REPUBLIC OF KENYA

MINISTRY OF EDUCATION

JUNIOR SCHOOL CURRICULUM DESIGN

MATHEMATICS

GRADE 9

FOR LEARNERS WITH VISUAL IMPAIRMENT

KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

A Skilled and Ethical Society

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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 nine curriculum designs for learners with visual impairment build on competencies attained by learners at Grade eight. Emphasis at this grade is the development of skills for exploration and making informed decision on pathways based on careers.

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,
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PREFACE

The Ministry of Education (MoE) nationally implemented Competency Based Curriculum (CBC) in 2019. Grade seven is the first grade of Junior school while Grade 9 is the final grade of the level in the reformed education structure.

The reviewed Grade nine curriculum furthers implementation of the CBC from Grade eight. The curriculum provides opportunities for learners to focus in a field of their choice to form a foundation for further education and training and/or gain employable skills. 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 nine curriculum designs for learners with visual impairment 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 nine and prepare them for smooth transition to Grade Senior school. Furthermore, it is my hope that teachers will use the adapted 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 nine curriculum designs for learners with visual impairment were developed and adapted 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,

I also wish to acknowledge the KICD curriculum developers and other staff, all teachers, educators who took part as panellists; the Semi-Autonomous Government Agencies (SAGAs) and representatives of various stakeholders for their roles in the development and adaptation of the Grade nine curriculum designs for learners with visual impairment. In relation to this, I 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 and adapting these designs. Finally, I am very grateful to the KICD Council Chairperson and other members of the Council for very consistent guidance in the process.

I assure all teachers, parents and other stakeholders that this curriculum design will effectively guide the implementation of the CBC at Grade nine and preparation of learners with visual impairment for transition to Senior school.

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TABLE OF CONTENTS

FOREWORD iii
PREFACE iv
ACKNOWLEDGEMENT v
TABLE OF CONTENTS vi
NATIONAL GOALS OF EDUCATION vii
LESSON ALLOCATION AT JUNIOR SCHOOL ix
LEVEL LEARNING OUTCOMES FOR MIDDLE SCHOOL ix
ESSENCE STATEMENT x
SUBJECT GENERAL LEARNING OUTCOMES x
SUMMARY OF STRANDS AND SUB STRANDS xi
STRAND 1.0: NUMBERS 1
STRAND 2.0: ALGEBRA 8
STRAND 3.0: MEASUREMENTS 14
STRAND 4.0: GEOMETRY 25
STRAND 5.0: DATA HANDLING AND PROBABILITY 33
APPENDIX I: COMMUNITY SERVICE LEARNING PROJECT 38
APPENDIX II: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES 42
APPENDIX III: USE OF ICT TOOLS 45

NATIONAL GOALS OF EDUCATION

Education in Kenya should:

i) Foster nationalism and patriotism and promote national unity.

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

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

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

a) Social Needs

Education in Kenya must prepare children for changes in attitudes and relationships which are necessary for the smooth progress of a rapidly developing modern economy. There is bound to be a silent social revolution following 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 up a modern and independent economy which is in need of an adequate and relevant domestic workforce.

c) Technological and Industrial Needs

Education in Kenya should provide learners with the necessary skills and attitudes for industrial development. Kenya 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.

iii) 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.

iv) Promote sound moral and religious values.

Education should provide for the development of knowledge, skills and attitudes that will enhance the acquisition of sound moral values and help children to grow up into self-disciplined, self-reliant and integrated citizens.

v) Promote social equality and responsibility.

Education should promote social equality and foster a sense of social responsibility within an education system which provides equal educational opportunities for all. It should give all children varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment.

vi) Promote respect for and development of Kenya's rich and varied cultures.

Education should 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.

vii) Promote international consciousness and foster positive attitudes towards other nations.

Kenya is part of the international community. It is part of the complicated and interdependent network of peoples and nations. Education should therefore lead the youth of the country to accept membership of this international community with all the obligations and responsibilities, rights and benefits that this membership entails.

viii. Promote positive attitudes towards good health and environmental protection.

Education should inculcate in young people the value of good health in order for them to avoid indulging in activities that will lead to physical or mental ill health. It should foster positive attitudes towards environmental development and conservation. It should lead the youth of Kenya to appreciate the need for a healthy environment.

