



KENYA INSTITUTE OF CURRICULUM DEVELOPMENT
A Skilled and Ethical Society

SENIOR SCHOOL CURRICULUM DESIGN

ESSENTIAL MATHEMATICS GRADE 11

OCTOBER, 2025

First Published in 2025

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: 978-9914-43-068-4

Published and printed by Kenya Institute of Curriculum Development

TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
NATIONAL GOALS OF EDUCATION	ii
THE SENIOR SCHOOL IN THE COMPETENCY BASED CURRICULUM.....	iv
LEARNING OUTCOMES FOR SENIOR SCHOOL.....	iv
TABLE 1: LIST OF SUBJECTS AT SENIOR SCHOOL	v
TABLE 2: LESSON DISTRIBUTION AT SENIOR SCHOOL	vi
ESSENCE STATEMENT	vii
SUBJECT GENERAL LEARNING OUTCOMES.....	viii
STRANDS	viii
SUMMARY OF STRANDS AND SUB STRANDS.....	ix
STRAND: NUMBERS AND ALGEBRA.....	1
STRAND 2.0: MEASUREMENTS AND GEOMETRY.....	10
STRAND 3.0: STATISTICS AND PROBABILITY.....	23
APPENDIX 1: SUMMARY OF RESOURCES, ASSESSMENT METHODS AND NON-FORMAL ACTIVITIES	28
APPENDIX 2: USE OF ICT TOOLS.....	31

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 resolving 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.

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 in the wake of rapid modernisation. 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 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 recognises 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 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 respect for and development of Kenya's rich and varied cultures.

Education should instil 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.

THE SENIOR SCHOOL IN THE COMPETENCY BASED CURRICULUM

Senior School is the fourth level of Basic Education in the Competency Based Curriculum (CBC) that the learner shall proceed to after the Pre-Primary School, Primary School and Junior School levels. The essence of Senior School is to offer learners a pre-tertiary/university/ pre-career experience in which the learners have an opportunity to choose pathways, tracks and subjects where they shall have demonstrated interest and/or potential at the earlier levels. Senior School comprises three years of education for learners generally in the 16-18 years age bracket and lays the foundation for further education and training at the tertiary level and the world of work. In the CBC vision, learners exiting this level are expected to be *engaged, empowered and ethical citizens* ready to participate in the socio-economic development of the nation.

At this level, the learner shall take seven (7) learning areas as recommended by the *Presidential Working Party on Educational Reforms* (PWPER, 2023). These shall comprise **four compulsory learning areas** namely: English, Kiswahili, Essential Mathematics/Core Mathematics and Community Service Learning (CSL). Learners will choose between Core Mathematics (for learners pursuing the Science Technology Engineering and Mathematics Pathway) and Essential Mathematics (for learners pursuing the non-STEM pathways). The learner will select three learning areas depending on their career choice, aptitude, interest and personality with guidance by the Senior School career teacher.

LEARNING OUTCOMES FOR SENIOR SCHOOL

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

1. communicate effectively and utilise information and communication technology across varied contexts,
2. apply mathematical, logical and critical thinking skills for problem solving,
3. apply basic research and scientific skills to manipulate the environment and solve problems,
4. exploit individual talents for leisure, self-fulfilment, career growth, further education and training,
5. uphold national, moral and religious values and apply them in day-to-day life,
6. apply and promote health care strategies in day-to-day life,
7. protect, preserve and improve the environment for sustainability,
8. demonstrate active local and global citizenship for harmonious co-existence,
9. demonstrate appreciation of diversity in people and cultures,
10. manage pertinent and contemporary issues responsibly.

TABLE 1: LIST OF SUBJECTS AT SENIOR SCHOOL

Core Subjects	Arts & Sports Science	Social Sciences	Science, Technology, Engineering & Mathematics (STEM)
1. English 2. Kiswahili/KSL 3. Core Mathematics/ Essential Mathematics 4. Community Service Learning (CSL)	5. Sports and Recreation 6. Music and Dance 7. Theatre and Film 8. Fine Arts	9. Literature in English 10. Indigenous Languages 11. Fasihi ya Kiswahili 12. Sign Language 13. Arabic 14. French 15. German 16. Mandarin Chinese 17. Christian Religious Education 18. Islamic Religious Education 19. Hindu Religious Education 20. Business Studies 21. History and Citizenship 22. Geography	23. Biology 24. Chemistry 25. Physics 26. General Science 27. Agriculture 28. Computer Studies 29. Home Science 30. Aviation 31. Building Construction 32. Electricity 33. Metalwork 34. Power Mechanics 35. Woodwork 36. Media Technology 37. Marine and Fisheries Technology

Note:

- Physical Education (PE) and Information Communication and Technology (ICT) will be offered to all learners to facilitate learning, enjoyment and acquisition of life skills.
- Every school shall offer Pastoral/Religious Programme of Instruction (P/RPI) to enhance moral, spiritual and character development of the learners.
- There shall be one (1) lesson for personal or group study to deepen knowledge and enhance skills in areas of choice by the learners.

