KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

A Skilled and Ethical Society

JUNIOR SCHOOL CURRICULUM DESIGN

MATHEMATICS

GRADE 9

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FOREWORD

The Government of Kenya is committed to ensuring that policy objectives for Education, Training and Research meet the aspirations of the Constitution of Kenya 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, Primary and Junior School levels.

The implementation of Competency Based Curriculum involves monitoring and evaluation to determine its success. After the five-year implementation cycle, a summative evaluation of the primary education cycle was undertaken to establish the achievement of learning outcomes as envisaged in the Basic Education Curriculum Framework. The Government of Kenya constituted a Presidential working Party on Education Reforms(PWPER) in 2022 to address salient issues affecting the education sector. PWPER made far reaching recommendations for basic education that necessitated curriculum review. The recommendations of the PWPER, monitoring reports, summative evaluation, feedback from curriculum implementers and other stakeholders led to rationalisation and review of the basic education curriculum.

The reviewed 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 School.

The curriculum designs present National Goals of Education, essence statements, general and specific expected learning outcomes for the 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, 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) nationally implemented Competency Based Curriculum (CBC) in 2019. Grade 9 is the final grade in Junior School in the reformed education structure.

The reviewed Grade 9 curriculum furthers implementation of the CBC from Grade 8 in Junior School. Grade 9 curriculum furthers implementation of the CBC from Grade 7. 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. They 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 School. Furthermore, it is my hope that teachers will use the designs to make learning interesting, exciting and enjoyable.

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ACKNOWLEDGEMENT

The Kenya Institute of Curriculum Development (KICD) Act Number 4 of 2013 (Revised 2019) mandates the Institute to develop and review 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)2017, that responds to the demands of the 21st Century and the aspirations captured in the Constitution of Kenya 2010, the Kenya Vision 2030, East African Community Protocol, International Bureau of Education Guidelines and the United Nations Sustainable Development Goals (SDGs).

KICD receives its funding from the Government of Kenya to facilitate 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 revised Grade 9 curriculum designs were developed with the support of the World Bank through the Kenya Primary Education Equity in Learning Programme (KPEELP); a project coordinated by MoE. Therefore, the Institute is very grateful for the support of the Government of Kenya, through the MoE and the development partners for policy, resource and logistical support. Specifically, special thanks to the Cabinet Secretary-MoE and the Principal Secretary-State Department of 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 and other members of the Council for very consistent guidance in the process.

We assure all teachers, parents and other stakeholders that this curriculum design will effectively guide the implementation of the CBC at Grade 9 and preparation of learners for transition to Senior School.

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DIRECTOR/CHIEF EXECUTIVE OFFICER
KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

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NATIONAL GOALS OF EDUCATION

Education in Kenya should:

1. **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.

2. **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.

   i) **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.

   ii) **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.

   iii) **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.

3. **Promote individual development and self-fulfilment**

   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.

4. **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.

5. **Promote social equity and responsibility**
   Education **respect** 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.

6. **Promote 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.

7. **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.

8. **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.

LESSON ALLOCATION

S/No	Learning Area	Number of Lessons Per Lesson (40 Minutes Per Lesson)
1.	English	5
2.	Kiswahili / Kenya Sign Language	4
3.	Mathematics	5
4.	Religious Education	4
5.	Social Studies	4
6.	Integrated Science	5
7.	Pre-Technical Studies	4
8.	Agriculture	4
9.	Creative Arts and Sports	5
	Pastoral /Religious Instructional Program	1*
Total		**40 + 1***

LEARNING OUTCOMES FOR JUNIOR SCHOOL

By end of Junior 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

SUMMARY OF STRANDS AND SUB STRANDS

Strands	Sub Strands	Suggested Number of Lessons
1.0 Numbers	1.1 Integers	6
	1.2 Cubes and Cube Roots	6
	1.3 Indices and Logarithms	8
	1.4 Compound Proportions and Rates of Work	9
2.0 Algebra	2.1 Matrices	8
	2.2 Equation of a Straight Line	15
	2.3 Linear Inequalities	6
3.0 Measurements	3.1 Area	8
	3.2 Volume of Solids	8
	3.3 Mass, Volume, Weight and Density	8
	3.4 Time, Distance and Speed	10
	3.5 Money	7
	3.6 Approximations and Errors	4
4.0 Geometry	4.1 Coordinates and Graphs	6
	4.2 Scale Drawing	14
	4.3 Similarity and Enlargement	8
	4.4 Trigonometry	7
5.0 Data Handling and Probability	5.1 Data Interpretation (Grouped Data)	6
	5.2 Probability	6
Total Number of Lessons		**150**
Note: The suggested number of lessons per sub strand may be less or more depending on the context.		

STRAND 1.0: NUMBERS

Sub strand: Integers

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers	**1.1 Integers** *Simple and combined operations on Integers*	By the end of the Sub Strand the learner should be able to: a) perform basic operations on Integers in different situations, b) work out combined Operations on Integers in different situations, c) apply Integers to real life situations, d) appreciate use of integers in real life situations.	The learner is guided to: • discuss and work out basic operations on integers using number cards and charts, • play games involving numbers and operations by picking integers and performing all basic operations, • work out combined operations of integers in the correct order, • carry out activities such as reading temperature changes in a thermometer and discuss how to record it. Consider temperatures below zero points and consider cases of use of integers in real life, • use IT tools and other resources such as print to	1. How do we carry out operations of integers in real life situations? 2. How do we apply integers in daily activities?

			carry out operations on integers, • play creative games that involve integers.	

Core Competencies to be developed;

- Critical thinking and problem solving- interpretation and inference: as learners work out combined operations of integers in the correct order.
- 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.
- Digital literacy- interacting with technologies; as learners use IT devices to determine temperature.

Values

- Respect; as learners work in pairs/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 common set goals of reading thermometer.

Pertinent and Contemporary Issues (PCIs):

Environmental education; as learners read temperature changes in a thermometer that tell about the climate

Link to other learning areas:

Learners discuss using language skills on how to work out combined operations of integers in the correct order.