LESSON ALLOCATION AT JUNIOR SCHOOL

S/No	Learning Area	Number of Lessons Per Week
1.	English for learners with visual impairment	5
2.	Kiswahili for learners with visual impairment	4
3.	Mathematics for learners with visual impairment	5
4.	Religious Education	4
5.	Social Studies for learners with visual impairment	4
6.	Integrated Science for learners with visual impairment	5
7.	Pre-Technical Studies for learners with visual impairment	4
8.	Agriculture and Nutrition for learners with visual impairment	4
9.	Creative Arts and Sports for learners with visual impairment	5
	Pastoral /Religious Instructional Program	1
Total		**41**

NOTE: Braille skills for learners with blindness be implemented as Non-formal (co- curricular) programmes

LEVEL LEARNING OUTCOMES FOR MIDDLE SCHOOL

By end of Junior School, the learner with visual impairment 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, and 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 coexistence.
8. Manage pertinent and contemporary issues in society effectively.
9. Apply digital literacy skills for communication and learning.

ESSENCE STATEMENT

Mathematics is essential to our daily interactions whereby we count, add, subtract, multiply or divide quantities and substances. It involves understanding numbers and the numerical operations used to develop strategies for mental mathematical problem-solving skills, estimation and computational fluency. It covers areas like space, shape and structures, therefore learners with visual impairment will be guided to use adapted learning experiences and resources to take part in activities involving abstract concepts. Mathematics can be applied in economic activities, scientific, social, religious and political worlds. It is therefore imperative that learners with visual impairment learn Mathematics from early years.

In Junior School, Mathematics builds on the competencies acquired by the learner with visual impairment from primary school. It enhances the learner's competencies in mathematical skills as a foundation for Science, Technology, Engineering and Mathematics (STEM) at Senior School. Mathematics also prepares the learner with visual impairment 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 School, the learner with visual impairment 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 organise 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

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 NUMBERS	**1.1 Integers** (5 lessons)	By the end of the sub-strand the learner should be able to: a) describe positive and negative integers in different situations, b) perform operations on integers in different situations, c) work out combined operations on integers in different situations, d) apply Integers to real life situations, e) use IT or other resources to learn more on integers, f) promote use of integers in real life situations.	• Learners brainstorm on the number line to identify positive and negative numbers on both sides and share with others. • Learners with low vision discuss and work out basic operations on integers using number cards and charts in appropriate font and colour contras. Learners with blindness undertake activity using braille number cards and braille charts. • Learners play adapted games involving numbers and operations by picking print or braille integers and performing all basic operations. • Learners work out combined operations of integers in the correct order. • In groups, learners with carry out activities such as reading temperature changes in a thermometer and discuss how to record it. Learners with low vision use thermometer with visible thermometric liquid and contrasting tactile marks. Learners with blindness use digital talking thermometer or a thermometer with tactile marks or be paired with sighted peers and supported to note the temperature reading on the thermometer. Consider temperatures below zero points and consider cases of use of integers in real life. • Learners discuss how to record temperatures above zero degrees Celsius for positive integers, where possible, record temperatures below zero in degrees Celsius for negative integers. Learners with blindness are guided to denote symbol for degrees Celsius in braille.	1. How do we apply integers in daily activities? 2. Why do we follow the correct order when carrying out combined operations on integers?

			• Learners use digital devices with assistive technology or other resources such as print or braille materials to carry out operations on integers. • Learners play creative games that involve integers.	

Core competencies to be developed:

- Critical thinking and problem solving: The learner develops interpretation and inference skills as they work out combined operations of integers in the correct order
- Learning to learn: The learner develops independence as they reflect on their own experience while carrying out activities such as reading temperature changes in a thermometer and discussing how to record it.
- Digital literacy: The learner interacts with technologies as they use digital devices with assistive technology to determine temperature.

Values:

- Respect: The learner enhances etiquette as they appreciate others' opinion as they work in groups to carry out activities such as reading temperature changes in a thermometer and discussing how to record it.
- Unity: The learner enriches cooperation as they work towards achieving set goals of reading thermometers.

Pertinent and Contemporary Issues:

Safety and security: The learner knows and exercises basic responsible online behaviour as they use digital devices with assistive technology to carry out operations on integers.

Link to other subjects:

Integrated Science: The learner links the knowledge of recording body temperature using a thermometer.