Table 2 provides guidelines on distribution of lessons at Senior School.

v

TABLE 2: LESSON DISTRIBUTION AT SENIOR SCHOOL

Subjects	No of Lessons Per Week (40 minutes per lesson)
Core Subjects 4	
1. English	5
2. Kiswahili	5
3. Essential Mathematics/Core Mathematics	5
4. Community Service Learning	3
Elective Subjects	
5. Elective 1	5
6. Elective 2	5
7. Elective 3	5
* Physical Education	3
* ICT Skills	2
*PPI	1
* Learner Personal /Group Study	1
Total Number of Lessons	40

vi

ESSENCE STATEMENT

Essential Mathematics in Senior School builds on and deepens the competencies acquired by the learner from Junior school. It plays a pivotal role in developing the learner's computational abilities as well as critical thinking and problem solving skills. Specifically, the subject focuses on numbers and algebra as foundation to the course in developing numerical and algebraic thinking. It also includes measurements of different quantities, particularly commercial arithmetic which is important for acquisition and application of financial literacy in real life. Further, some concepts in geometry are included since they are useful in spatial relations as well as navigational skills while Statistics and Probability are critical in research and in understanding different population dynamics and phenomena that are useful in solving problems in day to day life.

This Mathematics curriculum has explicitly suggested learning activities that focus on the mathematical process skills of problem solving, communication, connection, collaboration and reasoning as core to acquisition of the desirable competencies. Similarly, for holistic development and wellbeing of learners Pertinent and Contemporary Issues such as Life Skills, Citizenship and Education for Sustainable Development as well as Values are integrated into this Mathematics course.

Essential Mathematics is crucial in supporting and enhancing acquisition of knowledge and skills in other subjects. Further, it is critical in determining career choices in the fields of Social Sciences, Arts, Sports, vocational and humanities. Careers in areas such as media, hospitality industry, guidance and counseling, sole proprietorship, sports management, coaching, refereeing, journalism and photography will benefit from this Mathematics. More importantly, its aesthetic and utility value in day to day activities will contribute to an informed numerate citizenry.

vii

SUBJECT GENERAL LEARNING OUTCOMES

By the end of the course the learner should be able to:

1. Acquire numerical computational skills, concepts and competencies for continuous learning and application of mathematical skills in real life,
2. Apply measurement skills of different quantities used in daily activities,
3. Evaluate and make financial decisions and transactions in real-life situations,
4. Collect, analyse and represent data for informed decision-making in real-life situations,
5. Use mathematical concepts and skills to support other learning subjects for further training, research and career development,
6. Develop confidence and interest in mathematics as well as the coherence, utility and aesthetic nature of the subject for lifelong learning,
7. Apply critical and creative thinking, logical reasoning and analytical skills for problem-solving,
8. Use digital technology in computations, explorations, innovations, navigational skills and for further learning,
9. Demonstrate appropriate responsiveness to Pertinent and Contemporary Issues in the community and promote values for peaceful coexistence.

STRANDS

The Essential Mathematics curriculum has 3 strands namely:

1. Numbers and Algebra,
2. Measurements and Geometry; and
3. Statistics and Probability.

viii

SUMMARY OF STRANDS AND SUB STRANDS

S/No.	Strands	Sub strands
1.	Numbers and algebra	1.1 Quadratic Equations
		1.2 Matrices
		1.3 Variations
		1.4 Sequence and series
2.	Measurements and Geometry	2.1 Approximations and Errors
		2.2 Distance, time and Speed
		2.3 Commercial Arithmetic II
		2.4 Rotation
		2.5 Scale Drawing
3.	Statistics and Probability	3.1 Statistics II
		3.2 Probability II

STRAND: NUMBERS AND ALGEBRA

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers and Algebra	1.1 Quadratic Equations - <i>Formation of quadratic equations</i> - <i>Solution of quadratic equations - Applications of quadratic equations</i>	By the end of the sub strand, the learner should be able to: a) form quadratic equations from real life situations, b) solve quadratic equations using the quadratic formula, c) apply quadratic equations in real life situations, d) appreciate the use of quadratic equations in real life.	The learner is guided to: • read and interpret different case scenarios such as planting trees on a rectangular piece of land where the length and width are not known. Discuss and generate quadratic equations using known and unknown values, • work with peers to generate quadratic equations from scenarios or statements and use quadratic formula to work out the roots of the equations, • search from digital and print media the applications of quadratic equations in different life situations such as maximizing profit in business or predicting the path of a thrown ball in Sports. Discuss with peers, form and solve the equations.	How are quadratic equations used in real life situations?
Core Competencies to be developed: • Critical thinking and problem solving: The learner interprets and makes inference when generating quadratic equations from different case scenarios and applying the quadratic formula to solve quadratic equations. • Communication and collaboration: The learner develops reading, speaking, listening, and teamwork skills when reading and interpreting case scenarios from quadratic statements.				

