve integers.</li> </ul>	How do we apply integers in daily activities?
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Critical thinking and problem solving - interpretation and inference: as learners work out combined operations of integers in the correct order</li> <li>● Learning to learn - organizing own learning; as learners carry out activities such as reading temperature changes in a thermometer and discuss how to record it.</li> </ul>				

- Digital literacy - interacting with technologies; as learners use IT devices to determine temperature.

**Values:**

- Respect - as learners work in groups to carry out activities such as reading temperature changes in a thermometer and discuss how to record it.
- Unity - as learners work towards achieving set goals of reading thermometers.

**Pertinent and Contemporary Issues:**

- Integrated Science - as learners record their body temperature on a daily basis.
- Life skills and value education - as learners read and record their body temperatures.

**Link to other subjects:**

- **Social Studies** - as learners read and record temperatures in relation to weather changes.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to perform operations on Integers.	Precisely performs operations on integers.	Performs operations on Integers.	Partially performs operations on Integers.	Performs operations on Integers with difficulties.
Ability to Work out combined operations on Integers.	Systematically works out combined operations on Integers	Works out combined operations on Integers.	Partially works out combined operations on Integers.	Works out combined operations on Integers with difficulties.
Ability to apply operations on integers to real life situations.	Comprehensively applies operations on integers to real life situations.	Applies operations on integers to real life situations.	Applies operations on integers to most of the real life situations	Applies operations on integers to a few real life situations.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
1.0 Numbers	<b>1.2 Cubes and Cube Roots</b>  (5 lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>work out cubes of numbers by multiplication in different situations.</li> <li>determine cubes of numbers from mathematical tables.</li> <li>determine cube roots of numbers by factor method in different situations.</li> <li>determine cube roots of numbers from mathematical tables.</li> <li>work out cubes and cube roots using a calculator</li> <li>apply cubes of numbers in real life situations.</li> <li>promote use of cubes and cube roots of numbers in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>use stacks of cubes to demonstrate the concept of cube and cube roots.</li> <li>use IT or other resources to demonstrate stacking of cubes.</li> <li>discuss the volume of a container that is a cube and determine both the cube and cube root and relate the two.</li> <li>read the cube of numbers from mathematical tables and relate to cube roots.</li> <li>use IT such as calculators or other resources to determine cube and cube roots of numbers.</li> </ul>	How do we use cubes and cube roots in real life situations?
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>Communication and collaboration - speaking and listening; as learners work in groups to use stacks of cubes to demonstrate the concept of cube and cube roots of numbers.</li> <li>Imagination and creativity - open mindedness and creativity; as learners determine both the cube and cube root and relate the two.</li> <li>Digital literacy - as the learners use the digital devices to determine cubes and cube roots of numbers.</li> </ul>				

**Values:**

- Respect - as learners appreciate each other's contribution in group discussion on volume of a container that is a cube and determine both the cube and cube root and relate the two.
- Responsibility; as the learners take care of the digital devices or any other resources used in learning cubes and cube roots of numbers.

**Pertinent and Contemporary Issues:**

- Education for sustainable development - as learners relate cubes and volume to packaging and stacking goods.
- Life skills and values - as learners work out and discuss cube roots and its application in day to day life.

**Link to other subjects**

- PRE-Technical Studies as learners to work out cubes and cube roots of different containers.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to work out cubes of numbers by multiplication.	Systematically works out cubes of numbers by multiplication.	Works out cubes of numbers by multiplication.	Partially works out cubes of numbers by multiplication.	Works out cubes of numbers by multiplication with difficulties.
Ability to determine cubes of numbers from mathematical tables.	Consistently determines cubes of numbers from mathematical tables.	Determines cubes of numbers from mathematical tables.	Partially determines cubes of numbers from mathematical tables.	Determines cubes of numbers from mathematical tables with assistance.
Ability to determine cube roots of numbers by factor method.	Systematically determines cube roots of numbers by factor method.	Determines cube roots of numbers by factor method.	Partially determines cube roots of numbers by factor method.	Determines cube roots of numbers by factor method with difficulties.

Ability to determine cube root of numbers from mathematical tables.	Precisely determines cube roots of numbers from mathematical tables.	Determines cube roots of numbers from mathematical tables	Partially determines cube roots of numbers from mathematical tables	Determines cube roots of numbers from mathematical tables with assistance.
Ability to work out cubes and cube roots using a calculator	Correctly works out cubes and cube roots using a calculator	Works out cubes and cube roots using a calculator	Partially works out cubes and cube roots using a calculator	Works out cubes and cube roots using a calculator with assistance
Ability to apply cubes and cube roots of numbers in real life situations.	Comprehensively applies cubes and cube roots of number in real life situations	Applies cubes roots of numbers in real life situations.	Partially applies cubes and cube roots of numbers in real life situations	Applies cubes and cube roots of numbers in real life situations with assistance.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
1.0 Numbers	<b>1.3 Indices and Logarithms</b>  (5 lessons)	By the end of the sub- strand the learner should be able to; a) express numbers in index form in different situations. b) derive the laws of indices in different situations. c) apply the laws of indices in different situations. d) relate powers of 10 to common logarithms in different situations. e) reflect on use of indices and logarithms in real life situations.	The learner is guided to:- <ul style="list-style-type: none"> <li>● discuss and relate powers to indices and identify the base.</li> <li>● generate and show the laws of indices using multiplication and division.</li> <li>● use the laws of indices to work out indices.</li> <li>● discuss and relate powers of 10 to common logarithms.</li> <li>● use IT or other resources to work out common logarithms.</li> </ul>	How do we express numbers in power form?
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Communication and collaboration - as learners discuss how to use indices and logarithms of numbers.</li> <li>● Critical thinking and problem solving - as learners generate and show the laws of indices using multiplication and division.</li> <li>● Digital literacy - as learners use digital devices such as calculators to work out indices and logarithms of numbers.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Responsibility - as learners use digital devices such as calculators or other resources to work out indices and logarithms of numbers.</li> <li>● Unity - as learners work in groups during the discussion on indices and logarithms of numbers.</li> </ul>				
<b>Pertinent and Contemporary Issues:</b> Citizenship - as the learners use multiplication and division and relate to fair sharing of resources.				

**Link to other subjects:**

- Integrated science - as learners work out multiplication and division using laws of indices and logarithms of numbers.
- Languages - as learners use mathematical terms such as indices, base and logarithms.

**Suggested Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to express numbers in index form.	Proficiently expresses numbers in index form correctly and.	Expresses numbers in index form.	Partially expresses numbers in index form.	Expresses numbers in index form with assistance.
Ability to derive the laws of Indices.	Systematically derives the laws of indices	Derives the laws of indices.	Partially derives the laws of indices.	Derives the laws of indices with difficulties.
Ability to apply the laws of indices.	Systematically applies the laws of indices.	Correctly applies the laws of indices.	Partially applies the laws of indices.	Applies the laws of indices with difficulties.
Ability to relate powers of 10 to common logarithms.	Comprehensively relates powers of 10 to common logarithms	Relates powers of 10 to common logarithms.	Partially relates powers of 10 to common logarithms.	Relates powers of 10 to common logarithms with difficulties.

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Key Inquiry Questions
1.0 Numbers	<b>1.4 Compound Proportions and Rates of Work</b>  (8 lessons)	By the end of the sub- strand, the learner should be able to; <ol style="list-style-type: none"> <li>a) divide quantities into proportional parts in different situations.</li> <li>b) relate different ratios in real life situations.</li> <li>c) work out compound proportions using the ratio method in different situations.</li> <li>d) calculate rates of work in real life situations.</li> <li>e) appreciate use of compound proportions and rates of work in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● discuss and divide quantities into proportional parts and express them as a fraction.</li> <li>● compare and write different ratios.</li> <li>● determine compound proportions using ratios.</li> <li>● undertake different tasks, time how long it takes to complete the task and determine the rate of work.</li> <li>● play games involving rates of work using IT or other resources.</li> </ul>	<ol style="list-style-type: none"> <li>1. How do we express compound proportions in real life situations?</li> <li>2. Why do we consider the rate of work in day to day activities?</li> </ol>
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Citizenship - as learners work to accomplish tasks in a given time.</li> <li>● Critical thinking and problem solving - as learners determine compound proportions using ratios.</li> <li>● Communication and collaboration - as learners discuss and divide quantities into proportional parts and express as a fraction.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Responsibility - as learners undertake tasks in a given time to accomplish tasks in a given time.</li> <li>● Respect - for self and others as learners respect each other as they work at different rates.</li> <li>● Unity - as the learners discuss and appreciate dividing quantities into proportional parts.</li> </ul>				

**Pertinent and Contemporary Issues:**

Self-esteem - as learners' devise personal strategies to divide quantities into proportional parts.