Suggested Learning Resources:

Print and braille charts, Thermometer/ digital talking thermometer and Print and Braille Course Book, digital devices with assistive technology such as screen magnifiers, screen readers and adapted keyboards.

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)	By the end of the sub-strand the learner should be able to: a) define cube and cube roots of numbers in different situations, b) work out cubes of numbers by multiplication in real life situations, c) denote braille symbol for cube and cube root, *(for learners with blindness)* d) determine cubes of numbers from mathematical tables in different situations, e) determine cube roots of numbers by factor method in different situations, f) determine cube roots of numbers from mathematical tables in different situations, g) apply cubes and cube roots in real life situations, h) work out cubes and cube roots using IT devices, i) appreciate the importance of cubes and cube roots in real life situations.	• Learners use stacks of cubes to demonstrate the concept of cube and cube roots. Learners with blindness are guided to manipulate the stacks of cubes to identify its three dimensions and number of cubes on each dimension. Learners use this activity to generate the meaning of cubes and cube roots, • Leaners demonstrate stacking of cubes. • Learners with blindness are guided to write mathematical statements with braille symbols for cube and cube root. • In groups, learners discuss the volume of a cube and determine both the cube and cube root and relate the two. • Learners with low vision read the cube of numbers from print mathematical tables and relate to cube roots. Learners use low vision optical devices to read the table. Leaners with blindness are guided to identify rows and columns in the braille mathematical table, and match them so as to find cube root of numbers. • Learners use digital devices with assistive technology, scientific calculators, scientific talking calculators or other resources to determine cube and cube roots of numbers.	1. How do we use cubes and cube roots in real life situations? 2. Why do we relate cube and cube root? 3. How do we denote cube and cube root sign in braille?

Core competencies to be developed:

- Communication and collaboration: The learner develops speaking and listening skills as they work in groups to use stacks of cubes to demonstrate the concept of cube and cube roots of numbers.
- Critical thinking and problem solving : The learner develops open mindedness as they determine both the cube and cube root and relate the two.

Values:

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

Pertinent and Contemporary Issues: (PCIs)

- Education for sustainable development: The learner acquires life skills as they relate cubes and volume to packaging and stacking goods.
- Life skills and values: The learner works out and discusses cube roots and its application in day-to-day life.

Link to other subjects:

- Integrated science: The learner is able to relate the concept of volume to derived quantities.

Suggested Learning Resources:

Stacks of cubes, Elementary Print and braille Mathematical Tables, digital devices with assistive technology such as screen magnifiers, adapted keyboard and screen readers, scientific calculators, scientific talking calculators and Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 NUMBERS	**1.3 Indices and Logarithms** (5 lessons)	By the end of the sub-strand the learner should be able to: a) write indices and logarithm signs in braille, *(for learners with blindness)* b) express numbers in index form in different situations, c) generate the laws of Indices in different situations, d) apply the laws of indices in different situations, e) relate Powers of 10 to common logarithms in different situations, f) use IT to learn more on indices and common logarithms, g) appreciate use of indices and logarithms in real life situations.	● Learners with blindness are guided to identify indices and logarithm signs in braille from braille work cards. ● Learners with blindness practice writing expressions involving indices and logarithm signs in braille and share with their peers. ● Learners discuss indices and identify the base. ● Learners, show the laws of indices using multiplication and division. ● Learners use the laws of indices to work out indices. ● Learners use digital devices with assistive technology to work out common logarithms or learners with low vision use print mathematical tables and leaners with blindness are guided to match rows and columns of braille mathematical table so as to work out common logarithms.	1. How do we express numbers in power form? 2. How do we derive the laws of indices?

Core competencies to be developed:

- Communication and collaboration: The learner recognizes the value of others ideas as they discuss how to use indices and logarithms of numbers.
- Critical thinking and problem solving: The learner develops open mindedness as they generate and show the laws of indices using multiplication and division.

Values:

- Responsibility: The learner enhances diligence as they use digital devices such as calculators or other resources to work out indices and logarithms of numbers.
- Unity: The learner enriches cooperation as they work in groups during the discussion on indices and logarithms of numbers.

Pertinent and Contemporary Issues:(PCIs)

Citizenship: The learner promotes equity as they use multiplication and division and relate to fair sharing of resources.

Link to other subjects:

Integrated Science: The learner expresses numbers as indices and powers.