Values:

- Responsibility: The learner works diligently to form and solve quadratic equations from different case scenarios.
- Unity: The learner cooperates with peers to generate quadratic equations from scenarios or statements and use quadratic formula to solve the equations.

Pertinent and Contemporary Issues (PCIs):

Online safety: The learner observes safety while using digital resources to learn about applications of quadratic equations in real life situations.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers and Algebra	1.2 Matrices • <i>Elements in a matrix and order of a matrix</i> • <i>Addition and subtraction of matrices</i> • <i>Multiplication of matrices by a scalar</i> • <i>Application of matrices</i> NB <i>Multiplication of matrix by matrix, inverse of a matrix and determinant of a matrix will not be required.</i>	By the end of the sub strand, the learner should be able to: - determine the position of elements and order of a matrix in various scenarios, - perform addition and subtraction of compatible matrices, - multiply matrices by a scalar in different situations - perform combined operations on matrices in real life situations - embrace the use of matrices in real life situations.	The learner is guided to: - brainstorm on real life situations where objects or items are arranged in rows and columns such as arrangement of eggs in a tray, learners in a classroom. - play a game by arranging items in rows and columns such as on a tray, shelf, or crate and identify the position of each element by its specific row and column. - discuss with peers and identify the order of matrices by the number of rows and columns and establish whether two or more matrices are compatible or not. - play a game of compatibility or non-compatibility of matrices and carry out addition and subtraction of the matrices that are compatible, - discuss elements in matrices and carry out multiplication of matrices by a scalar quantity - work with peers to carry out combined operations on matrices involving addition, subtraction and multiplication by scalar quantity, - use digital and other resources to learn more about the use of matrices in day to day life	How are matrices used in everyday life?

Core Competencies to be developed: • Communication and collaboration: The learner develops writing, reading, speaking, listening, and teamwork skills as they discuss with peers and identify the order of matrices by the number of rows and columns. • Digital literacy: The learner uses digital technology to learn more about the use of matrices in day to day life
Values: • Respect: The learner demonstrates acceptance of others' opinions during the discussion of elements in matrices and carrying out multiplication of matrices by a scalar quantity. • Responsibility: The learner exhibits self-drive when engaging in assigned roles when playing a game of compatibility or non-compatibility of matrices and carrying out addition and subtraction of the matrices.
Pertinent and Contemporary Issues (PCIs): • Self-management: The learners develop self-esteem as they brainstorm on real life situations where objects or items are arranged in rows and columns such eggs in a tray. • Effective communication: The learner develops communication skills when working with peers to carry out combined operations involving matrix addition, subtraction and multiplication by scalar.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers and Algebra	1.3 Variations • <i>Direct and inverse variation</i> • <i>Joint and combined variations</i> • <i>Applications of variations.</i>	By the end of the sub strand, the learner should be able to: - identify direct and inverse variations of different quantities - determine direct and inverse variations of different quantities - determine joint and combined variations in different situations - apply direct, inverse, joint and combined variations to real life situations, - appreciate the use of direct and indirect variations in day to day life.	The learner is guided to: • discuss with peers the nature of relationships leading to direct and inverse variations such as the relationship between speed of a vehicle and time taken to cover the same distance. • role play with peers a shopping scenario to establish a relationship such as how the number of similar items bought vary with the total amount used to pay for the items. work out direct variations of different quantities. • work with peers to carry out an activity such as filling a big container with water and establish how the number of people affects the time taken to accomplish the task. work out inverse variations of different quantities. • discuss with peers the relationship between quantities in joint variations, for example the volume of a cylinder varies jointly as its height and radius. work out joint variations of different quantities. • use relevant examples of variations such as variation in distance, time and speed of a	How are variations applied in real life?

			moving vehicle to establish the relationship between quantities in combined variations. work out combined variations of different quantities. • discuss applications of variations in day to day life in quantities such as volume of containers, area of fields, fuel consumption and capacity of digital devices to store files. • use digital and print resources to learn more about the use of variations in day to day life	
Core Competencies to be developed • Critical thinking and problem solving: The learner works with peers to establish the relationship between quantities in direct and inverse variations from statements. • Learning to learn: The learner acquires more knowledge as he/she discusses various applications of variations in day to day life.				
Values • Unity: The learner collaborates with others to carry out an activity such as filling a container with water to establish how the number of people affects the time taken to accomplish the task. • Respect: The learners take turns to discuss the relationships leading to direct and inverse variations such as the relationship between speed of a vehicle and time taken to cover the same distance.				
Pertinent and Contemporary Issues (PCIs) Financial literacy: The learner acquires financial literacy while collaborating with peers to establish a direct relationship such as how the numbers of similar items bought vary with the total amount used.				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 Numbers and Algebra	1.4. Sequence and Series • <i>Number Sequences</i> • <i>Arithmetic sequence</i> • <i>The nth term in an arithmetic sequence</i> • <i>Arithmetic progression (A.P)</i> • <i>Sum of an A.P</i> • <i>The nth term in a geometric sequence.</i> • <i>Application of Arithmetic progressions</i>	By the end of the sub strand, the learner should be able to: a) determine the missing term in a number sequence, b) determine the first term and the common difference of an arithmetic sequence or series, c) determine the nth term in an arithmetic sequence in different situations, d) calculate the sum of n-terms of an Arithmetic Progression, e) apply arithmetic progressions in real life situations, f) value the use of sequence and series in day to day life.	The learner is guided to: • explore situations in everyday life where numbers form a sequence such as sitting arrangements; figure out the number of people that can be seated round tables or in rows of seats. identify the pattern and sequence formed, • work with peers to discuss and interpret an arithmetic sequence to establish the rule and use it to find the missing term, • use the first term and the common difference to find the value of the nth term in a given arithmetic sequence, • work with peers to find the sum of terms in an arithmetic progression using the first term and common difference • form and solve sequences and series from real life situations such as seating arrangement, bus schedule with a fixed time interval, tracking of daily income, stacking objects or items in big container such as a carton. • use digital and other resources to search for application of sequence and series in real life situations.	Where can sequences be applied in real life?