**Link to other subjects:**

Health and Hygiene - as learners share duties in cleaning and undertake them in specified time.

**Suggested Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to divide quantities into Proportional parts	Precisely divides quantities into proportional parts	Divides quantities into proportional parts	Partially divides quantities into proportional parts	Divides quantities into proportional parts with assistance
Relate different ratios	Comprehensively relates different ratios	Relates different ratios	Partially relates different ratios	Relates different ratios with difficulties
Ability to work out Compound proportions using ratio method	Systematically works out compound proportions using ratio method	Works out compound proportions using ratio method	Partially work out compound proportions using ratio method	Works out compound proportions using ratio method with difficulties
Ability to calculate rates of work	Systematically calculates rates of work	Calculates rates of work	Inconsistently calculates rates of work	Calculates rates of work with difficulties

## STRAND 2.0: ALGEBRA

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Key Inquiry Questions
2.0 Algebra	2.1 Matrices (8 lessons)	<p>By the end of the sub-strand the learner should be able to;</p> <ol style="list-style-type: none"> <li>identify a matrix in different situations.</li> <li>determine the order of a matrix in different situations.</li> <li>determine the position of items in a matrix in different situations.</li> <li>determine compatibility of matrices in addition and subtraction.</li> <li>carry out addition and subtraction of matrices in real life situations.</li> <li>reflect on the use of matrices in real life situations.</li> </ol>	<p>The learner is guided to;</p> <ul style="list-style-type: none"> <li>discuss the use of tables such as football league tables, travel schedules, shopping lists and any other. Count the number of rows and columns in the table, which is a matrix.</li> <li>arrange items in rows and columns and discuss how to represent a matrix.</li> <li>organize objects in rows and columns and give the order of the matrix in terms of row and columns (row <math>x</math> column).</li> <li>discuss and identify the position of each item or element in terms of row and column.</li> <li>discuss and identify matrices that have equal number of rows and equal number of columns (same order) for compatibility in addition and subtraction.</li> </ul>	<p>How do we use matrices in real life situations?</p>

			<ul style="list-style-type: none"> <li>discuss and note what is represented by the rows and what is represented by the columns from two or more matrices to carry out addition or subtraction.</li> </ul>	
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>Communication and collaboration - as learners discuss use of tables to represent matrices.</li> <li>Learning to learn - as learners arrange items or elements in rows and columns to form matrices.</li> </ul>				
<b>Values:</b> Integrity - as learners organize objects in rows and columns and give the order of the matrix				
<b>Pertinent and Contemporary Issues:</b> <ul style="list-style-type: none"> <li>Social and economic issues - as learners discuss the use of tables such as football league tables and shopping lists.</li> <li>Citizenship - as learners discuss how to use travel schedules to different places.</li> </ul>				
<b>Link to other subjects</b> <ul style="list-style-type: none"> <li>Language - as learners discuss and identify the position of each item or element in terms of row and column.</li> <li>Physical and Integrated Science - as learners generate tables of results in sports and refer to league schedules.</li> </ul>				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify a matrix.	Comprehensively identifies a matrix correctly and.	Identifies a Matrix	Partially Identifies a matrix.	Identifies a matrix with assistance.
Ability to determine the order of a matrix.	Systematically determines the order of a matrix.	Determines the order of a matrix.	Partially determines the order of a matrix.	Determines the order of a matrix with difficulties.

Ability to determine the position of items in a matrix.	Precisely Determines the position of items in a matrix.	Determines the position of items in a matrix.	Partially Determines the position of items in a matrix.	Determines the position of items in a matrix with assistance.
Ability to determine compatibility of matrices in addition and subtraction.	Precisely Determines compatibility of matrices in addition and subtraction.	Determines compatibility of matrices in addition and subtraction	Partially determines compatibility of matrices in addition and subtraction.	Determines compatibility of matrices in addition and subtraction with difficulties.
Ability to carry out addition and subtraction of matrices.	Systematically carries out addition and subtraction of matrices.	Carries out addition and subtraction of matrices.	Partially Carries out addition and subtraction of matrices.	Carries out addition and subtraction of matrices with assistance.

<b>Strand</b>	<b>Sub-Strand</b>	<b>Specific Learning Outcome</b>	<b>Suggested Learning Experiences</b>	<b>Key Inquiry Questions</b>
<b>2.0 Algebra</b>	<b>2.2 Equations of a Straight Line</b>  (15 lessons)	By the end of the sub strand the learner should be able to; a) identify the gradient in real life situations. b) determine the gradient of a line from two known points. c) determine the equation of a straight line given two points.	The learner is guided to; <ul style="list-style-type: none"> <li>discuss steepness in relation to gradient from the immediate environment.</li> <li>incline a ladder at different positions on the wall to demonstrate change in steepness of gradient. Discuss and compare the positions that the ladder is steeper.</li> </ul>	How do we use gradient or steepness in our daily activities?

		<p>d) determine the equation of a straight line from a known point and a gradient.</p> <p>e) express the equation of a straight line in the form of <math>y = mx + c</math></p> <p>f) interpret the equation <math>y = mx + c</math> in different situations.</p> <p>g) determine the <math>x</math> and <math>y</math> intercepts of a straight line.</p> <p>h) recognize the use of equations of straight lines in real life.</p>	<ul style="list-style-type: none"> <li>● observe and climb up and down places such as the stairs or hills and relate to gradients.</li> <li>● work out the equation of a straight line given two points or given a point and a gradient.</li> <li>● discuss and rewrite the equation of a straight line as <math>y = mx + c</math>. Explain the variables and constants in the equation.</li> <li>● work out the value of <math>x</math> when <math>y</math> is zero and the value of <math>y</math> when <math>x</math> is zero.</li> <li>● use IT or other resources to show different hills and mountains and discuss steepness.</li> </ul>	
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Digital literacy - as learners use IT or other resources to explore steepness or gradient of places.</li> <li>● Learning to learn - as learners place the ladder at different points on the ground as they discuss and compare steepness.</li> </ul>				
<p><b>Values:</b> Integrity - as learners observe gradient/steepness in staircases in buildings, bridges or ramps.</p>				
<p><b>Pertinent and Contemporary Issues:</b> Safety - as learners climb up and down places such as the stairs or hills and relate to gradients.</p>				

**Link to other subjects:**

- Integrated science - as learners use the ladder to make work easier by using different gradients.
- Pre-technical Studies as learners discuss and compare the gradients of parallel and perpendicular lines.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify the gradient.	Identifies the gradient comprehensively.	Identifies the gradient.	Inconsistently identifies the gradient.	Identifies the gradient with difficulties.
Ability to determine the gradient of a straight line from two known points.	Systematically determines the gradient of a straight line from two known points.	Determines the gradient of a straight line from two known points	Partially determines the gradient of a straight line from two known points.	Determines the gradient of a straight line from two known points with assistance.
Ability to determine the equation of a straight line from a known point and a gradient.	Precisely determines the equation of straight line from a known point and a gradient.	Determines the equation of a straight line from a known point and a gradient.	Partially determines the equation of a straight line from a known point and a gradient.	Determines the equation of a straight line from a known point and a gradient with difficulties.
Ability to express the equation of a straight line in the form of $y = mx + c$ .	Systematically expresses the equation of a straight line in the form of $y = mx + c$ and accurately.	Expresses the equation of a straight line in the form of $y = mx + c$ .	Partially expresses the equation of a straight line in the form of $y = mx + c$ .	Expresses the equation of a straight line in the form of $y = mx + c$ with difficulties.