Suggested Learning Resources:

Braille cards, digital devices with assistive technology such as screen magnifiers, adapted keyboard and screen readers Print and Braille mathematical tables.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
1.0 **NUMBERS**	**1.4 Compound Proportions and Rates of Work** (8 lessons)	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 ratios 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) use IT devices to learn more on compound proportions and rates of work, f) appreciate use of compound proportions and rates of work in real life situations.	● In groups, learners are guided to partition quantities into proportional parts and express them as a fraction. Learners with blindness are given one on one demonstration on how to partition different quantities so as to express them as fraction. ● In groups, learners compare and write different ratios. Leaners with blindness are guided to be guided to denote ratio sign in braille. ● Learners determine compound proportions using ratios. ● Learners work out rates of work. ● Learners play adapted games involving rates of work using digital devices with assistive technology.	1. How do we express compound proportions in real life situations? 2. Why do we consider the rate of work in day-to-day activities?

Core competencies to be developed:

- Critical thinking and problem solving: The learner breaks the problem down into smaller questions as they determine compound proportions using ratios.
- Communication and collaboration: The learner develops teamwork as they discuss and divide quantities into proportional parts and express as a fraction.

Values:

- Responsibility: The learner enriches determination as they undertake tasks in a given time to accomplish tasks in a given time.
- Respect: The learner enhances etiquette as they respect each other while working at different rates.
- Unity: The learner enriches cooperation as they discuss and appreciate dividing quantities into proportional parts.

Pertinent and Contemporary Issues:(PCIs)

Self-esteem: The learner enhances responsibility as they devise personal strategies to divide quantities into proportional parts.

Link to other subjects:

Agriculture and nutrition: A learner links the knowledge estimate harvests, seeds or fertilizer required for sowing or application as part of rates of work.

Suggested Learning Resources:

Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, stop watches, Print and Braille Course Book.

Suggested Assessment Rubric

Level / Indicator	Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Ability to: a) work out combined operations on integers in different 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) apply the laws of indices in different situations, e) work out compound proportions using ratio method in different situations,	The learner demonstrates 5 skills.	The learner demonstrates 4 skills.	The learner demonstrates 2 to 3 skills.	The learner demonstrates 1 skill or none.

STRAND 2.0: ALGEBRA

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 ALGEBRA	**2.1 Matrices** (8 lessons)	By the end of the sub-strand the learner should be able to: a) define matrices as used in mathematical computations, b) use square brackets to write matrices in braille *(for learners with blindness),* c) identify a matrix in different situations, d) determine the order of a matrix in different situations, e) determine the position of items in a matrix in different situations, f) determine compatibility of matrices in addition and subtraction, g) carry out addition and subtraction of matrices in real life situations, h) reflect on the use of matrices in real life situations.	● Learners brainstorm and search for information on matrices and share with peers the meaning of matrices in the mathematical contexts. ● Learners with blindness are guided to identify the square brackets in matrices and from braille work cards. ● Learners with blindness to practise writing matrices by appropriately aligning; integers in rows and columns between opening and closing square brackets, using a braille machine. ● Learners discuss the use of tables such as football league tables, travel schedules, shopping lists and any other. Count the number of rows and columns in the table, which is a matrix. Learners with blindness use tactile football league tables, travel schedules, shopping lists or be given verbal descriptions as they undertake the activity. ● Learners arrange items in rows and columns and discuss how to represent a matrix. Learners with blindness are given one on one demonstration on how to arrange items in rows and columns. ● Learners organize objects in rows and columns and give the order of the matrix in terms of row and columns (row ***x*** column). ● In groups, learners discuss and identify the position of each item or element in terms of row and column.	How do we use matrices in real life situations?

			● Learners discuss and identify matrices that have equal number of rows and equal number of columns (same order) for compatibility in addition and subtraction. Learners with blindness are guided on how to align the addition or subtraction sign with matrices appropriately. ● In groups, learners discuss and note what is represented by the rows and what is represented by the columns from two or more matrices to carry out addition or subtraction.	
Core competencies to be developed: ● Communication and collaboration: The learner speaks clearly and effectively using appropriate language as they discuss use of tables to represent matrices. ● Learning to learn: The learner reflects on their own experience as they arrange items or elements in rows and columns to form matrices.				
Values: Integrity: The learner enhances discipline as they organise objects in rows and columns and give the order of the matrix.				
Pertinent and Contemporary Issues: (PCIs) Social and economic issues: The learner discusses the use of tables such as football league tables and shopping lists.				
Link to other subjects: Creative Arts and Sports: The learner generates tables of results in sports and refers to league schedules.				
Suggested Learning Resources: Print and braille Football league tables, travel schedules, shopping lists and Print and Braille Course Book.				