Core Competencies to be developed - Communication and collaboration: The learner speaks engagingly while discussing with peers on how to find the sum of terms of an Arithmetic Progression - Citizenship: The learner appropriately interacts with others while working with peers to interpret an arithmetic sequence to establish the rule and use it to find the missing term.				
Values - Responsibility: The learner demonstrates accountability by engaging in the assigned roles and duties when exploring situations in everyday life where numbers form a sequence. - Unity: The learner cooperates and strives to achieve common goals when discussing with peers on how to interpret an arithmetic sequence to establish the rule and use it to find the missing term.				
Pertinent and Contemporary Issues (PCIs) Effective communication: The learner develops communication skills while discussing situations in real life where numbers form a sequence.				

Suggested Assessment Rubric

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to form and solve quadratic equations by using the quadratic formula	The learner forms and solves quadratic equations by using the quadratic formula accurately with examples	The learner forms and solves quadratic equations by using the quadratic formula accurately	The learner forms or solves quadratic equations by using the quadratic formula with minor errors	The learner forms or solves quadratic equations by using the quadratic formula with major errors
Ability to apply quadratic equations in real life situations	The learner correctly and comprehensively applies quadratic equations in all situations	The learner correctly applies quadratic equations in all situations	The learner correctly applies quadratic equations in situations with minor errors	The learner applies quadratic equations in a situations. with major errors

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to perform addition, subtraction and multiplication of matrices by a scalar	The learner accurately performs addition, subtraction and multiplication of matrices by a scalar using varied contexts.	The learner accurately performs addition, subtraction and multiplication of matrices by a scalar.	The learner accurately performs addition or subtraction or multiplication of matrices by a scalar	The learner accurately performs addition or subtraction or multiplication of matrices by a scalar in limited contexts
Ability to determine direct, inverse, joint and combined variations	The learner accurately determines direct, inverse, joint and combined variations using examples	The learner accurately determines direct, inverse, joint and combined variations	The learner accurately determines any 3 of direct, inverse, joint or combined variations	The learner accurately determines any 2 of direct, inverse, joint or combined variations
Ability to determine the first term, common difference, nth term and the sum of an arithmetic sequence or series	The learner correctly determines the first term, common difference, nth term and the sum of an arithmetic sequence or series giving examples	The learner correctly determines the first term, common difference, nth term and the sum of an arithmetic sequence or series	The learner accurately determines any 3 of the first term, common difference, nth term or sum of an arithmetic sequence or series	The learner determines any 2 of the first term or common difference or nth term of an arithmetic sequence or series
Ability to apply Arithmetic Progression in real life situations	The learner consistently and accurately applies Arithmetic Progression in real situations	The learner applies accurately Arithmetic Progression in all situations	The learner applies Arithmetic Progression in real situations with minor errors	The learner applies Arithmetic Progression in real situations with major errors

STRAND 2.0: MEASUREMENTS AND GEOMETRY

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 Measurements and Geometry	2.1 Approximation and Errors <i>Estimation and measurement of different quantities</i> <i>Errors and Percentages from measurements</i> <i>Applications of errors and approximations</i>	By the end of the sub strand, the learner should be able to: - estimate measurement of different quantities in real life situations - calculate errors arising from estimations and measurement, - compute percentage error from estimation and measurements, - apply errors and approximations to real life situations, - reflect on the effect of errors in estimates and measurements of quantities.	The learner is guided to: - estimate measurements of different quantities such as his/her height, length of the classroom floor, distance between one point to another within the school compound, for example from the gate to the Principal's office, classroom, toilets, dining hall. estimate the volume of a liquid in a container, share their estimates with peers. - work with peers to estimate and measure the length of an object such as a book, pen and work out the errors arising from estimations compared to the measured value, - work out the percentage errors from estimates and actual measurements of quantities such as length of a book, pen or volume of liquid in a container. - use digital devices and other resources to learn more about errors	- How are estimates and measurements used in real life? - Why is it important to minimize errors when measuring?