Sub strand: Cubes and cube roots

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers	**1.2 Cubes and Cube Roots** (5 Lessons) *cubes and cube roots of numbers by multiplication, mathematical tables and calculator*	By the end of the Sub Strand the learner should be able to: a) work out cubes of numbers by multiplication in real life situations, b) determine cubes of numbers from mathematical tables in different situations, c) determine cube roots of numbers by factor method in different situations, d) determine cube roots of numbers from mathematical tables in different situations, e) determine cube and cube roots of numbers using a calculator, f) apply cubes and cube roots in real life situations.	The learner is guided to: • use stacks of cubes to demonstrate the concept of cube and cube roots, • demonstrate stacking of cubes, • discuss the volume of a cube and determine both the cube and cube root and relate the two, • read the cube of numbers from mathematical tables and relate to cube roots, • use calculators to work out cube and cube roots of numbers.	1. How do we work out the cubes of numbers? 2. How do we work out the cube roots of numbers? 3. Where do we apply cubes and cube roots in real life situations?
Core Competencies to be developed: • Communication and collaboration- speaking and listening; as the learner works with peers to use stacks of cubes to demonstrate the concept of cube and cube roots.				

• Imagination and creativity- open mindedness and creativity: as the learner determines both the cube and cube root and relate the two.
Values: Respect: as the learner appreciates each other's contribution in the discussions on volume of cubes.
Pertinent and Contemporary Issues (PCIs): Environmental awareness: as the leaner uses stacks of cubes to demonstrate the concept of cube and cube roots, relate to objects in the environment.
Link to other learning areas: The learner is able to relate the concept of volume to derived quantities in integrated science.

Sub strand: Matrix

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Algebra	**1.3 Indices and Logarithms** (6 Lessons) • *numbers in index form* • *laws of indices* • *Powers of 10 to common logarithms*	By the end of the Sub Strand the learner should be able to: a) express numbers in index form in different situations, b) generate 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) appreciate use of indices and logarithms in real life situations.	The learner is guided to: • discuss indices and identify the base, • show the laws of indices using multiplication and division, • use the laws of indices to work out indices, • discuss and relate powers of 10 to common logarithms, • use IT to work out common logarithms or use mathematical tables.	How do we express numbers in powers?

Core Competencies to be developed:

- Critical thinking and problem solving: as learner shows the laws of indices using multiplication and division.
- Self-efficacy: as learner discusses and relates powers of 10 to common logarithms

Values:

- Responsibility: as learner takes the roles in turns to lead the teams in discussions on indices.
- Unity: as learner measures capacity in groups.

Pertinent and Contemporary Issues (PCIs):

Learner relates self-awareness to his/her own ideas as he/she discusses concept of Indices.

Link to other learning areas:

Learner relates expressing numbers as indices and powers as used in Integrated Science.

Sub strand: Matrix

Strand	Sub Strand	Specific Learning Outcome	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers	**1.4 Compound Proportions and Rates of Work** (12 Lessons) • *proportional parts* • *ratios* • *rates of work*	By the end of the Sub Strand, the learner should be able to: a) divide quantities into proportional parts in real life situations, b) relate different proportional parts in real life situations, c) work out compound proportions using ratio method in different situations, d) calculate rates of work in real life situations, e) appreciate use of compound proportions and rates of work in real life situations.	The learner is guided to: • discuss and divide quantities into proportional parts and express as a fraction, • compare and write different ratios, • determine compound proportions using ratios, • work out rates of work, • play games on rates of work using IT devices.	1. What are proportions? 2. Why do we work fast?

Core Competencies to be developed:

- Citizenship- active community life skills: as learner works with peers to discuss and divide quantities into proportional parts and express as a fraction.
- Critical thinking and problem solving- interpretation and inference; as learner works out rates of work.

Values:

- Responsibility; as learner commits to working out answers of given tasks on rates.
- Respect: as learner works out rates of work cooperatively.

Pertinent and Contemporary Issues (PCIs): Self-esteem: as learner devices personal strategies to estimate products in multiplication.
Link to other learning areas: Agriculture helps learner estimate harvests, seeds or fertilizer during sowing or application as part of rates of work.

Suggested Assessment Rubric

Level **Indicator**	**Exceeds Expectations**	**Meets Expectations**	**Approaches Expectations**	**Below Expectations**
Ability to work out combined operations on Integers (addition, subtraction, multiplication and division)	The learner works out combined operations on Integers accurately and Systematically	The learner works out combined operations on Integers accurately	The learner works out combined operations of any 3 of the operations on Integers accurately	The learner works out combined operations of any 2 of the operations on Integers partially accurately
Ability to Work out cubes and cue roots of numbers by multiplication and from mathematical tables	The learner works out cubes and cube roots of numbers by multiplication and from mathematical tables accurately and systematically	The learner works out cubes and cube roots of numbers by multiplication and from mathematical tables accurately	The learner works out cubes or cube roots of numbers by multiplication or from mathematical tables accurately	The learner works out cubes or cube roots of numbers by multiplication or from mathematical tables partially accurately
Ability to generate and apply the laws of Indices	The learner generates and applies the laws of Indices correctly and Systematically	The learner generates and applies the laws of Indices correctly	The learner generates or applies the laws of Indices correctly	The learner generates the laws of Indices correctly

Level / Indicator	Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Ability to relate Powers of 10 to common logarithms	The learner relates Powers of 10 to common logarithms Comprehensively	The learner relates Powers of 10 to common logarithms accurately	The learner relates Powers of 10 to common logarithms partially accurately	The learner relates Powers of 10 to common logarithms incompletely
Ability to divide quantities into Proportional parts	The learner divides quantities into Proportional parts Precisely	The learner divides quantities into Proportional parts correctly	The learner divides some quantities into Proportional parts correctly	The learner divides few quantities into Proportional parts partially correctly
Ability to relate different ratios	The learner relates different ratios Comprehensively	The learner relates different ratios accurately	The learner relates different ratios partially accurately	The learner relates different ratios incompletely
Ability to work out Compound proportions using ratio method	The learner works out Compound proportions using ratio method Systematically	The learner works out Compound proportions using ratio method accurately	The learner works out some Compound proportions using ratio method accurately	The learner works out few Compound proportions using ratio method partially accurately
Ability to calculate rates of work	The learner calculates rates of work Systematically	The learner calculates rates of work correctly	The learner calculates rates of work partially correctly	The learner calculates rates of work incompletely

STRAND 2.0: ALGEBRA

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 **Algebra**	**2.1 Matrices** (8 lessons) *order of a matrix* *position of items in a matrix* *compatibility of matrices* *addition and subtraction of matrices*	By the end of the sub-strand the learner should be able to**;** a) identify a matrix in different situations. b) determine the order of a matrix in different situations. c) determine the position of items in a matrix in different situations. d) determine compatibility of matrices in addition and subtraction. e) carry out addition and subtraction of matrices in real life situations. f) reflect on the use of matrices in real life situations.	The learner is guided to; ● discuss the use of tables such as football league tables, travel schedules and shopping lists. Count the number of rows and columns in the table, which is a matrix. ● arrange items in rows and columns and discuss how to represent a matrix. ● organize objects in rows and columns and give the order of the matrix in terms of row and columns (row ***x*** column). ● discuss and identify the position of each item or element in terms of row and column. ● discuss and identify matrices that have equal number of rows and equal number of columns (same order) for compatibility in addition and subtraction. ● discuss and note what is represented by the rows and what	How do we use matrices in real life situations?

			is represented by the columns from two or more matrices to carry out addition or subtraction.	