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 ALGEBRA	**2.2 Equations of a Straight Line** (15 lessons)	By the end of the sub-strand the learner should be able to: a) identify the gradient in real life situations, b) determine the gradient of a line from two known points, c) determine the equation of a straight line given two points, 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) recognise the use of equations of straight lines in real life.	● Learners discuss steepness in relation to gradient from the immediate environment. Learners with blindness are given one on one orientation in the environment to experience steepness of different objects and relate to gradient. ● Learners 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. Learners with blindness are guided to explore the ladder in different positions and note the changes in steepness. ● Learners climb up and down places such as the stairs or hills and relate to gradients. Learners with blindness are guided to climb up and down places to experience steepness and relate to gradient. ● Learners work out the equation of a straight line given two points or given a point and a gradient. Learners with blindness are guided to write the coordinates in braille. ● In groups, learners discuss and rewrite the equation of a straight line in print or braille in the form of $y = mx + c$. Explain the variables and constants in the equation.	1. How do we use gradients in our daily activities? 2. How to interpret the equation $y = mx + c$ in different situations?

			• Learners work out the value of x when y is zero and the value of y when x is zero. • Learners use digital devices with assistive technology or other resources to show different hills and mountains and discuss steepness.	

Core competencies to be developed:

- Digital literacy: The learner accesses learning materials using digital devices with assistive technology or other resources to explore steepness or gradients of places.
- Learning to learn: The learner builds on their own learning experiences as they place the ladder at different points on the ground while discussing and comparing steepness.

Values:

- Integrity: The learner enhances discipline as they observe gradient/steepness in staircases in buildings, bridges or ramps.

Pertinent and Contemporary Issues:(PCIs)

Safety and security: The learner promotes awareness as they climb up and down places such as the stairs or hills and relate to gradients.

Link to other subjects:

- Integrated Science: The learner uses the ladder to make work easier by using different gradients.
- Pre-Technical studies: The learner relates the concepts of parallel and perpendicular lines to technical drawing.

Suggested Learning Resources:

Ladder, Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
2.0 ALGEBRA	**2.3 Linear Inequalities** (6 lessons)	By the end of the sub-strand the learner should be able to: a) solve linear inequalities in one unknown, b) represent linear inequalities in one unknown graphically, *(leaners with low vision)* c) interpret linear inequality in one unknown graphically, *(leaners with blindness)* d) represent linear inequality in two unknowns graphically, *(leaners with low vision)* e) interpret linear inequality in two unknowns graphically, *(leaners with blindness)* f) apply linear inequalities to real life situations, g) reflect on the use of linear inequalities in real life.	● Learners discuss why sometimes resources are shared unequally. ● Learners discuss simple inequality statements, form and work out the inequalities in one unknown. ● Learners with low vision discuss and generate a table of values and draw linear inequalities in one unknown. Indicate and discuss the region that satisfies the inequalities. ● Learners with blindness are guided to manipulate tactile graphs of linear inequalities, identify and discuss the region that satisfies the inequalities. ● Learners with low vision discuss and generate a table of values and draw linear inequalities in two unknowns. Indicate and discuss the region that satisfies the inequalities. ● Learners with blindness are guided to manipulate tactile graphs of linear inequalities in two unknowns and identify the region that satisfies the inequality. ● In groups, learners discuss and work out linear inequalities that involve real life cases. ● Learners use digital devices with assistive technology 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: Communication and collaboration: The learner speaks clearly and effectively by making several points in logical order as they discuss and generate a table of values and draw linear inequalities.				
Values: Social justice: The learner enhances fairness as they apply concepts of inequalities and equity in sharing available resources in real life situations.				
Pertinent and Contemporary Issues:(PCIs) Citizenship: The learner discusses and indicates the regions that satisfy inequalities.				
Link to other subjects: Social Studies: The learner discusses inequality statements that may involve distribution of resources.				
Suggested Learning Resources: Tactile graphs, digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, Print and Braille Course Book.				