10

			and approximations and their effect in day to day life	
Core Competencies to be developed: - Creativity and imagination: The learner exchanges ideas while estimating measurement of different quantities in real life situations. - Self-efficacy: The learner communicates clearly when discussing with peers to work out errors arising from estimations and measurement.				
Values: - Integrity: The learner displays honesty when using different instruments to measure length of different items. - Social justice: The learner demonstrates equity by according equal opportunities in sharing responsibilities when working with peers to estimate and measure the length of an object such as a book.				
Pertinent and Contemporary Issues (PCIs): Integrity: The learner appreciates the significance of integrity as they reflect on the effect of errors in estimates and measurements of different quantities.				

11

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 Measurements and Geometry	2.2 Distance, Time and Speed - Distance, speed, velocity and acceleration - Relative motion - Application of distance, time and speed	By the end of the sub strand, the learner should be able to: - explain the terms distance, time and speed in real life, - determine speed and velocity in real life situations, - determine acceleration of an object in motion - compute relative motion of two bodies moving in the same and opposite direction, - apply relative motion in real life situations, - appreciate the importance of relative motion in day to day life.	The learner is guided to: - participate in a running competition of a specified distance and record the time taken to run to the finish line for each participant, use the data to discuss the terms distance, time and speed, - use the distance and the time taken from the running competition to calculate the speed of each learner, - demonstrate velocity by moving an object from one point to another in a specified direction, record the distance, time, and work out velocity - work out the acceleration of moving objects such as vehicles, from one point to another, - carry out an activity involving two bodies such as toy cars moving in the same direction at different speeds, discuss and work out the relative speed of the two bodies and the dangers of careless overtaking, - carry out an activity involving two bodies such as toy cars moving in opposite directions at different speeds, discuss and	- Why is speed important in real life? - How is relative motion applicable in real life?

			work out the relative speed of the two bodies. - discuss how relative motion is applied in real life situations such as walking, driving or cycling in same and in opposite direction - use digital and other resources to explore more on relative motion in day-to-day life such as watching a video on movement of vehicles on a road, observing vehicles overtaking and bypassing each other, and relate it to relative motion	
Core Competencies to be developed: - Digital literacy: The learner makes use of digital resources to explore more on relative motion in day-to-day life. - Critical thinking and problem solving: The learner explores complex scenarios while carrying out activities involving motion of two bodies moving in the same and in opposite directions.				
Values: - Unity: The learner cooperates and displays team spirit when working with peers to determine the velocity and acceleration of moving objects from one point to another. - Responsibility: The learner reflects on accountability and ways of observing safety precautions while discussing and working out the relative motion of two bodies and the dangers of careless overtaking.				
Pertinent and Contemporary Issues (PCIs): - Road safety: The learner acquires skills on road safety such as dangers of careless overtaking on roads as they discuss how relative motion is applicable in day to day life. - Self- awareness: The learner gains awareness of their potential as they participate in a race with peers in a specified direction and covering a certain distance.				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 Measurements and Geometry	2.3 Commercial Arithmetic (II) • <i>Export duty.</i> • <i>Customs value</i> • <i>Import duty/customs duty</i> • <i>Excise duty</i> • <i>Value Added Tax on imported goods</i>	By the end of the sub strand, the learner should be able to: a) identify the imported and exported goods in Kenya b) compute the export duty charged on different goods exported from Kenya c) calculate the custom value of imported goods in Kenya, d) compute the import duty charged on different goods, e) calculate excise duty for imported goods, f) compute VAT charged on imported goods, g) appreciate the role of custom duties in Kenya	The learner is guided to: • work with peers to discuss and list items within the school and home environment which are locally made and those that are imported into Kenya. • discuss and list the imported and exported goods in Kenya, • calculate the export levy charged on different goods exported from Kenya to different countries, • discuss the components of custom value and work out the customs value for different imported goods, • use the custom duty rates to work out the custom/import duty charged on different imported goods, • discuss the process of working out excise duty for imported goods and work out excise duty charged on imported goods, • work with peers to establish the process of working out VAT for imported goods and calculate VAT for imported goods,	How does the government raise revenue through importation and exportation of goods?