Ability to interpret the equation $y = mx + c$ .	Comprehensively interprets the equation of a line $y = mx + c$	Interprets the equation $y = mx + c$ .	Interprets the equation $y = mx + c$ inconsistently.	Interprets the equation $y = mx + c$ with difficulties.
Ability to determine the $x$ and $y$ intercepts of a straight line.	Systematically determines the $x$ and $y$ intercepts of a straight line.	Determines the $x$ and $y$ intercepts of a straight line.	Partially determines the $x$ and $y$ intercepts of a straight line.	Determines the $x$ and $y$ intercepts of a straight line with difficulties.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<b>2.0 Algebra</b>	<b>2.3 Linear Inequalities</b>  (6 lessons)	By the end of the sub-strand the learner should be able to; a) solve linear inequalities in one unknown. b) represent linear inequalities in one unknown graphically. c) represent linear inequality in two unknowns graphically. d) apply linear inequalities to real life situations. e) reflect on the use of linear inequalities in real life.	The learner is guided to; <ul style="list-style-type: none"> <li>● discuss why sometimes resources are shared unequally.</li> <li>● discuss simple inequality statements, form and work out the inequalities in one unknown.</li> <li>● discuss and generate a table of values and draw linear inequalities in one unknown. Indicate and discuss the region that satisfies the inequalities.</li> <li>● discuss and generate a table of values and draw linear inequalities in two unknowns. Indicate and discuss the region that satisfies the inequalities.</li> </ul>	<ol style="list-style-type: none"> <li>1. How do we represent linear inequalities in graphs?</li> <li>2. How do we use linear inequalities in real life situations?</li> </ol>

			<ul style="list-style-type: none"> <li>• discuss and work out linear inequalities that involve real life cases</li> <li>• use IT or other graphing tools to present linear inequalities</li> </ul>	
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>• Digital literacy - as learners use IT resources to present linear inequalities.</li> <li>• Communication and collaboration - as learners discuss and generate table of values and draw linear inequalities.</li> </ul>				
<b>Values:</b> Social justice - as learners apply concepts of inequalities and equity in sharing available resources real in life situations.				
<b>Pertinent and Contemporary Issues:</b> Citizenship - as learners discuss and indicate the regions that satisfy inequalities.				
<b>Link to other subjects:</b> Social studies - as learners discuss inequality statements that may involve distribution of resources.				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to solve linear inequalities in one unknown.	Systematically Solves linear inequalities in one unknown	Solves linear inequalities in one unknown.	Partially solves linear inequalities in one unknown.	Solves linear inequalities in one unknown with assistance.
Ability to represent linear inequalities in one unknown graphically.	Proficiently represents linear inequalities in one unknown graphically.	Represents linear inequalities in one unknown graphically.	Partially represents linear inequalities in one unknown graphically.	Represents linear inequalities in one unknown graphically with difficulties.

Ability to represent linear inequalities in two unknowns graphically	Proficiently Represent linear inequalities in two unknowns graphically	Represents linear inequalities in two unknowns graphically	Partially represents linear inequalities in two unknowns graphically	Represents linear inequalities in two unknowns graphically with difficulties
Ability to apply linear inequalities	Creatively applied linear inequalities	Applies linear inequalities	Inconsistently applies linear inequalities	Apply linear inequalities with difficulties

DRAFT

### STRAND 3.0: MEASUREMENTS

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<b>3.0 Measurements</b>	<b>3.1 Area</b>  (8 lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>calculate the area of a pentagon and a hexagon in different situations.</li> <li>work out the surface area of triangular and rectangular based prisms.</li> <li>work out the surface area of triangular, rectangular and square based pyramids.</li> <li>calculate the area of a sector and segment of a circle.</li> <li>work out the surface area of a cone in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>discuss the properties of regular polygons and use cut outs to work out the area of pentagons and hexagons.</li> <li>collect from the environment objects that are spheres, cones/funnels, pyramids, prisms and frustums.</li> <li>discuss and sketch the nets of the solids.</li> <li>use models of prisms to work out the surface area of prisms.</li> <li>open up the net and draw the faces of a pyramid. Use the relevant formulas of area of plane figures to work out the surface area of the pyramid.</li> <li>draw a circle with a sector, a chord and a segment and discuss the relationship and make cut outs of a sector and a segment. Determine the area of a sector and a segment.</li> <li>open the cone to form a net and determine the curved surface area of a</li> </ul>	How do we determine the area of different surfaces?

		<p>f) calculate the surface area of a sphere in real life situations.</p> <p>g) recognize the use of area in real life situations.</p>	<p>cone. Work out the surface area of a closed and an open cone.</p> <ul style="list-style-type: none"> <li>● use relevant formulas to work out the surface area of different sizes of spherical balls.</li> <li>● use IT or other resources to sketch different models and nets.</li> </ul>	
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Communication and collaboration - as learners work in groups to discuss the properties of regular polygons and use cut outs to work out the area of pentagon and hexagon.</li> <li>● Creativity and imagination - as learners open nets of different models and work out surface area.</li> </ul>				
<p><b>Values:</b> Responsibility - as learners take care and work out surface area using models and open nets of different objects.</p>				
<p><b>Pertinent and Contemporary Issues:</b> Patriotism - as learners collect objects from the environment, use and dispose of them safely.</p>				
<p><b>Link to other subjects:</b> Pre-Technical Studies as learners use models and open nets of different objects.</p>				

<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to calculate the Area of a pentagon and a hexagon.	Proficiently calculates the area of a pentagon and a hexagon correctly and.	Calculates the area of a pentagon and a hexagon.	Partially Calculates the area of a pentagon and a hexagon.	Calculates the area of a pentagon and a hexagon with assistance.
Ability to work out the surface Area of a prism.	Systematically works out the surface area of a prism.	Works out the surface area of a prism.	Works out the surface area of a prism partially.	Works out the surface area of a prism with difficulties.
Ability to work out the surface area of a pyramid.	Works out the surface area of a pyramid accurately and proficiently.	Works out the surface area of a pyramid.	Partially works out the surface area of a pyramid	Works out the surface area of a pyramid with difficulties.
Ability to calculate the area of a sector and segment of a circle.	Systematically calculates the area of a sector and segment of a circle.	Calculates the area of a sector and segment of a circle.	Partially calculates the area of a sector and segment of a circle.	Calculates the area of a sector and segment of a circle with difficulties.
Ability to work out the surface area of a cone.	Systematically works out the surface area of a cone.	Works out the surface area of a cone.	Partially works out the surface area of a cone.	Works out the surface area of a cone with difficulties.
Ability to calculate the surface area of a sphere.	Proficiently calculates the surface area of a sphere.	Calculates the surface area of a sphere.	Partially calculates the surface area of a sphere.	Calculates the surface area of a sphere with difficulties.

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Key Inquiry Questions
3.0 Measurements	<b>3.2 Volume of Solids</b>  (8 lessons)	By the end of the sub- strand the learner should be able to; <ol style="list-style-type: none"> <li>a) work out the volume of a triangular and rectangular based prisms.</li> <li>b) calculate the volume of a triangular, rectangular and squares based pyramids..</li> <li>c) work out the volume of a cone in real life situations.</li> <li>d) determine the volume of a frustum in real life situations.</li> <li>e) calculate the volume of a sphere in real life situations.</li> <li>f) promote use of volume and capacity of different containers in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● collect different containers and objects. This may include prisms, pyramids, cones, funnels and balls.</li> <li>● identify and discuss the model of a prism. Using the relevant formulas, determine the volume of a prism.</li> <li>● use relevant formulae to work out the volume of pyramids and cones.</li> <li>● identify and work out the volume of models of a pyramid. Cut the pyramid into two parts to get a frustum and a small pyramid and determine the volume of the frustum using relevant formula.</li> </ul>	<ol style="list-style-type: none"> <li>1. How do we determine the volume of different solids?</li> <li>2. How do we use the volume of solids in real life situations?</li> </ol>

			<ul style="list-style-type: none"> <li>● Play any games involving different sizes of balls and work out volume of a sphere.</li> <li>● use IT or other resources to determine the volumes of solids.</li> </ul>	
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Critical thinking and problem solving - as learners identify and work out the volume of a frustum from a pyramid</li> <li>● Creativity and Imagination - as learners identify, discuss and work out volume of solids.</li> </ul>				
<p><b>Values:</b></p> <ul style="list-style-type: none"> <li>● Responsibility - as learners take care of the models of pyramids, cones, and spheres.</li> <li>● Patriotism - as learners collect objects from the environment to determine and discuss models/objects for different volumes of solids.</li> </ul>				
<p><b>Pertinent and Contemporary Issues:</b></p> <ul style="list-style-type: none"> <li>● Environmental Education - as learners take care of the environment while collecting the containers and objects.</li> <li>● Safety - as learners collect containers and objects cautiously.</li> </ul>				
<p><b>Link to other subjects;</b> Creative Arts - as learners make models of pyramids, cones/funnels and spheres/balls from available materials.</p>				