Core competencies to be developed:

- Communication and collaboration – as the learner discusses use of tables to represent matrices.
- Learning to learn – as the learner arranges items or elements in rows and columns to form matrices.

Values:

Integrity - as learner organizes objects in rows and columns and give the order of the matrix

Pertinent and Contemporary Issues:

- Social and economic issues - as the learner discusses the use of tables such as football league tables and shopping lists.
- Citizenship - as the learners discusses how to use travel schedules to different places.

Link to other learning areas

Learner generates tables of results in sports and refers to league schedules and relates this to sporting activities in creative Arts and Sports.

Strand	Sub-Strand	Specific Learning Outcome	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Algebra	**2.2 Equation of a Straight Line** (15 lessons) • *gradient of a line* • *equation of a straight line* • *equation of a straight line in the form of* $y = mx + c$ • *the x and y intercepts of a straight line*	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. d) determine the equation of a straight line from a known point and a gradient. e) express the equation of a straight line in the form of $y = mx + c$ f) interpret the equation $y = mx + c$ in different situations. g) determine the *x* and *y* intercepts of a straight line. h) recognize the use of equations of straight lines in real life.	The learner is guided to; ● discuss steepness in relation to gradient from the immediate environment. ● 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. ● observe and climb up and down places such as the stairs or hills and relate to gradients. ● work out the equation of a straight line given two points or given a point and a gradient. ● discuss and rewrite the equation of a straight line as $y = mx + c$. Explain the variables and constants in the equation. ● work out the value of x when y is zero and the value of y when x is zero. ● use IT or other resources to show different hills and	How do we use gradient or steepness in our daily activities?

			mountains and discuss steepness.	

Core competencies to be developed:

- Digital literacy - as the learner uses IT or other resources to explore steepness or gradient of places.
- Learning to learn - as the learner places the ladder at different points on the ground as they discuss and compare steepness.

Values:

Integrity - as the learner observes gradient/steepness in staircases in buildings, bridges or ramps.

Pertinent and Contemporary Issues:

Safety - as the learner climbs up and down places such as the stairs or hills and relate to gradients.

Link to other learning areas:

- The learner relates the concept of gradient to making work easier in Integrated Science by use of an inclined plane.
- The learner relates the concepts of parallel and perpendicular lines to technical drawing in Pre-Technical studies.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Algebra	**2.3 Linear Inequalities** (6 lessons) • *linear inequalities in one unknown* • *linear inequality in two unknowns*	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; • discuss why sometimes resources are shared unequally. • discuss simple inequality statements, form and work out the inequalities in one unknown. • discuss and generate a table of values and draw linear inequalities in one unknown. Indicate and discuss the region that satisfies the inequalities. • discuss and generate a table of values and draw linear inequalities in two unknowns. Indicate and discuss the region that satisfies the inequalities. • discuss and work out linear inequalities that involve real life cases • use IT or other graphing tools to present linear inequalities	1. How do we represent linear inequalities in graphs? 2. How do we use linear inequalities in real life situations?
Core competencies to be developed: • Digital literacy - as the learner uses IT resources to present linear inequalities. • Communication and collaboration - as the learner discusses and generates table of values and draw linear inequalities.				
Values: Social justice - as the learner applies concepts of inequalities and equity in sharing available resources real in life situations.				

Pertinent and Contemporary Issues: Citizenship - as the learner discusses and indicates the regions that satisfy inequalities.
Link to other learning areas: Social Studies - as the learner relates inequality statements that may involve unequal distribution of resources in the community.

Suggested Assessment Rubrics

Level / Indicators	Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Ability to identify a Matrix and determine the position of items in a matrix	The learner identifies a Matrix and determines the position of items in a matrix accurately and systematically	The learner identifies a Matrix and determines the position of items in a matrix accurately	The learner identifies a Matrix and determines the position of some items in a matrix accurately	The learner identifies a Matrix and determines the position of few items in a matrix accurately
Ability to determine compatibility of Matrices in addition and subtraction and carry out addition and subtraction of matrices	The learner determines compatibility of Matrices in addition and subtraction and carries out addition and subtraction of matrices accurately and systematically	The learner determines compatibility of Matrices in addition and subtraction and carries out addition and subtraction of matrices accurately	The learner determines compatibility of Matrices in addition or subtraction and carries out addition or subtraction of matrices accurately	The learner determines compatibility of Matrices in addition or subtraction and carries out addition or subtraction of matrices partially accurately
Ability to identify the gradient and determine the gradient of a Straight line from two known points	The learner Identifies the gradient and determines the gradient of a Straight line from two known points accurately and systematically	The learner Identifies the gradient and determines the gradient of a Straight line from two known points accurately	The learner Identifies the gradient or determines the gradient of a Straight line from two known points accurately	The learner Identifies the gradient or determines the gradient of a Straight line from two known points partially accurately

Level / Indicators	Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Ability to determine the equation of Straight line from a known point and a gradient and express the equation of a straight line in the form of $y = mx + c$	The learner determines the equation of Straight line from a known point and a gradient and expresses the equation of a straight line in the form of $y = mx + c$ accurately and systematically	The learner determines the equation of Straight line from a known point and a gradient and expresses the equation of a straight line in the form of $y = mx + c$ accurately	The learner determines the equation of Straight line from a known point and a gradient or expresses the equation of a straight line in the form of $y = mx + c$ accurately	The learner determines the equation of Straight line from a known point and a gradient or expresses the equation of a straight line in the form of $y = mx + c$ partially accurately
Ability to Interpret the equation $y = mx + c$ and determine the *x* and *y* intercepts of a straight line	The learner Interprets the equation $y = mx + c$ and determines the *x* and *y* intercepts of a straight line accurately and comprehensively	The learner Interprets the equation $y = mx + c$ and determines the *x* and *y* intercepts of a straight line accurately	The learner Interprets the equation $y = mx + c$ or determines the *x* or *y* intercepts of a straight line accurately	The learner Interprets the equation $y = mx + c$ or determines the *x* or *y* intercepts of a straight line partially accurately
Ability to draw the graph of a straight line given the equation, relate and apply gradients of Parallel and perpendicular lines.	The learner draws the graph of a straight line given the equation, relates and applies gradients of Parallel and perpendicular lines accurately and creatively	The learner draws the graph of a straight line given the equation, relates and applies gradients of Parallel and perpendicular lines accurately	The learner draws the graph of a straight line given the equation or relates or applies gradients of Parallel or perpendicular lines accurately	The learner draws the graph of a straight line given the equation or relates or applies gradients of Parallel lines accurately
Ability to solve linear inequality in one unknown and represent linear inequality in one and two unknowns graphically	The learner solves linear inequality in one unknown and represents linear inequality in one and two unknowns graphically correctly and systematically	The learner solves linear inequality in one unknown and represents linear inequality in one and two unknowns graphically correctly	The learner solves linear inequality in one unknown or represents linear inequality in one or two unknowns graphically correctly	The learner solves linear inequality in one unknown or represents linear inequality in one unknown graphically correctly