			• use digital and print media to work out custom duty, import duty, export duty, excise duty and VAT for imported goods based on current tax rates.	
Core Competencies to be developed: • Citizenship: The learner acquires civic mindedness while working with peers to establish the process of working out customs duty for imported goods. • Digital Literacy: The learner uses digital learning platforms and digital devices to determine custom duty, import duty, export duty, excise duty and VAT for imported goods based on current tax rates.				
Values: • Patriotism: The learner exhibits honesty when working with others to establish the percentage charged on exported goods then use the rate to calculate the export duty charged on different goods. • Peace: The learner exhibits harmony when working with peers to establish the process of working out VAT for imported goods.				
Pertinent and Contemporary Issues (PCIs): • Effective communication: The learner develops effective communication skills while discussing with peers the goods that the country exports or imports. • Online safety: The learner observes online safety while using digital devices to determine custom duty, import duty, export duty, excise duty and VAT for imported goods based on current tax rates.				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 Measurements and Geometry	2.4 Rotation • <i>Properties of rotation</i> • <i>Rotation on plane surface</i> • <i>Rotational Symmetry</i>	By the end of the sub-strand the learner should be able to: a) determine the properties of rotation in different situations b) rotate an object on a plane given the centre and angle of rotation c) determine the centre and angle of rotation given an object and its image, d) determine the order of rotational symmetry of plane figures, e) appreciate the application of rotation in real-life situations.	The learner is guided to: • discuss real world situations where objects rotate about a fixed point in particular direction such as a clock minute and hour hand, wheels, windmills and fan blades, doors, • explore rotating objects/items, such as minute or hour hand from model clock, to establish the angle, centre and direction of rotation as the properties of rotation, • construct image formed after rotation of an object on a plane through a given angle and centre of rotation in a specific direction, • use the object and the image to find the centre and angle of rotation by drawing, • trace an outline of different objects with the base in the shape such as rectangles, triangles, squares. Establish the number of times the object fits onto outline in one complete turn as the order of rotational symmetry,	1. How is rotation applied in real-life situations? 2. Why is rotation useful in day to day life activities?

			• use digital devices to rotate plane figures and solids on the screen. use print to learn more on rotation.	
Core Competencies to be developed: • Critical thinking and Problem Solving: the learner develops open mindedness and creativity skills when using an object and its image on a plane surface to generate the properties of rotation and share with peers. • Communication and Collaboration: the learner acquires teamwork skills when discussing with peers real world situations where objects rotate about a fixed point.				
Values: • Responsibility: the learner develops the value of accountability as they care for the models of a face clock, when demonstrating the centre and angle of rotation. • Love: the learners develop the value of compassion and caring by respecting others while discussing with peers real world situations where objects rotate about a fixed point.				
Pertinent and Contemporary Issues (PCIs): Environment awareness: the learner rotates and observes items in the immediate environment such as <i>water taps, doors, windows, fans, books</i> , estimates the angles of rotation and sketches the items and angles of rotation.				

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 Measurements and Geometry	2.5 Scale Drawing - Linear scale - Bearing - Scale drawing	By the end of the sub-strand, the learner should be able to: - write linear scales in statement and ratio form in different situations. - interpret linear scales in statement and ratio form in different situations. - convert linear scale from statement form to ratio form and ratio form to statement form - determine the bearing of a point from another point, - make scale drawings in different situations, - apply scale drawing in real life situations, - recognize the use of scale drawing in maps.	The learner is guided to: - read a map from an atlas such as map of Kenya or Africa and discuss the scales in the map with peers. - Write the scales from the map in statement and ratio form - read, discuss and interpret linear scales in statement and ratio form. - discuss and carry out conversion of scales from statement to ratio form and from ratio to statement form. - discuss with peers and suggest the bearing of their school from specific places such as nearby market, hospital/health facility, police post or any landmark. locate a point/place from a map and state its bearing with reference to another point/place in the same map. - draw and measure the bearing of a point from another point - sketch and make scale drawings of different figures from scenarios.	How do we use scale drawing in real life situations?

			- use ICT devices to display the maps and use the zoom functions to demonstrate scale. - Use maps from Atlases and digital devices to read scales, show and locate places. Project <i>Work in groups to undertake this project</i> - Sketch the map of your school focusing on the main features. Estimate and measure the distance between the features or structures like buildings, flag post, playgrounds/fields among others. - Using the measurements and an appropriate scale, draw the school layout and label the features or structures appropriately. - Take pictures or video clips when undertaking different activities during project and save files in an appropriate digital device. - Document the processes of the project including resources required, identification of features and structures, steps taken during measurements, symbols used to represent features and	
--	--	--	---	--

			structures, and challenges faced while doing the project.	
Core Competencies to be developed • Creativity and imagination: the learner displays creative skills as they draw the school layout and label the features or structures appropriately. • Digital literacy: the learner develops digital skills as they use ICT devices to display the maps and use the zoom functions to show scale and locate places.				
Values • Responsibility: The learner exhibits care of resources as they read a map from an atlas <i>such as a map of Kenya or Africa</i> and discuss the scales in the map with peers. • Citizenship: The learner appreciates the shape of his/her country as they use maps to demonstrate scale.				
Pertinent and Contemporary Issues (PCIs): Environmental education; the learner exhibits environmental awareness as they sketch the features, structures and fields of their school.				