<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to work out the Volume of a prism.	Systematically works out the volume of a prism.	Works out the volume of a prism.	Partially works out the volume of a prism.	Works out the volume of a prism with difficulties.
Ability to calculating the Volume of a pyramid.	Precisely calculates the volume of a pyramid.	Calculates the volume of a pyramid	Partially Calculates the volume of a pyramid.	Calculates the volume of a pyramid with difficulties.
Ability to work out the Volume of a cone.	Systematically works out the volume of a cone.	Works out the volume of a cone.	Partially Works out the volume of a cone.	Works out the volume of a cone with difficulties.
Ability to determine the volume of a frustum.	Systematically determines the volume of frustum	Determines the volume of frustum.	Partially determines the volume of frustum.	Determines the volume of frustum with difficulties.
Ability to calculate the volume of a sphere.	Consistently calculates the volume of sphere	Calculates the volume of sphere.	Partially calculates the volume of sphere	Calculates the volume of sphere with difficulties.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
3.0 Measurements	<b>3.3 Mass, Volume, Weight and Density</b>  (8 Lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>convert units of mass from one form to another in different situations.</li> <li>relate mass and weight in real life situations.</li> <li>determine mass, volume and density in different situations.</li> <li>apply density to real life situations.</li> <li>recognize the use of density in daily life.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>discuss different instruments and tools used in weighing materials or objects and relate to consumer awareness and protection.</li> <li>Collect and weigh different materials or objects and change one unit of mass to another.</li> <li>discuss the relationship between mass and weight.</li> <li>carry out activities relating mass and volume to density using containers or different substances.</li> <li>discuss and find the density of different materials or objects.</li> <li>work out mass, volume and density using IT or other resources.</li> </ul>	How do you weigh materials and objects?
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>Communication and collaboration - as learners discuss the relationship between mass and weight.</li> <li>Creativity and imagination - as learners determine the density of different materials or objects.</li> <li>Digital literacy - as learners use IT devices to determine the mass, volume and density of different objects.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>Integrity - as learners give correct masses and weights of different material and objects.</li> </ul>				

- Responsibility - as learners work and take care of weighing machines and other resources.

**Pertinent and Contemporary Issues:**

- Education for Sustainable Development (ESD) - Careers in business such as shop keeping.
- Self-awareness - as learners weigh themselves for health purposes.

**Link to other subjects:**

- Home Science - as learners weigh different quantities for a variety of recipes.
- Integrated science - as learners use machines and tools which involve weighing and balancing.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to convert units of mass from one form to another.	Precisely Converts units of mass from one form to another.	Converts units of mass from one form to another.	Partially converts some units of mass from one form to another.	Converts units of mass from one form to another with assistance.
Ability to relate mass and weight.	Comprehensively Relates mass and weight.	Relates mass and weight.	Partially relates mass and weight	Relates mass and weight with assistance.
Ability to determine the mass, volume and density.	Systematically determines mass, volume and density	Determines the mass, volume and density.	Partially determines the mass, volume and density.	Determines the mass, volume and density with difficulties.
Ability to apply density to real life situations.	Systematically applies density to real life situations and correctly.	Applies density to real life situations.	Partially applies density to real life situations.	Applies density to real life situations with difficulties.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
3.0 Measurements	<b>3.4 Time, Distance and Speed</b>  (10 lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>a) work out speed in km/h and m/s in real life situations.</li> <li>b) work out average speed in real life situations.</li> <li>c) determine velocity in real life situations.</li> <li>d) work out acceleration in real life situations.</li> <li>e) identify the longitudes on the globe.</li> <li>f) relate longitudes to time on the globe.</li> <li>g) determine local time of places on the earth along different longitudes.</li> <li>h) appreciate use of time and distance in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● engage in activities that will involve measuring distances and time, for example running track events to determine speed.</li> <li>● discuss and relate distance and time.</li> <li>● discuss the difference between velocity and speed.</li> <li>● Discuss and determine acceleration from track events in school or community.</li> <li>● discuss and use maps and models of a globe to work out and relate time of different places on the earth.</li> <li>● use IT devices to watch videos on the globe, longitudes and time zones in different parts of the earth.</li> <li>● use other resources such as maps to locate different places (cities) on the earth and discuss time differences.</li> </ul>	<ol style="list-style-type: none"> <li>1. How do we observe speed in daily activities?</li> <li>2. Why does time vary in different places of the world?</li> </ol>

**Core competencies to be developed:**

- Self-efficacy - as learners participate in track events to measure speed.
- Digital literacy -as learners use IT devices to determine time in different zones in the world.
- Citizenship- global citizenship as learners determine local time in different parts of the world.

**Values:**

- Integrity- as learners correctly record individual running time during track events and other games.
- Respect - as learners adhere to their lanes on track events and other games.

**Pertinent and Contemporary Issues:**

- Safety - as learners observe safety measures and time during games and sports.
- Education for Sustainable Development (ESD) - as learners participate and choose careers in games and sporting activities.
- Self-awareness - as learners participate and time themselves in games.

**Link to other subjects:**

- Integrated science - as learners use digital devices to tell time in different zones of the world.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to work out speed in Km/h and m/s.	Systematically works out speed in Km/h and m/s	Works out speed in Km/h and m/s.	Partially works out speed in Km/h and m/s.	Works out speed in Km/h and m/s with assistance.
Ability to work out average speed.	Systematically works out average speed.	Works out average speed.	Inconsistently works out average speed.	Works out average speed with difficulties.
Ability to determining velocity.	Precisely Determines velocity.	Determines velocity.	Determines velocity inconsistently.	Determines velocity with difficulties.

Ability to Work out acceleration.	Systematically Works out acceleration	Works out acceleration c.	Works out acceleration partially.	Works out acceleration with difficulties.
Ability to identify the longitudes on the globe.	Precisely identifies the longitudes on the globe.	Identifies the longitudes on the globe	Inconsistently identifies longitudes on the globe.	Identifies the longitudes on the globe with difficulties.
Ability to relate longitudes to time on the globe.	Comprehensively relates longitudes to time on the globe	Relates longitudes to time on the globe.	Inconsistently relates longitudes to time on the globe.	Relates longitudes to time on the globe with difficulties.
Ability to determine local time of places on the earth along different longitudes.	Systematically determines local time of places on the earth along different longitudes	Determines local time of places on the earth along different longitudes	Partially Determines local time of places on the earth along different longitudes.	Determines local time of places on the earth along different longitudes with difficulties.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<b>3.0 Measurements</b>	<b>3.5 Money</b> (7 lessons)	By the end of the sub- strand, the learner should be able to; a) identify currencies that are used in different countries. b) convert currency from one form to another in real life situations. c) work out import and export duties charged on goods and services. d) work out excise duty charged on goods and services. e) determine value added tax charged on goods and services. f) appreciate use of money in day to day activities.	The learner is guided to; <ul style="list-style-type: none"> <li>● use IT or other resources to obtain and compile a collage of currencies from different countries. For example, currencies of East African Countries, US dollars, Euro, Yen and Sterling pound.</li> <li>● work out currency exchange from Kenya Shillings to any other currency and vice versa.</li> <li>● discuss and determine the export and import duty charges on different goods.</li> <li>● discuss and identify goods that attract excise duty. Determine excise duty.</li> <li>● use receipts from shopping to discuss and work out VAT on goods and services.</li> <li>● identify currency exchange rates from different sources including daily papers, IT devices, financial</li> </ul>	<ol style="list-style-type: none"> <li>1. Why do we change currencies from one form to another?</li> <li>2. What are the types of taxes the government levy on its citizens?</li> </ol>

			institutions and relate this to consumer awareness and protection.	
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Global Citizenship - as learners of different currencies of the world.</li> <li>● Digital Literacy - as learners use digital devices to learn on exchange rates for foreign currency.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Integrity - as learners accurately work out currency, import and exchange rates.</li> <li>● Social Cohesion - as learners work and appreciate exchange rates for other countries.</li> </ul>				
<b>Pertinent and Contemporary Issues:</b> <ul style="list-style-type: none"> <li>● Financial Literacy - as learners learn the currencies used in different countries</li> <li>● Education for Sustainable Development (ESD) - as learners choose careers in business, imports and exports.</li> </ul>				
<b>Link to other subjects:</b> Business studies - as learners work out VAT and currency exchange.				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify currencies that are used in different countries	Comprehensively identifies currencies that are used in different countries	Identifies currencies that are used in different countries	Partially identifies currencies that are used in other countries	Identifies currencies that are used in their country