STRAND 3.0: MEASUREMENTS

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.1 Area** (8 lessons) • *area of a pentagon and a hexagon* • *surface area of triangular and rectangular based prisms* • *surface area of triangular, rectangular and square based pyramids, cones and sphere.* • *area of a sector and segment of a circle*	By the end of the sub-strand the learner should be able to; a) calculate the area of a pentagon and a hexagon in different situations. b) work out the surface area of triangular and rectangular based prisms. c) work out the surface area of triangular, rectangular and square based pyramids. d) calculate the area of a sector and segment of a circle. e) work out the surface area of a cone in real life situations.	The learner is guided to; ● discuss the properties of regular polygons and use cut outs to work out the area of pentagons and hexagons. ● collect from the environment objects that are spheres, cones/funnels, pyramids, prisms and frustums. ● discuss and sketch the nets of the solids. ● use models of prisms to work out the surface area of prisms. ● 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.	How do we work out the area of different surfaces?

		f) calculate the surface area of a sphere in real life situations. g) recognize the use of area in real life situations.	• 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. • open the cone to form a net and determine the curved surface area of a cone. Work out the surface area of a closed and an open cone. • use relevant formulas to work out the surface area of different sizes of spherical balls. • use IT or other resources to sketch different models and nets • explore ethno math; patterns in fabrics, structures such as pyramids, prisms and circles.	

Core competencies to be developed: ● Communication and collaboration – as the learner works with peers to discuss the properties of regular polygons and use cut outs to work out the area of pentagon and hexagon. ● Creativity and imagination – as the learner opens nets of different models and work out surface area.
Values: Responsibility – as the learner takes care and work out surface area using models and open nets of different objects.
Pertinent and Contemporary Issues: Patriotism – as the learner collects objects from the environment, use and dispose of them safely.
Link to other learning areas: Pre-Technical Studies as the learner uses models and open nets of different objects to work out surface area.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.2 Volume of Solids** (8 lessons) • *volume of a triangular and rectangular based prisms* • *volume of a triangular, rectangular and squares based pyramids* • *the volume of a frustum and a sphere*	By the end of the sub-strand the learner should be able to; a) work out the volume of a triangular and rectangular based prisms. b) calculate the volume of a triangular, rectangular and squares based pyramids.. c) work out the volume of a cone in real life situations. d) determine the volume of a frustum in real life situations. e) calculate the volume of a sphere in real life situations. f) promote use of volume and capacity of different containers in real life situations.	The learner is guided to; ● collect different containers and objects. This may include prisms, pyramids, cones, funnels and balls. ● identify and discuss the model of a prism. Using the relevant formulas, determine the volume of a prism. ● use relevant formulae to work out the volume of pyramids and cones. ● 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. ● Play any games involving different sizes of balls and work out volume of a sphere.	1. How do we determine the volume of different solids? 2. How do we use the volume of solids in real life situations?

			● use IT or other resources to determine the volumes of solids.	

Core competencies to be developed:

- Critical thinking and problem solving – as the learner identifies and works out the volume of a frustum from a pyramid
- Creativity and Imagination – as the learner identifies, discusses and works out volume of solids.

Values:

- Responsibility – as the learner takes care of the models of pyramids, cones, and spheres.
- Patriotism - as the learner collects objects from the environment to determine and discuss models/objects for different volumes of solids.

Pertinent and Contemporary Issues:

- Environmental Education – as the learner takes care of the environment while collecting the containers and objects.
- Safety - as the learner collects containers and objects cautiously.

Link to other learning areas;

Creative Arts and sports - as the learner makes models of pyramids, cones/funnels and spheres/balls from available materials.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.3 Mass, Volume, Weight and Density** **(**8 Lessons**)** • *Conversions of units of mass* • *Relating mass and weight* • *mass, volume and density of substances*	By the end of the sub-strand the learner should be able to; a) convert units of mass from one form to another in different situations, b) relate mass and weight in real life situations. c) determine mass, volume and density of different substances, d) apply density to real life situations, e) recognize the use of density in daily life.	The learner is guided to; ● discuss different instruments and tools used in weighing materials or objects and relate to consumer awareness and protection. ● Collect and weigh different materials or objects and change one unit of mass to another. ● discuss the relationship between mass and weight. ● carry out activities relating mass and volume to density using containers or different substances. ● discuss and find the density of different materials or objects. ● work out mass, volume and density using IT or other resources.	How do you weigh materials and objects?

Core competencies to be developed:

- Communication and collaboration – as the learner discusses the relationship between mass and weight.
- Creativity and imagination – as the learner determines the density of different materials or objects.
- Digital literacy – as the learner uses IT devices to determine the mass, volume and density of different objects.

Values: ● Integrity – as the learner gives correct masses and weights of different material and objects. ● Responsibility – as the learner works 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 where weighing tools are used. ● Self-awareness – as the learner weighs themselves for health purposes.
Link to other learning areas: Integrated Science – as the learner uses machines and tools which involve weighing different substances.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.4 Time, Distance and Speed** (10 lessons) • *Speed in km/h and m/s* • *Average speed* • *Acceleration* • *Longitudes and local time*	By the end of the sub- strand the learner should be able to; a) work out speed in km/h and m/s in real life situations. b) work out average speed in real life situations. c) determine velocity in real life situations. d) work out acceleration in real life situations. e) identify the longitudes on the globe. f) relate longitudes to time on the globe. g) determine local time of places on the earth along different longitudes. h) appreciate use of time and distance in real life situations.	The learner is guided to; ● engage in activities that will involve measuring distances and time, for example running track events to determine speed. ● discuss and relate distance and time. ● discuss the difference between velocity and speed. ● discuss and determine acceleration from track events in school or community. ● discuss and use maps and models of a globe to work out and relate time of different places on the earth. ● use IT devices to watch videos on the globe, longitudes and time zones in different parts of the earth.	1. How do we observe speed in daily activities? 2. Why does time vary in different places of the world?