Suggested Assessment Rubric

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to estimate and measure quantities	The learner accurately estimates and measures quantities using varied examples	The learner accurately estimates and measures quantities	The learner accurately estimates or measures quantities with minor errors	The learner estimates or measures quantities with minor errors with major errors
Ability to determine errors and percentage errors from estimations and	The learner correctly determines errors and percentage errors from estimations and	The learner correctly determines errors and percentage errors from estimations and	The learner determines errors or percentage errors from estimations and measurements of	The learner correctly determines errors from estimations and measurements of

20

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
measurements of quantities	measurements of various quantities	measurements of quantities	quantities with minor errors	quantities with major errors
Ability to determine velocity and acceleration	The learner accurately determines velocity and acceleration giving relevant examples	The learner accurately determines velocity and acceleration	The learner determines velocity or acceleration with minor errors	The learner determines velocity or acceleration with major errors
Ability to determine relative motion of two bodies moving in the same and opposite directions	The learner correctly determines relative motion of two bodies moving in the same and opposite directions using adequate examples	The learner correctly determines relative motion of two bodies moving in the same and opposite directions	The learner determines relative motion of two bodies moving in the same or opposite directions with minor errors	The learner determines relative motion of two bodies moving in the same or opposite directions with major errors
Ability to calculate the export duty, custom value, import duty, excise duty and VAT on goods	The learner accurately calculates the export duty, custom value, import duty, excise duty and VAT on goods using examples.	The learner accurately calculates the export duty, custom value, import duty, excise duty and VAT on goods.	The learner accurately calculates any 3 of; export duty, custom value, import duty, excise duty on most goods,	The learner calculates any 2 of; export duty and custom value on few goods.
Ability to rotate an object given the centre and angle of rotation on a Cartesian plane	The learner accurately rotates an object given the centre and angle of rotation on a Cartesian plane proficiently.	The learner accurately rotates an object given the centre and angle of rotation on a Cartesian plane	The learner rotates an object given the centre and angle of rotation on a Cartesian plane with minor errors	The learner plots an object given the centre and angle of rotation on a Cartesian plane with major errors
Ability to determine the centre and angle of	The learner accurately determines the centre and	The learner accurately determines the centre and	The learner determines the centre or angle of	The learner determines the centre or angle of

21

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
rotation given an object and its image	angle of rotation given an object and its image with various examples	angle of rotation given an object and its image	rotation given an object and its image with minor errors	rotation given an object and its image with major errors
Ability to write and interpret linear scales in statement and ratio form	The learner correctly and comprehensively writes and interprets linear scales in statement and ratio form	The learner correctly writes and interprets linear scales in statement and ratio form	The learner writes or interprets linear scales in statement or ratio form omitting few details	The learner writes or interprets linear scales in statement or ratio form omitting most details
Ability to convert linear scale from statement form to ratio form and from ratio to statement form	The learner accurately converts linear scale from statement form to ratio form and from ratio to statement form using relevant examples	The learner accurately converts linear scale from statement form to ratio form and from ratio to statement form	The learner accurately converts linear scale from statement form to ratio form or from ratio to statement form omitting few details	The learner converts linear scale from statement form to ratio form or from ratio to statement form omitting most details
Ability to make scale drawings	The learner accurately makes scale drawings of various examples	The learner accurately makes scale drawings with precision	The learner accurately makes scale drawings with most details	The learner partially makes scale drawings with few details

STRAND 3.0: STATISTICS AND PROBABILITY

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Statistics and Probability	3.1 Statistics II - Collection of data - Organization of data (frequency distribution table) - Measures of central tendency (mode, mean and median) of grouped data - Presentation of data (histogram for uniform classes) - Application of measures of central tendency in real life situations	By the end of the sub strand, the learner should be able to: - collect data from the immediate environment, - group and represent the data in a frequency distribution table, - determine mean, mode and median of grouped data, - present grouped data using histograms, - apply measures of central tendency in real life situations, - embrace the use of measures of central tendency in everyday life.	The learner is guided to: - collect and record data from immediate environment such as shoe sizes, heights of learners, weight of learners, number of learners in different classes in school. - Put the collected data into groups of appropriate classes and generate a frequency distribution table. - use the grouped data to work out the mean, mode and median. - work with peers and use the collected data to draw histograms (with equal class-width) - discuss with peers the use of mean, mode and median in everyday life - search from the internet or other sources the importance of measures of central tendency Project <i>Work in groups to undertake this project</i> - Identify an area or issue to collect data on. Discuss and document the	- Why is data collection important in day to day life? - How are measures of central tendency applicable in real life?

			preparation phase including the resources required to collect and record data. - Organise data into frequency distribution table and work out the measures of central tendency. Share your findings with other groups. Discuss how the findings can be used to make informed decisions. - Document your work and store in a digital or print portfolio.	
Core Competencies to be developed: - Self-efficacy: The learner executes the task while collecting data on availability of pedestrian crossing points along major roads in the locality or collect any other data and use it to prepare a frequency distribution table for a grouped data, - Creativity and imagination: The learner finds hidden patterns when using grouped data from different sources and works out the mode, median and mean				
Values: - Unity: The learner collaborates with others when working in a group and using collected data to draw histograms (with equal class-width) - Integrity: The learner displays honesty when collecting data on availability of pedestrian crossing points along major roads in the locality or collecting any other data and using it to prepare a frequency distribution table for a grouped data.				
Pertinent and Contemporary Issues (PCIs): Online Safety as learners search from the internet or other available resources to explore for data sources and use different and appropriate methods to collect data.				