Suggested Assessment Rubric

Level / Indicator	Exceeds Expectations	Meets Expectations	Approaches Expectations	Below Expectations
Ability to: a) carry out addition and subtraction of matrices in real life situations, b) express the equation of a straight line in the form of $y = mx + c$, c) determine the x and y intercepts of a straight line, d) represent linear inequality in two unknowns graphically, *(leaners with low vision)* or interpret linear inequality in two unknowns graphically, *(leaners with blindness)*	The learner demonstrates the four skills.	The learner demonstrates three skills.	The learner demonstrates two skills.	The learner demonstrates one or no skill

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)	By the end of the sub- strand the learner should be able to: a) describe polygons in different situations, b) calculate the area of a pentagon and a hexagon in different situations, c) work out the surface area of triangular and rectangular based prisms, d) work out the surface area of triangular, rectangular and square-based pyramids, e) calculate the area of a sector and segment of a circle, f) work out the surface area of a cone in real life situations, g) calculate the surface area of a sphere in real life situations, h) recognise the use of area in real life situations.	● Learners to manipulate models or real objects of polygon to explore and familiarise with polygons in a variety of real life contexts. ● Learners discuss the properties of regular polygons and use cut-outs to work out the area of pentagons and hexagons. Leaners with blindness are guided to manipulate cut-outs of pentagons and hexagons and identify their properties. ● Learners collect from the environment objects that are spheres, cones/funnels, pyramids, prisms and frustums. Learners with blindness are orientated in the environment to collect and explore different objects to identify their shapes. ● Learners with low vision discuss and sketch the nets of the solids. Learners with blindness are guided to explore nets of different solids and relate them to the solids. ● Learners use models of prisms to work out the surface area of prisms. Leaners with blindness are guided to explore models of prisms to identify the shape of their faces and calculate area. ● Learners with low vision open up the net and draw the faces of a pyramid. Use the relevant formula of area of plane figures to work out the surface area of the pyramid. Learners with blindness are guided to open up the net and	1. How do we determine the area of different surfaces? 2. How do we use area in real life situations?

			identify the shape of the faces of a pyramid and calculate its surface area. ● Learners with low vision draw a circle with a sector, a chord and a segment and discuss the relationship Learners with blindness are guided to manipulate a tactile circle with a sector, a chord and a segment and relate them. Determine the area of a sector and a segment. ● Learners with low vision make cut-outs of a sector and a segment. Learners with blindness are given one on one demonstration to make cut-outs of a sector and segment from a circle. ● Learners open the cone to form a net and determine the curved surface area of a cone. Learners with blindness are guided to open a cone and manipulate to identify its shape and calculate its area. Work out the surface area of a closed and an open cone. ● Learners use relevant formulas to work out the surface area of different sizes of spherical balls. ● Learners use digital devices with assistive technology or other resources to sketch different models and nets.	

Core competencies to be developed:

- Communication and collaboration: The learner improves the team by not creating unnecessary conflicts and resolving conflicts as they work in groups to discuss the properties of regular polygons and use cut-outs to work out the area of pentagon and hexagon.
- Creativity and imagination: The learner develops originality skills as they open nets of different models and work out surface area.

Values:

Responsibility: The learner enhances diligence as they take care and work out surface area using models and open nets of different objects.

Pertinent and Contemporary Issues:(PCIs)

Patriotism: The learner promotes loyalty as they collect objects from the environment, use and dispose of them safely.

Link to other subjects:

Pre-Technical Studies: The learner uses models and open nets of different objects.

Suggested Learning Resources:

Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, nets of solids, spheres, cones/funnels, pyramids, prisms and frustums, cut- outs of regular polygons, manilla papers, Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcome	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 MEASUREMENTS	**3.2 Volume of Solids** (8 lessons)	By the end of the sub-strand the learner should be able to: a) describe the concept of volume in real life contexts, b) work out the volume of a triangular and rectangular based prisms, c) calculate the volume of a triangular, rectangular and square-based pyramids, d) work out the volume of a cone in real life situations, e) determine the volume of a frustum in real life situations, f) calculate the volume of a sphere in real life situations, g) promote use of volume and capacity of different containers in real life situations.	● Learners to discuss on the concept of volume of solids from personal experiences and share with peers for understanding of the concept. ● Learners collect different containers and objects such as balls and 3-D models of prisms, pyramids, cones and frustum. Learners with blindness are orientated in the environment to collect and explore different containers to identify their shapes. ● Learners identify and discuss the model of a prism. Leaners with blindness are guided to explore models of prisms to identify properties and discuss. Using the relevant formula, determine the volume of triangular and rectangular based prism. ● Learners use relevant formulae to work out the volume of pyramids and cones. ● Learners 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 the relevant formula. Learners with blindness are given one on one demonstration to cut pyramid into two parts, manipulate the two parts and	1. How do we determine the volume of different solids? 2. How do we use the volume of solids in real life situations?