			● use other resources such as maps to locate different places (cities) on the earth and discuss time differences.	

Core competencies to be developed:

- Self-efficacy – as the learner participates in track events to measure speed.
- Digital literacy -as the learner uses IT devices to determine time in different zones in the world.
- Citizenship- global citizenship as the learner determines local time in different parts of the world.

Values:

- Integrity- as the learner correctly records individual running time during track events and other games.
- Respect - as the learner adheres to their lanes on track events and other games.

Pertinent and Contemporary Issues:

- Safety - as the learner observes safety measures and time during games and sports.
- Education for Sustainable Development (ESD) - as the learner participates and chooses careers in games and sporting activities.
- Self-awareness - as the learner participates and times themselves in games.

Link to other learning areas:

Integrated Science - as the learner uses digital devices such as digital clock to tell time in different zones of the world.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.5 Money** (7 lessons) • *Currencies of other countries* • *Currency conversions* • *Export, import and excise duties* • *Value added tax*	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) determine export duties charged on goods in real life situations, d) determine import duties charged on goods e) work out excise duty charged on goods and services in real life situations, f) calculate value added tax charged on goods and services, g) appreciate use of money in day to day activities.	The learner is guided to; ● 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, Japanese Yen and Sterling pound. ● work out currency exchange from Kenya Shillings to any other currency and vice versa ● identify currency exchange rates from different sources including daily papers, IT devices, financial institutions and relate this to consumer awareness and protection ● discuss and work out the export duties charged on different goods sold to other countries. ● discuss and work out import duties charged on goods given customs value of the goods where customs value is the cost	1. Why do we change currencies from one form to another? 2. How do we determine taxes charged on different goods.

			of goods at the point of entry to the country, ● discuss and identify local goods that attract excise duty. Determine excise duty of different goods. ● discuss and determine duty on imported goods, ● use receipts from shopping or other resources to discuss and work out VAT on local goods and services. ● search and work out VAT of imported goods.	
Core competencies to be developed: ● Global Citizenship - as the learner discusses about different currencies various countries of the world. ● Digital Literacy - as the learner uses digital devices to learn about exchange rates for foreign currency.				
Values: ● Integrity - as the learner accurately works out currency exchange rates. ● Social Cohesion - as the learner works and appreciates exchange rates for other countries.				
Pertinent and Contemporary Issues: ● Financial Literacy - as the learner learns the currencies used in different countries ● Education for Sustainable Development (ESD) - as the learner chooses careers in business, imports and exports.				
Link to other learning areas: Pre-Technical Studies - as the learner works out VAT and currency exchange rates.				

Strand	Sub-strand	Specific Learning Outcome	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Measurements	**3.6 Approximations and Errors** **(**4 lessons**)** • *errors from estimations and actual measurements* • *percentage* errors	By the end of the sub-strand the learner should be able to; a) approximate quantities in measurements in different situations, b) determine errors using estimations and actual measurements of quantities, c) determine percentage errors using actual measurements of quantities, d) appreciate approximations and errors in real life situations.	The learner is guided to; ● carry out activities of measurements of different quantities such as length, area, volume, capacity and mass using arbitrary units. ● estimate and measure different quantities using appropriate instruments. compare the estimates and the actual measurements and determine the error. ● work out the percentage error from the estimated and the actual measurements ● work out errors using IT devices or other resources and relate this to consumer awareness.	How do we estimate measurements of different quantities?
Core competencies to be developed: ● Creativity and imagination - as the learner carries out measurements of different quantities and discuss error. ● Digital literacy - as the learner uses IT devices to compute errors.				

Values: ● Integrity - as the learner measures different quantities and minimize errors. ● Responsibility - as learner takes care of tools for measuring different quantities.
Pertinent and Contemporary Issues: Safety - as the learner handles measuring tools with care.
Link to other learning areas: Integrated science - as the learner measures different quantities that may involve errors as they carry out experiments.

Suggested Assessment Rubric

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to calculate the Area of a pentagon and a hexagon.	The learner calculates the area of a pentagon and a hexagon correctly and proficiently.	The learner calculates the area of a pentagon and a hexagon correctly	The learner calculates the area of a pentagon or a hexagon correctly	The learner calculates the area of a pentagon correctly
Ability to work out the surface Area of a prism and pyramid.	The learner works out the surface area of a prism and a pyramid accurately and systematically.	The learner works out the surface area of a prism and a pyramid accurately	The learner works out the surface area of a prism or a pyramid accurately	The learner works out the surface area of a prism partially accurately
Ability to calculate the area of a sector and segment of a circle.	The learner calculates the area of a sector and segment of a circle correctly and systematically.	The learner calculates the area of a sector and segment of a circle correctly	The learner calculates the area of a sector or segment of a circle correctly	The learner calculates the area of a sector of a circle correctly

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to work out the surface area of a cone and a sphere.	The learner works out the surface area of a cone and a sphere accurately and systematically.	The learner works out the surface area of a cone and a sphere accurately	The learner works out the surface area of a cone or a sphere accurately	The learner works out the surface area of a cone accurately
Ability to work out the Volume a triangular, rectangular and square based prisms and pyramids.	The learner works out the volume of a triangular, rectangular and square based prisms and pyramids correctly and systematically.	The learner works out the volume of a triangular, rectangular and square based prisms and pyramids correctly	The learner works out the volume of a triangular, rectangular or square based prisms or pyramids correctly	The learner works out the volume of a triangular or rectangular based prisms correctly
Ability to work out the Volume of a cone, frustum and sphere.	The learner works out the volume of a cone, frustum and sphere correctly and systematically.	The learner works out the volume of a cone, frustum and sphere correctly	The learner works out the volume of a cone, frustum or sphere correctly	The learner works out the volume of a cone correctly
Ability to determine the mass, volume and density.	The learner determines mass, volume and density correctly and systematically	The learner determines mass, volume and density correctly	The learner determines mass, volume or density correctly	The learner determines mass or volume correctly
Ability to work out speed in Km/h and m/s, velocity and acceleration.	The learner works out speed in Km/h and m/s, velocity and	The learner works out speed in Km/h and m/s, velocity and	The learner works out speed in Km/h and m/s, velocity or acceleration accurately	The learner works out speed in Km/h and m/s, accurately