Ability to convert currency from one form to another	Precisely converts currency from one form to another	Converts currency from one form to another	inconsistently Converts currency from one form to another	Convert currency from one form to another with difficulties
Ability to work out import and export duties	Systematically works out import and export duties and correctly	Works out import and export duties	Partially works out import and export duties	Works out import and export duties with difficulties
Ability to workout excise duty	Systematically works out excise duty	Works out excise duty	Inconsistently Works out excise duty	Works out excise duty with difficulties
Ability to determine Value Added Tax	Precisely determines Value Added Tax	Determines Value Added Tax	Determines Value Added Tax inconsistently	Determines Value Added Tax with difficulties

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Key Inquiry Questions
3.0 Measurements	<b>3.6 Approximations and Errors</b>  (5 lessons)	By the end of the sub-strand the learner should be able to; <ol style="list-style-type: none"> <li>a) approximate quantities in measurements in different situations.</li> <li>b) determine errors using estimations and actual measurements of quantities.</li> <li>c) determine percentage errors using actual measurements of quantities</li> <li>d) appreciate approximations and errors in real life situations.</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● carryout activities of measurements of different quantities such as length, area, volume, capacity and mass using arbitrary units.</li> <li>● Estimate and measure different quantities using appropriate instruments. compare the estimates and the actual measurements and determine the error.</li> <li>● work out the percentage error from the estimated and the actual measurements</li> <li>● work out errors using IT devices or other resources and relate this to consumer awareness.</li> </ul>	How do we estimate measurements of different quantities?
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Creativity and imagination - as learners carry out measurements of different quantities and discuss error.</li> <li>● Digital literacy - as learners use IT devices as they compute errors.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Integrity - as learners measure different quantities and minimize errors.</li> </ul>				

- Responsibility - as learners take care of tools for measuring different quantities.

**Pertinent and Contemporary Issues:**

Safety - as learners handle measuring tools with care.

**Link to other subjects:**

Integrated science - as learners measure different quantities as they carry out experiments.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to approximate quantities in measurements	Accurately approximates quantities in measurements	Approximates quantities in measurements	Partially approximate quantities in measurements	Approximate quantities in measurements with difficulties
Ability determine errors using estimations and actual measurements of quantities.	Accurately determines errors using estimations and actual measurements of quantities.	Determines errors using estimations and actual measurements of quantities.	Partially determines errors using estimations and actual measurements of quantities.	Determines errors using estimations and actual measurements of quantities. with assistance

## STRAND 4.0: GEOMETRY

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
4.0 Geometry	<b>4.1 Coordinates and Graphs</b>  (6 lessons)	By the end of the sub-strand, the learner should be able to; <ol style="list-style-type: none"> <li>a) plot out points on a Cartesian plane</li> <li>b) draw a straight line graph given an equation.</li> <li>c) draw parallel lines on the Cartesian plane.</li> <li>d) relate the gradients of parallel lines.</li> <li>e) draw perpendicular lines on the Cartesian plane.</li> <li>f) relate the gradients of perpendicular lines.</li> <li>g) apply graphs of straight line in real life situation</li> </ol>	The learner is guided to; <ul style="list-style-type: none"> <li>● work in groups and locate the point of intersection of the x coordinate and the y- coordinates on a Cartesian plane.</li> <li>● generate a table of values from equation a of a straight line, plot and join the points to form a straight line.</li> <li>● Generate table of values for each of the given equations, plot and join them to form straight lines on the Cartesian plane</li> <li>● work out the gradients of each of the lines and compare them to establish their relationship of parallelism.</li> <li>● Generate table of values for each of the given equations of perpendicular lines, plot and join them to form straight lines on the Cartesian plane</li> <li>● work out the gradients of each of the lines and compare them to establish</li> </ul>	<ol style="list-style-type: none"> <li>1. How do we draw graphs of straight lines?</li> <li>2. How do we interpret graphs of straight lines?</li> </ol>

			the relationship of perpendicular lines.	
<b>Core Competencies to be developed:</b>				
<ul style="list-style-type: none"> <li>● Communication and collaboration - learners work in groups to locate the point of intersection of straight lines</li> <li>● Critical thinking and problem solving - as learners generate a table of values.</li> </ul>				
<b>Values:</b>				
Responsibility - as learners take care of graphing instruments and other resources.				
<b>Pertinent and Contemporary Issues:</b>				
<ul style="list-style-type: none"> <li>● Education for Sustainable Development (ESD) - as learners generate tables of values and draw graphs of straight lines.</li> <li>● Safety - as learners handle graphing instruments with sharp ends.</li> </ul>				
<b>Link to other subjects:</b>				
<ul style="list-style-type: none"> <li>● Integrated Science - as learners plot graphs of straight lines in different quantities.</li> </ul>				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to plot out points on a Cartesian plane	Precisely plots out points on a Cartesian plane	Plots out points on a Cartesian plane	Inconsistently plots out some points on a Cartesian plane	With assistance plots out points on a Cartesian plane
Ability to draw a straight line graph given an equation	Consistently draws a straight line graph given an equation	Draws a straight line graph given an equation	Inconsistently draws a straight line graph given an equation	Requires assistance draws a straight line graph given an equation
Ability to draw parallel lines on the Cartesian plane	Accurately draws parallel lines on the Cartesian plane	Draws parallel lines on the Cartesian plane	Partially draws parallel lines on the Cartesian plane	Draws parallel lines on the Cartesian plane with assistance

Ability to relate the gradients of parallel lines.	Comprehensively relates the gradients of parallel lines.	Relates the gradients of parallel lines.	Partially relates the gradients of parallel lines.	Relates the gradients of parallel lines with assistance.
Ability to draw perpendiculars line on the Cartesian plane.	Accurately draws perpendiculars line on the Cartesian plane.	Draws perpendiculars lines on the Cartesian plane.	Partially draws perpendiculars line on the Cartesian plane.	Draws perpendiculars line on the Cartesian plane with assistance.
Ability to relate the gradients of perpendicular lines.	Comprehensively relates the gradients of perpendicular lines.	Relates the gradients of perpendicular lines.	Partially relates the gradients of perpendicular lines.	Relates the gradients of perpendicular lines with difficulties.
Ability to apply graphs of straight line in real life situation	Accurately applies graphs of straight line in real life situation	Applies graphs of straight line in real life situation	Partially applies graphs of straight line in real life situation	With assistance applies graphs of straight line in real life situation

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<b>4.0 Geometry</b>	<b>4.2 Scale Drawing</b> (14 lessons)	By the end of the sub-strand, the learner should be able to; a) identify compass and true bearings in real life situations. b) determine the bearing of one point from another in real life situations. c) locate a point using bearing and distance in real life situations.	Learner is guided to: <ul style="list-style-type: none"> <li>● draw and discuss the compass directions and relate to the compass and true North bearings.</li> <li>● discuss and locate places from different points using bearings.</li> <li>● discuss and locate a place using bearing and distance. Sketch and use scale drawing to show the</li> </ul>	How do we use scale drawing in real life?

		<p>d) identify angles of elevation in real life situations.</p> <p>e) determine angles of elevation in different situations.</p> <p>f) identify angles of depression in real life situations.</p> <p>g) determine angles of depression in different situations.</p> <p>h) apply scale drawing in simple surveying.</p> <p>i) appreciate the use of scale drawing in real life situations.</p>	<p>position of places from given points.</p> <ul style="list-style-type: none"> <li>● carryout different activities involving angles of elevation, for example observing different objects or points that are above. Discuss, sketch and make a scale drawing to determine the angles of elevation.</li> <li>● Carryout different activities involving angles of depression, for example observing different objects or points that are below.</li> <li>● discuss, sketch and make a scale drawing to determine the angles of depression.</li> <li>● discuss and use scale drawing in simple surveying.</li> <li>● observe maps or watch videos on bearings and simple surveying.</li> </ul>	
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Creativity and imagination - as learners sketch and determine angles of elevation and depression</li> <li>● Citizenship - as learners use scale drawing in simple surveying</li> </ul>				
<p><b>Values:</b></p> <ul style="list-style-type: none"> <li>● Unity - as learners sketch and agree on points in simple surveying.</li> <li>● Social Cohesion - as learners observe maps and watch videos on land surveying.</li> </ul>				

<b>Pertinent and Contemporary Issues:</b> Education for Sustainable Development (ESD) - Career in scale drawing and surveying.				
<b>Link to other subjects:</b> Social studies - as learners work in groups to observe maps in surveying.				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Identifying compass and true bearings.	Comprehensively identifies compass and true bearings.	Identifies compass and true bearings.	Partially identifies compass and true bearings.	Identifies compass and true bearings with difficulties.
Determining the bearing of one point from another.	Precisely determines the bearing of one point from another.	Determines the bearing of one point from another.	Partially determines the bearing of one point from another.	Determines the bearing of one point from another with difficulties.
Locating a point using bearing and distance.	Precisely locates a point using bearing and distance.	Locates a point using bearing and distance.	Partially Locates a point using bearing and distance.	Locates a point using bearing and distance with assistance.
Identifying angles of elevation.	Comprehensively identifies angles of elevation.	Identifies angles of elevation.	Inconsistently identifies angles of elevation.	Identifies angles of elevation with difficulties.
Determining angles of elevation.	Systematically determines angles of elevation	Determines angles of elevation.	Partially determines angles of elevation.	Determines angles of elevation with difficulties.