			identify them as frustrum and small cone. ● Learners play adapted games involving different sizes of balls and work out the volume of a sphere. ● Learners use digital devices with assistive technology or other resources to determine the volumes of solids.	

Core competencies to be developed:

Critical thinking and problem solving: The learner explores the link between different events as they identify and work out the volume of a frustum from a pyramid.

Values:

- Responsibility: The learner enriches determination as they take care of the models of pyramids, cones, and spheres.
- Patriotism: The learner enhances citizenship as they collect objects from the environment to determine and discuss models/objects for different volumes of solids.

Pertinent and Contemporary Issues:(PCIs)

- Environmental education: The learner appreciates the gift of nature as they take care of the environment while collecting the containers and objects.
- Safety and security: The learner collects containers and objects cautiously.

Link to other subjects:

Creative Arts and Sports: The learner makes models of pyramids, cones/funnels and spheres/balls from available materials.

Suggested Learning Resources:

Different containers and objects e.g. prisms, pyramids, cones, funnels and balls, Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, Print and Braille Course Book.

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**)**	By the end of the sub- strand the learner should be able to: a) describe units of measuring mass in different situations, b) convert units of mass from one form to another in different situations, c) relate mass and weight in real life situations, d) determine mass, volume and density in different situations, e) apply density to real life situations, f) recognise the use of density in daily life.	● Learners brainstorm on various units of measuring mass and their practical applications in real life and share with peers ● Learners discuss different instruments and tools used in weighing materials or objects and relate to consumer awareness and protection. ● Learners collect and weigh different materials or objects and change one unit of mass to another. Learners with blindness are supported to note the reading on the weighing scales used in the activity. ● Learners discuss the relationship between mass and weight. ● Learners carry out activities relating mass and volume to density using containers or different substances. Learners with blindness are given verbal descriptions of the information on the container. ● Learners discuss and find the density of different materials or objects. ● Learners work out mass, volume and density using digital devices with assistive technology or other resources.	1. How do you weigh materials and objects? 2. How do we use density in daily life?

Core competencies to be developed:

- Communication and collaboration: The learner speaks engagingly by using facts and examples to support points when they are discussing the relationship between mass and weight.
- Learning to learn**:** The learner organises their own learning as they collect and weigh different materials or objects and change one unit of mass to another.

Values:

- Integrity: The learner enhances discipline as they give correct mass and weights of different material and objects.
- Responsibility**:** The learner enhances diligence as they work and take care of weighing machines and other resources.

Pertinent and Contemporary Issues:(PCIs)

Self-awareness: The learner weighs themselves for health purposes.

Link to other subjects:

- Agriculture and Nutrition: The learner weighs different quantities for a variety of recipes.
- Integrated Science: The learner uses machines and tools which involve weighing and balancing.

Suggested Learning Resources:

Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, objects/containers, weighing scales, Print and Braille Course Book.

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)	By the end of the sub-strand the learner should be able to: a) explain the relationship between time, distance and speed in real life situations, b) work out speed in km/h and m/s in real life situations, c) work out average speed in real life situations, d) determine velocity in real life situations, e) work out acceleration in real life situations, f) denote bearing symbol in braille, *(for learners with blindness),* g) identify the longitudes on the globe, h) relate longitudes to time on the globe, i) determine local time of places on the earth along different longitudes, j) appreciate the use of time and distance in real life situations.	● Learners engage in activities that involve measuring distances and time, for example running track events to determine speed. Learners with blindness are paired with sighted guides during track events. Learners to discuss and relate distance and time. ● Learners discuss the difference between velocity and speed. ● In groups, learners discuss and determine acceleration from track events in school or community. ● Learners with blindness are guided to read bearing symbol in braille from braille work cards. ● Learners practice to write mathematics expressions with bearing symbols in braille and share with peers. ● Learners with low vision discuss and use maps in appropriate font and colour contrast and models of a globe to work out and relate time of different places on the earth. Learners with blindness are guided to manipulate models of a globe to identify longitudes and latitudes and relate it to time. ● Learners use digital devices with assistive technology to watch/listen to	1. How do we observe speed in daily activities? 2. Why does time vary in different places of the world?

			videos on the globe, longitudes and time zones in different parts of the earth. ● Learners use other resources such as maps or tactile maps to locate different places (cities) on the earth and discuss time differences.	