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 Statistics and Probability	3.2 Probability II - Experiments involving probabilities - Range of probability - Probability space - Mutually exclusive and independent events - Probability tree diagrams (maximum of 2 events) - Application of probability	By the end of the sub strand, the learner should be able to: - perform experiments involving probabilities in different situations, - identify the range of probability in different situations, - generate probability space of different events, - determine the probability of mutually exclusive and independent events, - determine probability of different events using tree diagrams, - appreciate the application of probability in real-life situations.	The learner is guided to: - Play a game with peers in turns involving chance such as tossing a coin, throwing a dice and record the outcomes in a table. - discuss with peers the probabilities of events and show the range of probability, - work with peers to list down all the possible outcomes of different events such as gender of children in a family, predicting outcomes in a game, weather forecast, generate a table showing the probability space of the events. - carry out experiments involving mutually exclusive and independent events such rolling a die or tossing a coin and determine the probabilities of different outcomes. - work with peers and use a tree diagram to work out probability of up to two independent and/or mutually exclusive events.	How is probability applied in real-life situations?

			use digital and other resources available to learn more on probability.	
Core Competencies to be developed: - Communication and collaboration: The learner contributes to group decision making while discussing, creating and playing games related to probability, - Self-efficacy: The learner orders and prioritizes tasks while working out probability of up to three independent and/or mutually exclusive events using tree diagrams,				
Values: - Unity: The learner respects other people's opinions when discussing with peers the probabilities of events and shows the range of probability. - Respect: The learner understands others and waits for their turn when playing a game with peers in turns involving chance such as tossing a coin, throwing a dice and record the outcomes in a table				
Pertinent and Contemporary Issues (PCIs): Road safety: The learner lists down all the possible outcomes of different events in real-life situations such as getting pedestrians crossing the roads at undesignated areas and highlights its dangers for public awareness.				

Suggested Assessment Rubric

Level Indicators	Exceeds Expectation	Meets Expectation	Approaches Expectation	Below Expectation
Ability to collect, group and represent data	The learner accurately collects, groups and represents data of varied contexts	The learner accurately collects, groups and represents data	The learner collects and groups data	The learner collects data
Ability to determine the mean, mode and median for grouped data	The learner accurately determines the mean, mode and median for various grouped data	The learner accurately determines the mean, mode and median for grouped data	The learner accurately determines any 2 of; the mean, mode and median for grouped data	The learner accurately determines any one; the mean, mode and median for grouped data
Ability to identify the range of probability and generate probability space	The learner precisely identifies the range of probability and generates probability space	The learner identifies the range of probability and generates probability space	The learner identifies the range of probability and partially generates probability space	The learner identifies the range of probability.
Ability to determine the probability of mutually exclusive and independent events	The learner accurately determines the probability of mutually exclusive and independent events of varied contexts	The learner accurately determines the probability of mutually exclusive and independent events	The learner determines the probability of mutually exclusive or independent events	The learner determines the probability of mutually exclusive events

APPENDIX 1: SUMMARY OF RESOURCES, ASSESSMENT METHODS AND NON-FORMAL ACTIVITIES

Strands	Sub-strand	Suggested Learning Resources	Suggested Assessment Methods	Suggested Non-Formal Activities
1.0 Numbers and Algebra	1.1 Quadratic Equations	Calculators	Written test Oral and written quizzes Project Peer assessments Oral questions Check list Journals Practical work Observation	Clubs and societies Field trips Mathematics symposiums Science and Engineering Fair Mathematics club
	1.2 Matrices	• Tables and charts • Pictures of objects arranged in rows and columns • Calculators		
	1.3 Variations	• Grid boards • Geometrical equipment • Graph paper • Stop watch • Calculator • Ruler or tape measure		
	1.4 Sequences and Series	• Objects on different sizes • Strings • Measuring instruments • Stop watch		

Strands	Sub-strand	Suggested Learning Resources	Suggested Assessment Methods	Suggested Non-Formal Activities
2.0 Measurements and Geometry	2.1 Approximation and Errors	• Measuring instruments like measuring cylinder, metre rule, tape measure, • Calculator • Stop watch		
	2.2 Distance, time and speed	• stop watch • tape measure • string • Grid board • Worksheet • video clips		
	2.3 Commercial arithmetic II	• Resource person • Video clips • Calculators		
	2.4 Rotation	• Geometrical instruments • Model analogue clocks • Drawing tools		
	2.5 Scale drawing	• Atlases • Digital tools • Drawing tools		

Strands	Sub-strand	Suggested Learning Resources	Suggested Assessment Methods	Suggested Non-Formal Activities
3.0 Statistics and probability	3.1 Statistics II	• Video clips • Digital devices • Internet • Grids • Ruler		
	3.2 Probability II	• Dice • Coins • Glass marbles of different colours • Calculators • Digital devices		

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. CDs
12. Scanners
13. Internet
14. Other relevant digital resources e.g. Online Education Resources such as the Kenya Education Cloud.