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
	acceleration accurately and systematically	acceleration accurately		
Ability to determine local time of places on the earth along different longitudes.	The learner determines local time of places on the earth along different longitudes correctly and systematically	The learner determines local time of places on the earth along different longitudes correctly	The learner determines local time of some places on the earth along different longitudes correctly	The learner determines local time of few places on the earth along different longitudes partially accurately
Ability to identify currencies used in different countries and convert currency from one form to another	The learner identifies currencies that are used in different countries and converts currency from one form to another accurately and comprehensively	The learner identifies currencies that are used in different countries and converts currency from one form to another accurately	The learner identifies currencies that are used in different countries or converts currency from one form to another accurately	The learner identifies currencies that are used in different countries accurately
Ability to work out import, export, excise duties and determine Value Added Tax	The learner works out import, export and excise duties and determines Value Added Tax correctly and systematically	The learner works out import, export and excise duties and determines Value Added Tax correctly	The learner works out import, export or excise duties or determines Value Added Tax correctly	The learner works out import, export or excise duties correctly
Ability to approximate quantities in measurements and determine errors using	The learner approximates quantities in measurements and determines errors using	The learner approximates quantities in measurements and	The learner approximates quantities in measurements or	The learner approximates quantities in measurements or

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
estimations and actual measurements of quantities.	estimations and actual measurements of quantities accurately and systematically	determines errors using estimations and actual measurements of quantities accurately	determines errors using estimations or actual measurements of quantities accurately	determines errors using estimations accurately

STRAND 4.0: GEOMETRY

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 Geometry	**4.1 Coordinates and Graphs** (6 lessons) • *straight line graph* • *parallel and perpendicular lines* • *gradients of parallel and perpendicular lines*	By the end of the sub-strand, the learner should be able to; a) plot out points on a Cartesian plane b) draw a straight line graph given an equation. c) draw parallel lines on the Cartesian plane. d) relate the gradients of parallel lines. e) draw perpendicular lines on the Cartesian plane. f) relate the gradients of perpendicular lines. g) apply graphs of straight line in real life situation	The learner is guided to; ● work with peers and locate the point of intersection of the x coordinate and the y-coordinates on a Cartesian plane. ● generate a table of values from equation a of a straight line, plot and join the points to form a straight line. ● generate table of values for each of the given equations, plot and join them to form straight lines on the Cartesian plane ● work out the gradients of each of the lines and compare them to establish their relationship of parallelism. ● 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	1. How do we draw graphs of straight lines? 2. How do we interpret graphs of straight lines?

			● work out the gradients of each of the lines and compare them to establish the relationship of perpendicular lines.	

Core Competencies to be developed:

- Communication and collaboration – as the learner works with peers to locate the point of intersection of straight lines.
- Critical thinking and problem solving - as the learner generates a table of values.

Values:

Responsibility - as the learner takes care of graphing instruments and other resources.

Pertinent and Contemporary Issues:

- Education for Sustainable Development (ESD) - as the learner generates tables of values and draw graphs of straight lines.
- Safety - as the learner handles graphing instruments with sharp ends.

Link to other learning areas:

Integrated Science - as the learner plots graphs of straight lines of different quantities measured in sciences.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 Geometry	**4.2 Scale Drawing** (14 lessons) • *compass and true bearings* • *bearing of a point* • *angles of elevation and depression* • *simple* surveying	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 a point from another point in real life situations. c) locate a point using bearing and distance in real life situations. d) identify angles of elevation in real life situations. e) determine angles of elevation in different situations. f) identify angles of depression in real life situations. g) determine angles of depression in different situations. h) apply scale drawing in simple surveying.	Leaner is guided to: ● draw and discuss the compass directions and relate to the compass and true North bearings. ● discuss and locate places from different points using bearings. ● discuss and locate a place using bearing and distance. Sketch and use scale drawing to show the position of places from given points. ● 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. ● carryout different activities involving angles of depression, for example observing different objects or points that are below.	How do we use scale drawing in real life?

		i) appreciate the use of scale drawing in real life situations.	● discuss, sketch and make a scale drawing to determine the angles of depression. ● discuss and use scale drawing in simple surveying. ● observe maps or watch videos on bearings and simple surveying.	
Core competencies to be developed: ● Creativity and imagination - as the learner sketches and determines angles of elevation and depression ● Citizenship - as the learner use scale drawing in simple surveying				
Values: ● Unity - as the learner sketches, discusses and agrees on points in simple surveying. ● Social Cohesion - as the learner observe maps and watch videos on land surveying.				
Pertinent and Contemporary Issues: Learner discusses with others possible Careers in scale drawing and surveying.				
Link to other learning areas: Social Studies helps learner to work cooperatively with others to observe maps in surveying and locating bearing.				

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 Geometry	**4.3 Similarity and Enlargement** (8 lessons) • *similar figures* • *properties of enlargement* • *linear* scale factor	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. f) promote use of similarity and enlargement in real life situations.	The learner is guided to; ● collect objects and sort according to similarity. Discuss and note down properties of similar objects. ● use properties of similar objects to scale-draw similar figures. ● discuss and identify properties of enlargement. ● use properties of enlargement to represent objects and their images. ● determine the linear relationship of similar figures and objects. ● enlarge objects and figures using IT devices	1. What are similar objects? 2. How do we use enlargement in real life situations?
Core Competencies to be developed: ● Critical thinking and problem solving - as the learner draws similar and enlarged objects and figures. ● Digital literacy - as the learner learns and uses digital devices to enlarge objects and figures.				
Values: ● Responsibility - as the learner collects similar objects and take care of them in the learning process. ● Social cohesion - as the learner works in groups to draw similar objects and figures.				

Pertinent and Contemporary Issues: Environmental Education -as the learner collects similar objects from the environment.
Link to other learning areas: Pre-Technical Studies contributes to learner's scale-drawing skills of similar figures and objects.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 Geometry	**4.4 Trigonometry** (7 lessons) • *angles and sides of right angled triangles* • *trigonometric ratios for acute angles*	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. d) determine trigonometric ratios of acute angles using calculators e) apply trigonometric ratios to calculate lengths and angles of right angled triangles in different situations. f) appreciate use of trigonometric ratios in real life situations.	The learner is guided to: ● draw right angled triangles and recognize angles and sides. Discuss the relationship between angles and sides. ● discuss and relate the trigonometric ratios to angles in a right angled triangle. ● use trigonometric ratios to determine lengths and angles of right angled triangles ● use Mathematical tables or IT devices to find trigonometric ratios of given angles.	What is the relationship between angles and sides in a right angled triangle?
Core competencies to be developed: ● Critical thinking and problem solving - as the learner relates the trigonometric ratios to angles in a right angled triangle. ● Digital literacy - as the learner uses tables or calculators to find trigonometric ratios of given angles.				