Identifying angles of depression.	Identifies angles of depression comprehensively.	Identifies angles of depression.	Identifies angles of depression inconsistently.	Identifies angles of depression with difficulties.
Determining angles of depression.	Precisely determines angles of depression and accurately.	Determines angles of depression.	Partially determines angles of depression.	Determine angles of depression with difficulties.
Applying scale drawing in simple surveying.	Comprehensively applies scale drawing in simple surveying	Applies scale drawing in simple surveying.	Partially Applies scale drawing in simple surveying.	Applies scale drawing in simple surveying with difficulties.

<b>Strand</b>	<b>Sub-strand</b>	<b>Specific Learning Outcomes</b>	<b>Suggested Learning Experiences</b>	<b>Key Inquiry Questions</b>
<b>4.0 Geometry</b>	<b>4.3 Similarity and Enlargement</b>  (10 lessons)	By the end of the sub- strand, the learner should be able to; a) identify similar figures and their properties. b) draw similar figures in different situations. c) determine properties of enlargement of different figures. d) apply properties of enlargement to draw similar objects and their images. e) determine the linear scale factor of similar figures.	The learner is guided to; <ul style="list-style-type: none"> <li>● collect objects and sort according to similarity. Discuss and note down properties of similar objects.</li> <li>● use properties of similar objects to scale-draw similar figures.</li> <li>● discuss and identify properties of enlargement.</li> <li>● use properties of enlargement to represent objects and their images.</li> </ul>	<ol style="list-style-type: none"> <li>1. What are similar objects?</li> <li>2. How do we use enlargement in real life situations?</li> </ol>

		f) promote use of similarity and enlargement in real life situations.	<ul style="list-style-type: none"> <li>determine the linear relationship of similar figures and objects.</li> <li>enlarge objects and figures using IT devices</li> </ul>	
--	--	---	---	--

**Core Competencies to be developed:**

- Critical thinking and problem solving - as learners draw similar and enlarged objects and figures.
- Digital literacy - as learners learn, use digital devices to enlarge objects and figures.

**Values:**

- Responsibility - as learners collect similar objects and take care of them in the learning process.
- Social cohesion - as learners work in groups to draw similar objects and figures.

**Pertinent and Contemporary Issues:**

Environmental Education -as learners collect similar objects from the environment.

**Link to other subjects:**

Pre-Technical Studies as learners scale-draw similar figures and objects.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify similar figures and their properties.	Comprehensively identifies similar figures and their properties.	Identifies similar figures and their properties.	Partially identifies similar figures and their properties.	Identifies similar figures and their properties with assistance.
Ability to draw similar figures.	Creatively draws similar figures	Draws similar figures	Partially draws similar figures.	Draws similar figures with assistance.

Ability to determine properties of enlargement.	Comprehensively determines properties of enlargement.	Determines properties of enlargement.	Partially determines some properties of enlargement.	Determines properties of enlargement with assistance.
Ability to apply properties of enlargement to draw similar objects and their images.	Creatively Applies properties of enlargement to draw objects and their images a	Applies properties of enlargement to draw objects and their images.	Partially applies properties of enlargement to draw objects and their images.	Applies properties of enlargement to draw objects and their images with difficulties.
Ability to determine the linear scale factor of similar figures.	Systematically determines the linear scale factor of similar figures.	Determines the linear scale factor of similar figures.	Partially determines the linear scale factor of similar figures	Determines the linear scale factor of similar figures with difficulties.

<b>Strand</b>	<b>Sub-Strand</b>	<b>Specific Learning Outcomes</b>	<b>Suggested Learning Experiences</b>	<b>Key Inquiry Questions</b>
<b>4.0 Geometry</b>	<b>4.4 Trigonometry</b>  (8 lessons)	By the end of the sub- strand, the learner should be able to; a) identify angles and sides of right angled triangles in different situations. b) identify Sine, Cosine and Tangent ratios from a right angled triangle in different situations. c) read tables of trigonometric ratios for acute angles.	The learner is guided to: <ul style="list-style-type: none"> <li>● draw right angled triangles and recognize angles and sides. Discuss the relationship between angles and sides.</li> <li>● discuss and relate the trigonometric ratios to</li> </ul>	What is the relationship between angles and sides in a right angled triangle?

		<p>d) determine trigonometric ratios of acute angles using calculators</p> <p>e) apply trigonometric ratios to calculate lengths and angles of right angled triangles in different situations.</p> <p>f) appreciate use of trigonometric ratios in real life situations.</p>	<p>angles in a right angled triangle.</p> <ul style="list-style-type: none"> <li>● use trigonometric ratios to determine lengths and angles of right angled triangles</li> <li>● use Mathematical tables or IT devices to find trigonometric ratios of given angles.</li> </ul>	
<p><b>Core competencies to be developed:</b></p> <ul style="list-style-type: none"> <li>● Critical thinking and problem solving - as learners relate the trigonometric ratios to angles in a right angled triangle.</li> <li>● Digital literacy - as learners use tables or calculators to find trigonometric ratios of given angles.</li> </ul>				
<p><b>Values:</b></p> <p>Responsibility - as learners take care of digital devices, mathematical tables and drawing materials.</p>				
<p><b>Pertinent and Contemporary Issues:</b></p> <p>Safety - As learners plug and use digital devices</p>				
<p><b>Link to other subjects:</b></p> <p>Pre-Technical Studies as learners draw right angled triangles and recognize angles and sides.</p>				
<p><b>Assessment Rubric</b></p>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify Angles and sides of right angled triangles.	Precisely Identifies angles and sides of right angled triangles.	Identifies angles and sides of right angled triangles.	Partially identifies angles and sides of right angled triangles.	Identifies angles and sides of right angled triangles with difficulties.

Ability to identify Sine, Cosine and Tangent ratios from a right angled triangle.	Comprehensively Identifies Sine, Cosine and Tangent ratios from a right angled triangle.	Identifies Sine, Cosine and Tangent ratios from a right angled triangle.	Partially Identifies Sine, Cosine and Tangent ratios from a right angled triangle	Identifies Sine, Cosine and Tangent ratios from a right angled triangle with assistance.
Ability to read tables of trigonometric ratios.	Precisely Reads tables of trigonometric ratios.	Reads tables of trigonometric ratios.	Inconsistently reads tables of trigonometric ratios.	Reads tables of trigonometric ratios with assistance.
Ability to determine trigonometric ratios of acute angles using calculators	consistently determines trigonometric ratios of acute angles using calculators	determines trigonometric ratios of acute angles using calculators	sometimes determines trigonometric ratios of acute angles using calculators	with help determines trigonometric ratios of acute angles using calculators
Ability to apply trigonometric ratios to calculate lengths and angles of right angled triangles.	Systematically applies trigonometric ratios to calculate lengths and angles of right angled triangles an	Applies trigonometric ratios to calculate lengths and angles of right angled triangles	Partially applies trigonometric ratios to calculate lengths and angles of right angled triangles.	Applies trigonometric ratios to calculate lengths and angles of right angled triangles with difficulties.

## STRAND 5.0: DATA HANDLING AND PROBABILITY

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<b>5.0 Data Handling and Probability</b>	<b>5.1 Data Interpretation (Grouped Data)</b>  (8 lessons)	By the end of the sub- strand, the learner should be able to; a) determine appropriate class width for grouping data. b) draw frequency distribution tables of grouped data c) identify the modal class of grouped data. d) calculate the mean of a grouped data from real life situations. e) determine the median of a grouped data from real life situations. f) appreciate data interpretation in real life situations.	The learner is guided to: <ul style="list-style-type: none"> <li>● collect data and work out an appropriate class width.</li> <li>● tally the data and represent it in a frequency distribution table.</li> <li>● recognize the modal class from a set of grouped data.</li> <li>● work out the mean from different sets of grouped data.</li> <li>● use the frequencies to determine the median class of grouped data.</li> <li>● work out the median from different sets of grouped data.</li> <li>● use IT or other materials to determine the mean and median of grouped data.</li> </ul>	How do we interpret data?
<b>Core competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Learning to learn - as learners collect, organize and interpret data.</li> <li>● Critical thinking and problem solving - as learners discuss and determine the modal class, mean and median of grouped data.</li> <li>● Digital literacy - as learners use IT or other materials to determine the mean and median of grouped data.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Respect - as learners work together in groups to collect data from the immediate environment.</li> </ul>				

**Pertinent and Contemporary Issues:**

- Citizenship - as learners collect data that may relate to the population.
- Education for Sustainable Development (ESD) - as learners may be sensitized to choose career paths on statistics and other related fields.

**Link to other subjects:**

- Integrated science - as the learners interpret data related to different organisms and materials.
- Social studies - as learners analyze and interpret data in different social aspects.

**Assessment Rubric**

<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to determine appropriate width for grouping data.	Precisely determines appropriate width for grouping data.	Determines appropriate width for grouping data.	Inconsistently determines appropriate width for grouping data.	Determines appropriate width for grouping data with assistance.
Ability to draw frequency distribution tables of grouped data.	Consistently draws frequency distribution tables of grouped data	Draws frequency distribution tables of grouped data	Inconsistently draws frequency distribution tables of grouped data	Draws frequency distribution tables of grouped data with help.
Ability to identify the modal class of grouped data.	Consistently identifies the modal class of grouped data	Identifies the modal class of grouped data.	Inconsistently identifies the modal class of grouped data.	Identifies the modal class of grouped data with assistance.
Ability to calculate the mean of grouped data.	Systematically calculates the mean of grouped data	Calculates the mean of grouped data.	Partially calculates the mean of grouped data.	Calculates the mean of grouped data with difficulties.

Ability to determine the median of grouped data.	Systematically determines the median of grouped data acutely	Determines the median of grouped data.	Partially determines the median of grouped data.	Determines the median of grouped data with difficulties.
--	--	--	--	--

<b>Strand</b>	<b>Sub-strand</b>	<b>Specific Learning Outcomes</b>	<b>Suggested Learning Experiences</b>	<b>Key Inquiry Questions</b>
<b>5.0 Data Handling and Probability</b>	<b>5.2 Probability</b> (6 lessons)	By the end of the sub-strand, the learner should be able to; a) perform experiments involving equally and likely outcomes in different situations. b) determine the range of probability of an event. c) identify mutually exclusive events in real life situations. d) perform experiments of single chance involving mutually exclusive events e) perform experiments involving independent events in different situations. f) draw a tree diagram for a single outcome	The learner is guided to; <ul style="list-style-type: none"> <li>● discuss and carry out experiments of events involving equally and likely outcomes.</li> <li>● work out the range of probability of different events.</li> <li>● discuss and carry out experiments involving mutually inclusive events.</li> <li>● discuss and carry out experiments involving independent events.</li> <li>● practice representing probability occurrences in a tree diagram.</li> </ul>	Why is probability important in real life situations?

		g) appreciate the probability of events occurring in real life situations.	<ul style="list-style-type: none"> <li>● use IT or other resources to explore more on probability.</li> </ul>	
<b>Core Competencies to be developed:</b> <ul style="list-style-type: none"> <li>● Communication and collaboration - as learners discuss and carry out experiments of events involving equally likely outcomes.</li> <li>● Critical thinking and problem solving - as learners carry out experiments involving mutually inclusive events.</li> <li>● Self- efficacy -as learners carry out experiments involving independent events and avoid harmful practices of gambling.</li> </ul>				
<b>Values:</b> <ul style="list-style-type: none"> <li>● Responsibility - as learners discuss and carry out experiments involving mutually inclusive events</li> <li>● Social cohesion - as learners work in groups and practice representing probability occurrences in a tree diagram.</li> </ul>				
<b>Pertinent and Contemporary Issues:</b> Financial Literacy - as learners carry out experiments involving independent events and avoid harmful practices of gambling using money				
<b>Link to other subjects:</b> Agriculture - as learners work in groups to explore the weather patterns.				
<b>Assessment Rubric</b>				
<b>Indicators</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to perform experiments involving equally likely outcomes.	Systematically performs experiments involving equally likely outcomes.	Performs experiments involving equally likely outcomes	Partially performs experiments involving equally likely outcomes.	Performs experiments involving equally likely outcomes with difficulties.

Ability to determine the range of probability of an event.	Proficiently Determines the range of probability of an event.	Determines the range of probability of an event.	Inconsistently determines the range of probability of an event	Determines the range of probability of an event with difficulties.
Ability to identify mutually exclusive events.	Proficiently identifies mutually exclusive events.	Identifies mutually exclusive events.	Inconsistently identifies mutually exclusive events.	Identifies mutually exclusive events with difficulties.
Ability to perform experiments of single chance involving mutually exclusive events.	Systematically performs experiments of single chance involving mutually exclusive events	Performs experiments of single chance involving mutually exclusive events.	Partially performs experiments of single chance involving mutually exclusive events.	Performs experiments of single chance involving mutually exclusive events with difficulties.
Ability to perform experiments involving independent events.	Proficiently Performs experiments involving independent events.	Performs experiments involving independent events.	Inconsistently performs experiments involving independent events.	Performs experiments involving independent events with difficulties.
Ability to draw a tree diagram for a single outcome.	Systematically Draws a tree diagram for a single outcome correctly and.	Draws a tree diagram for a single outcome.	Partially draws a tree diagram for a single outcome	Draws a tree diagram for a single outcome with difficulties.

## COMMUNITY SERVICE LEARNING PROJECT

### Introduction

In Grade 9, learners will undertake a CSL activity on thematic areas provided to them. They will be required to identify a community problem through research, design solution and come up with a plan to solve the problem. The preparations will be carried out in convenient groups. Learners will build on CSL knowledge, skills and attitudes acquired during Social Studies as well as other learning areas.

### CSL Skills to be covered:

- i) **Leadership:** Learners develop leadership skills as they undertake various roles during preparation.
- ii) **Financial Literacy and Entrepreneurship Skills:** Learners will gain skills on wise spending, saving and investing for sustained economic growth. They could consider ways of generating income as they undertake the CSL project through innovative ways. Moreover, they could identify business ideas and opportunities as well as resources to meet the needs of the community.
- iii) **Research:** Learners will exploit research skills as they identify a problem or a pertinent issue in the community, design a solution and plan how the problem will be solved. They will then do a report of the project accomplished.
- iv) **Communication and collaboration:** Learners will develop these skills as they interrogate the problem in the society, research and brainstorm on solution, and collaborate with the members of the community in the implementation process.
- v) **Citizenship:** Learners will engage in the CSL activities, in appreciation of their responsibilities, rights and privileges as citizens, giving them a sense of belonging and attachment to the nation. They will also be empowered to engage and assume active roles in shaping a more cohesive, peaceful and inclusive society.
- vi) **Life Skills:** Learners will develop life skills in the areas of decision making, assertiveness, effective communication, and problem solving and stress management.
- vii) **Community Development:** Learners will be sensitized with the needs or gaps in the community, and empowered to take responsibility within their means for stronger and more resilient communities.