Values: Responsibility - as the learner takes care of digital devices, mathematical tables and drawing materials.
Pertinent and Contemporary Issues: Safety - as the learner plugs and uses digital devices carefully.
Link to other learning areas: Pre-Technical Studies as the learner draws right angled triangles and recognizes angles and sides.

Suggested Assessment Rubric				
Level **Indicators**	**Exceeds Expectation**	**Meets Expectation**	**Approaches Expectation**	**Below Expectation**
Ability to draw a straight line graph given an equation, parallel and perpendicular lines	The learner draws a straight line graph given an equation and parallel and perpendicular lines accurately and precisely	The learner draws a straight line graph given an equation, parallel and perpendicular lines accurately	The learner draws a straight line graph given an equation, parallel or perpendicular lines accurately	The learner draws a straight line graph given an equation accurately
Ability to relate the gradients of parallel and perpendicular lines.	The learner relates the gradients of parallel and perpendicular lines correctly and Comprehensively.	The learner relates the gradients of parallel and perpendicular lines correctly	The learner relates the gradients of parallel or perpendicular lines correctly	The learner relates the gradients of parallel lines correctly
Determining the bearing of one point from another and angles of elevation and depression.	The learner determines the bearing of one point from another and angles of elevation and	The learner determines the bearing of one point from another and angles of elevation and depression correctly.	The learner determines the bearing of one point from another or	The learner determines the bearing of one point from another correctly.

	depression correctly and systematically.		angles of elevation or depression correctly.	
Applying scale drawing in simple surveying.	The learner applies scale drawing in simple surveying accurately and appropriately	The learner applies scale drawing in simple surveying accurately	The learner applies scale drawing in simple surveying partially accurately	The learner applies scale drawing in simple surveying incompletely
Ability to identify Angles and sides of right angled triangles.	The learner identifies angles and sides of right angled triangles accurately and systematically.	The learner identifies angles and sides of right angled triangles accurately.	The learner identifies angles or sides of right angled triangles accurately.	The learner identifies angles of right angled triangles accurately.
Ability to determine properties of enlargement, draw similar figures and determine the linear scale factor of similar figures.	The learner determines properties of enlargement, draws similar figures and determines the linear scale factor of similar figures accurately and concisely.	The learner determines properties of enlargement, draws similar figures and determines the linear scale factor of similar figures accurately	The learner determines properties of enlargement or draws similar figures or determines the linear scale factor of similar figures accurately	The learner determines properties of enlargement or draws similar figures accurately
Ability to identify Sine, Cosine and Tangent ratios from a right angled triangle.	The learner identifies Sine, Cosine and Tangent ratios from a right angled triangle accurately and consistently.	The learner identifies Sine, Cosine and Tangent ratios from a right angled triangle accurately.	The learner identifies any 2 of; Sine, Cosine or Tangent ratios from a right angled triangle accurately	The learner identifies any one of; Sine, Cosine or Tangent ratios from a right angled triangle accurately.

Ability to read tables of trigonometric ratios and determine trigonometric ratios of acute angles using calculators.	The learner reads tables of trigonometric ratios and determines trigonometric ratios of acute angles using calculators accurately and fluently.	The learner reads tables of trigonometric ratios and determines trigonometric ratios of acute angles using calculators accurately	The learner reads tables of trigonometric ratios or determines trigonometric ratios of acute angles using calculators accurately	The learner reads tables of trigonometric ratios accurately
Ability to apply trigonometric ratios to calculate lengths and angles of right angled triangles.	The learner applies trigonometric ratios to calculate lengths and angles of right angled triangles accurately and systematically	The learner applies trigonometric ratios to calculate lengths and angles of right angled triangles accurately	The learner applies trigonometric ratios to calculate lengths or angles of right angled triangles accurately.	The learner applies trigonometric ratios to calculate lengths of right angled triangles accurately

STRAND 5.0: DATA HANDLING AND PROBABILITY

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
5.0 Data Handling and Probability	**5.1 Data Interpretation (Grouped Data)** (6 lessons) • *frequency distribution tables of grouped data* • *modal class* • *mean and median of grouped data*	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: ● collect data and work out an appropriate class width. ● tally the data and represent it in a frequency distribution table. ● recognize the modal class from a set of grouped data. ● work out the mean from different sets of grouped data. ● use the frequencies to determine the median class of grouped data. ● work out the median from different sets of grouped data. ● ● use IT or other materials to determine the mean and median of grouped data. ● use digital devices or other materials to search for distances from school or home to health facilities using different roads or routes.	How do we interpret data?

Core competencies to be developed:

- Learning to learn - as the learner collects, organizes and interprets data.
- Critical thinking and problem solving - as the learner discusses and determines the modal class, mean and median of grouped data.
- Digital literacy - as the learner uses IT or other materials to determine the mean and median of grouped data.

Values:

Respect - as the learner works together with peers to collect data from the immediate environment.

Pertinent and Contemporary Issues:

Citizenship - as learner collects data that may relate to the population.

Link to other learning areas:

- Integrated science - as the learner interprets data related to different organisms and materials.
- The learner relates analyzing and interpreting data in different social aspects learnt in Social Studies.

Strand	Sub-strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
5.0 Data Handling and Probability	**5.2 Probability** **(**6 lessons) • *experiments involving equally and likely outcomes* • *range of probability of an event* • *exclusive and independent events* • *tree diagram*	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 g) appreciate the probability of events occurring in real life situations.	The learner is guided to; ● discuss and carry out experiments of events involving equally and likely outcomes. ● work out the range of probability of different events. ● discuss and carry out experiments involving mutually inclusive events. ● discuss and carry out experiments involving independent events. ● practice representing probability occurrences in a tree diagram. ● use IT or other resources to explore more on probability.	Why is probability important in real life situations?
Core Competencies to be developed: ● Communication and collaboration - as the learner discusses and carries out experiments of events involving equally likely outcomes. ● Critical thinking and problem solving - as the learner carries out experiments involving mutually inclusive events.				

● Self- efficacy -as the learner carries out experiments involving independent events and avoid harmful practices of gambling.
Values: ● Responsibility - as the learner discusses and carries out experiments involving mutually inclusive events ● Social cohesion - as the learner works in groups and practices representing probability occurrences in a tree diagram.
Pertinent and Contemporary Issues: Financial Literacy - as learners carries out experiments involving independent events and avoid harmful practices of gambling using money
Link to other learning areas: The learner works in teams to explore the weather patterns as they have learnt how it affects Agriculture.