Suggested PCIs	Specific Learning Outcomes	Suggested Learning Experiences	Key Inquiry Questions
<ul style="list-style-type: none"> <li>● Environmental degradation</li> <li>● Life style diseases</li> <li>● Communicable and non-communicable diseases</li> <li>● Poverty</li> <li>● Violence in community</li> <li>● Food security issues</li> <li>● Conflicts in the community</li> </ul> <p><b>Note:</b> The suggested PCIs are only examples. Teachers should allow learners to identify PCIs as per their context and reality.</p>	<p>By the end of the CSL project, the learner should be able to:</p> <ol style="list-style-type: none"> <li>a) identify a problem in the community through research</li> <li>b) design a solutions to the identified problem,</li> <li>c) plan to solve the identified problem in the community,</li> <li>d) implement the plan to solve the problem,</li> <li>e) report and reflect on the concluded project</li> <li>f) appreciate the need to belong to a community.</li> </ol>	<p>The learner is guided to:</p> <ul style="list-style-type: none"> <li>● brainstorm on pertinent and contemporary issues in their community that need attention in groups</li> <li>● choose a PCI that needs immediate attention and explain why in groups</li> <li>● carry out research using digital devices print media/interactions with members of the community/resource persons in identifying a community problem to address in groups</li> <li>● discuss possible solutions to the identified issue in groups</li> <li>● propose the most appropriate solution to the problem in groups</li> <li>● discuss ways and instruments they can use to collect data on the problem (questionnaires, interviews, observation schedule, etc)</li> <li>● develop instruments for data collection</li> <li>● identify resources needed for the CSL project (human, technical, financial)</li> <li>● discuss when the project will begin and end</li> </ul>	<ol style="list-style-type: none"> <li>1. How does one determine a community need?</li> <li>2. Why is it necessary to make adequate preparations before embarking on a project?</li> </ol>

		<ul style="list-style-type: none"> <li>● prepare a programme/timetable of the entire project execution</li> <li>● Assign roles to be carried by all group members</li> <li>● reflect on how the project preparation enhanced learning.</li> </ul>	
<p><b>Key Component of CSL developed:</b></p> <ol style="list-style-type: none"> <li>a) identification of a problem in the community through research,</li> <li>b) designing solution(s) to the identified problem,</li> <li>c) planning to implement the solution,</li> <li>d) implementing the plan to solve the problem,</li> <li>e) conclude, reflect, report on the project.</li> </ol>			
<p><b>Core Competencies to be Developed:</b></p> <ul style="list-style-type: none"> <li>● Communication and collaboration: Learners will make the preparations in groups and conduct discussions on best ways of carrying out the project.</li> <li>● Self-efficacy: Learner develops the skills of self-awareness and leadership as they undertake the CSL project</li> <li>● Creativity and Imagination: Learner will come up with creative ways of solving the identified community problem</li> <li>● Critical Thinking and Problem Solving: Learners will demonstrate autonomy in identifying a community need, exploring plausible solutions and making necessary preparations to address the problem.</li> <li>● Digital Literacy: Learner can use technology when as they research on a community problem that they can address.</li> <li>● Learning to Learn: Learner gains new knowledge and skills as they identify a community problem to be addressed and make preparations to carry out the project.</li> <li>● Citizenship: This is enhanced as learner chooses a PCI that needs immediate attention in the community.</li> </ul>			
<p><b>Pertinent and contemporary Issues</b></p> <ul style="list-style-type: none"> <li>● Social cohesion as learner discusses possible solutions to the identified issue.</li> <li>● Critical thinking as learner discusses possible solutions to the identified issue.</li> </ul>			

**Values**

- Integrity as learner carries out research using digital devices and print media as they identify a community problem to address.
- Respect as learner brainstorms on pertinent and contemporary issues in their community that need attention

**Assessment Rubric**

<b>Indicator</b>	<b>Exceeds Expectation</b>	<b>Meets Expectation</b>	<b>Approaches Expectation</b>	<b>Below Expectation</b>
Ability to identify a problem in the community	Exhaustively identifies a problem in the community	Identifies a problem in the community	Fairly identifies a problem in the community	Only with prompts identifies a problem in the community
Ability to design solutions to the identified problem	Elaborately designs solutions to the identified problem	Designs solutions to the identified problem	Fairly designs solutions to the identified problem	With assistance designs solutions to the identified problem
Ability to plan to solve the identified problem	Thoroughly plans to solve the identified problem	Plans to solve the identified problem	Fairly plans to solve the identified problem	With assistance plans to solve the identified problem
Ability to implement the plan to solve the problem	Comprehensively implements the plan to solve the problem	Implements the plan to solve the problem	Fairly implements the plan to solve the problem	With assistance implements the plan to solve the problem
Ability to report on the concluded project	Exhaustively reports on the concluded project	Reports on the concluded project	Partially reports on the concluded project	With assistance reports on the concluded project

**APPENDIX 1: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES**

<b>Strand</b>	<b>Sub-strand</b>	<b>Suggested Assessment Methods</b>	<b>Suggested Learning Resources</b>	<b>Suggested Non-Formal Activities</b>
<b>Numbers</b>	Integers	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> <li>● Project</li> </ul>	Number lines, games on charts, number cards, steps, up and down stairs.	Prepare or improvise number lines games on charts.
	Cubes and cube roots	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> </ul>	Multiplication, cubes and cube root tables.	
	Indices and logarithms	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> </ul>	Mathematical tables Calculators.	
	Compound proportions and rates of work	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> </ul>	Digital clocks	

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
		<ul style="list-style-type: none"> <li>• Home or extended assignments or activities.</li> </ul>		
<b>Algebra</b>	Matrices	<ul style="list-style-type: none"> <li>• Class activities</li> <li>• Class written tests</li> <li>• Home or extended assignments or activities.</li> </ul>	Information from different sources on arrangement of items in rows and columns.	Carry out activities involving arranging objects from their immediate environment into rows and columns. This can be done at home. Take photos and share with class or school. Use the concept of organizing objects/items at school and home.
	Equations of a straight line	<ul style="list-style-type: none"> <li>• Class activities</li> <li>• Class written tests</li> <li>• Home or extended assignments or activities.</li> </ul>	Rulers, drawing tools, graph papers/ squared books	
	Linear inequalities	<ul style="list-style-type: none"> <li>• Class activities</li> <li>• Class written tests</li> </ul>	Rulers, drawing tools, graph papers/ squared books	

<b>Strand</b>	<b>Sub-strand</b>	<b>Suggested Assessment Methods</b>	<b>Suggested Learning Resources</b>	<b>Suggested Non-Formal Activities</b>
		<ul style="list-style-type: none"> <li>● Home or extended assignments or activities.</li> </ul>		
<b>Measurement</b>	Area	<ul style="list-style-type: none"> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> </ul>	Square cut outs, squares, writing materials	
	Volume of solids	<ul style="list-style-type: none"> <li>● Class written tests</li> <li>● Home or extended assignments or activities</li> <li>● Project</li> </ul>	Solids such as prisms, pyramids, cones, spheres	Make models of prisms, pyramids cones and spheres that can be used as learning resources for Mathematics and other subjects.
	Mass, volume, weight and density	<ul style="list-style-type: none"> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> </ul>	Solids such as prisms, pyramids, cones, spheres	
	Time, distance and speed	<ul style="list-style-type: none"> <li>● Class written tests</li> <li>● Home or extended assignments or activities</li> </ul>	Clocks, ropes, metre rule, globe, maps, digital devices	Use digital devices or maps and other resources to determine local time of different cities in the world. Use this information to

<b>Strand</b>	<b>Sub-strand</b>	<b>Suggested Assessment Methods</b>	<b>Suggested Learning Resources</b>	<b>Suggested Non-Formal Activities</b>
		<ul style="list-style-type: none"> <li>● Project</li> </ul>		generate possible travel flight schedules.
	Money	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Home or extended assignments or activities</li> <li>● Project</li> </ul>	Currency dummies, paper cut out of foreign currencies	Prepare dummies or paper cut outs of currencies from different countries and role play currency exchange activities.
	Approximation and errors	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Home or extended assignments or activities.</li> </ul>	Rulers, digital clocks	
<b>Geometry</b>	Coordinates and graphs	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities.</li> </ul>	Rulers, plotting/graph paper	
	Scale drawing	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities</li> </ul>	Pair of compasses, Rulers, Straight edges	Observe the position of different structures or objects in the school or home compound and sketch. Estimate the distance between

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
		<ul style="list-style-type: none"> <li>● Project</li> </ul>		the structures or objects and scale draw the school or home compound.
	Similarity and enlargement	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> <li>● Home or extended assignments or activities</li> <li>● project</li> </ul>	Similar containers, objects of different sizes	Collect similar containers from the immediate environment including home, discuss how they are used especially in packaging different quantities. Discuss how packaging can be used to protect consumers.
	Trigonometry	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> </ul>	Pair of compasses, Rulers, Straight edges	
<b>Data handling and probability</b>	Data interpretation (Grouped data)	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> </ul>	Data from different sources	
	Probability	<ul style="list-style-type: none"> <li>● Class activities</li> <li>● Class written tests</li> </ul>	Coins, dice, Data from different sources	

## **APPENDIX 2: USE OF ICT TOOLS**

The following ICT tools may be used in learning and teaching of mathematics at this level:

1. Learner digital devices (**LDD**)
2. Teacher digital devices(**TDD**)
3. Mobile phones
4. Digital clocks
5. Television sets
6. Videos
7. Cameras
8. Projectors
9. Radios
10. DVD players
11. CD's
12. Scanners
13. Internet
14. Other resources.