Suggested Assessment Rubric

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to determine appropriate width and draw frequency distribution tables for grouping data.	The learner determines appropriate width and draw frequency distribution tables for grouping data accurately and systematically.	The learner determines appropriate width and draw frequency distribution tables for grouping data accurately	The learner determines appropriate width or draw frequency distribution tables for grouping data accurately	The learner determines appropriate width for grouping data accurately
Ability to determine the modal class, mean and the median of grouped data.	The learner determines the modal class, mean and the median of grouped data	The learner determines the modal class, mean and the median of grouped data accurately	The learner determines the modal class, mean or the median of grouped data accurately	The learner determines the modal class or mean of grouped data accurately

Level / Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
	accurately and systematically			
Ability to perform experiments involving equally likely outcomes, determine the range of probability of an event and identify mutually exclusive events.	The learner performs experiments involving equally likely outcomes, determines the range of probability of an event and identifies mutually exclusive events accurately and systematically.	The learner performs experiments involving equally likely outcomes, determines the range of probability of an event and identifies mutually exclusive events accurately	The learner performs experiments involving equally likely outcomes or determines the range of probability of an event or identifies mutually exclusive events accurately	The learner performs experiments involving equally likely outcomes or determines the range of probability of an event accurately
Ability to perform experiments of single chance involving mutually exclusive and independent events.	The learner performs experiments of single chance involving mutually exclusive and independent events correctly and systematically	The learner performs experiments of single chance involving mutually exclusive and independent events correctly	The learner performs experiments of single chance involving mutually exclusive or independent events correctly	The learner performs experiments of single chance involving mutually exclusive events correctly
Ability to draw a tree diagram for a single outcome.	The learner draws a tree diagram for a single outcome correctly and precisely.	The learner draws a tree diagram for a single outcome correctly.	The learner draws a tree diagram for a single outcome partially correctly	The learner draws a tree diagram for a single outcome incompletely

APPENDIX 1: GUIDELINES FOR INTEGRATING COMMUNITY SERVICE LEARNING (CSL) PROJECT

Introduction

In Grade 9, learners will undertake an integrated Community Service Learning (CSL) project of choice from a single or combined subject. The CSL project will enable the learner to apply knowledge and skills from other learning areas to address a problem in the community. The implementation of the integrated CSL project will take a Whole School Approach, where all members of the school community including teachers, school administration, parents/guardians/ local community and support staff. It will be a collaborative effort where the teacher of Social Studies coordinates and works with other subject teachers to design and implement the integrated CSL project. The teachers will select a theme drawn from different Learning Areas and the broader categories of Pertinent and Contemporary Issues (PCIs) for the CSL project. It should also provide an opportunity for development of core competencies and nurturing of values. Learners will undertake a **variety of** integrated CSL group projects in teams of following a 6-step milestone approach as follows:

Milestone	**Description**
Milestone 1	**Problem Identification** Learners study their community to understand the challenges faced and their effects on community members. Some of the challenges in the community can be: • Environmental degradation • Lifestyle diseases, Communicable and non-communicable diseases • Poverty • Violence and conflicts in the community • Food security issues

Milestone 2	**Designing a solution** Learners create an intervention to address the challenge identified.
Milestone 3	**Planning for the Project** Learners share roles, create a list of activities to be undertaken, mobilise resources needed to create their intervention and set timelines for execution
Milestone 4	**Implementation** The learners execute the project and keep evidence of work done.
Milestone 5	**Showcasing /Exhibition and Report Writing** Exhibitions involve showcasing learners' project items to the community and reflecting on the feedback Learners write a report detailing their project activities and learnings from feedback
Milestone 6	**Reflection** Learners review all project work to learn from the challenges faced. They link project work with academic concepts, noting how the concepts enabled them to do their project as well as how the project helped to deepen learning of the academic concepts.

Note: The milestones will be staggered across the 3 terms of the academic calendar.

Assessment of CSL integrated Project

Assessment for the integrated CSL group projects will be conducted formatively. The assessment will consider both the process and end product. This entails assessing each of the milestone stages of the integrated CSL group projects. They will focus on 3 components namely: skills from various learning areas applied in carrying out the projects, core competencies developed and values nurtured.

APPENDIX 2: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
Numbers	Integers	● Class activities ● Class written tests ● Home or extended assignments or activities. ● Project	Number lines, games on charts, number cards, steps, up and down stairs.	Prepare or improvise number lines games on charts.
	Cubes and cube roots	● Class activities ● Class written tests ● Home or extended assignments or activities.	Multiplication, cubes and cube root tables.	
	Indices and logarithms	● Class activities ● Class written tests ● Home or extended assignments or activities.	Mathematical tables Calculators.	
	Compound proportions and rates of work	● Class activities ● Class written tests ● Home or extended assignments or activities.	Digital clocks	
Algebra	Matrices	● Class activities ● Class written tests	Information from different sources on arrangement of	Carry out activities involving arranging objects from their

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
		● Home or extended assignments or activities.	items in rows and columns.	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	● Class activities ● Class written tests ● Home or extended assignments or activities.	Rulers, drawing tools, graph papers/ squared books	
	Linear inequalities	● Class activities ● Class written tests ● Home or extended assignments or activities.	Rulers, drawing tools, graph papers/ squared books	
Measurement	Area	● Class written tests ● Home or extended assignments or activities.	Square cut outs, squares, writing materials	
	Volume of solids	● Class written tests	Solids such as prisms, pyramids, cones, spheres	Make models of prisms, pyramids cones and spheres that can be used as learning

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
		● Home or extended assignments or activities ● Project		resources for Mathematics and other learning areas.
	Mass, volume, weight and density	● Class written tests ● Home or extended assignments or activities.	Solids such as prisms, pyramids, cones, spheres	
	Time, distance and speed	● Class written tests ● Home or extended assignments or activities ● Project	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 generate possible travel flight schedules.
	Money	● Class activities ● Home or extended assignments or activities ● Project	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	● Class activities ● Home or extended assignments or activities.	Rulers, digital clocks	

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
Geometry	Coordinates and graphs	● Class activities ● Class written tests ● Home or extended assignments or activities.	Rulers, plotting/graph paper	
	Scale drawing	● Class activities ● Class written tests ● Home or extended assignments or activities ● Project	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 the structures or objects and scale draw the school or home compound.
	Similarity and enlargement	● Class activities ● Class written tests ● Home or extended assignments or activities ● project	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	● Class activities ● Class written tests	Pair of compasses, Rulers, Straight edges	
	Data interpretation (Grouped data)	● Class activities ● Class written tests	Data from different sources	

Strand	Sub-strand	Suggested Assessment Methods	Suggested Learning Resources	Suggested Non-Formal Activities
Data handling and probability	Probability	● Class activities ● Class written tests	Coins, dice, Data from different sources	

APPENDIX 3: 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.