Core competencies to be developed:

- Self-efficacy: The learner describes the procedure to be followed when measuring distances and time, for example running track events to determine speed
- Critical thinking and problem solving: The learner studies the instructions before working out and relate time of different places on the earth

Values:

- Integrity: The learner enhances discipline as they correctly record individual running time during track events and other games.
- Respect**:** The learner enhances etiquette as they adhere to their lanes on track events and other games.

Pertinent and Contemporary Issues:(PCIs)

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

Link to other subjects:

Integrated Science: A learner uses digital devices to tell time in different zones of the world.

Suggested Learning Resources:

Maps in appropriate font and colour contrast, Models of a globe, Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, digital watches, meter rule, tactile meter rule, tape measure, print and tactile maps and Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 MEASUREMENTS	**3.5 Money** (7 lessons)	By the end of the sub-strand, the learner should be able to: a) write braille symbol for US dollars, Euro, Yen and Sterling pound, *(for learners with blindness),* b) identify currencies that are used in different countries, c) convert currency from one form to another in real life situations, d) work out import and export duties charged on goods and services, e) work out excise duty charged on goods and services, f) determine value added tax (VAT) charged on goods and services, g) appreciate use of money in day-to-day activities.	● Learners with blindness are guided to identify braille symbols for US dollars, Euro, Yen and Sterling pounds on braille cards. ● Learners with blindness practice to write expressions with US dollars, Euro, Yen and Sterling pounds using braille equipment and materials and share with others in class. ● Learners use digital devices with assistive technology or other resources to obtain and compile a collage of currencies from different countries. For example, currencies of East African countries, US dollars, Euro, Yen and Sterling pound. ● Learners work out currency exchange from Kenya shillings to any other currency and vice versa. ● In groups, learners are guided to discuss and determine the export and import duty charges on different goods. ● Learners are guided to discuss and identify goods that attract excise duty. Determine excise duty. ● Learners use receipts from shopping to discuss and work out VAT on goods and services. Learners with blindness are given verbal descriptions of the information on the receipts from shopping then undertake the activity. ● Learners identify currency exchange rates from different sources, including daily papers, digital devices with assistive technology, and financial institutions, and relate this to consumer awareness and protection.	1. Why do we change currencies from one form to another? 2. How do we denote different currencies in braille? 3. Why should citizens pay taxes to the government?

Core competencies to be developed:

- Critical thinking and problem solving: The learner carries out research to build their understanding when compiling a collage of currencies from different countries.
- Citizenship: The learner demonstrates interest and interacts with others as they discuss and determine the export and import duty charges on different goods.

Values:

- Integrity: The learner enhances accountability as they accurately work out currency, import and exchange rates.
- Social cohesion: The learner promotes coexistence as they work and appreciate exchange rates for other countries.

Pertinent and Contemporary Issues:(PCIs)

- Education for Sustainable Development (ESD): The learner acquires life skills as they choose careers in business, imports and exports.
- Global citizenship: The learner develops honesty as they learn about different currencies of the world.

Link to other subjects:

Pre-Technical Studies: The learner works out VAT and currency exchange.

Suggested Learning Resources:

Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, Shopping receipts, Daily papers, braille work cards and Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
3.0 MEASUREMENTS	**3.6 Approximations and Errors** **(**4 lessons**)**	By the end of the sub-strand the learner should be able to: a) Explain the importance of approximations in measures, b) approximate quantities in measurements in different situations, c) determine errors using estimations and actual measurements of quantities, d) determine percentage errors using actual measurements of quantities, e) appreciate approximations and errors in real life situations.	● Learners are guided to search for information on approximation of various single and combining measurements and their applications in real life situations and mathematical contexts. ● Learners carry out activities of measurements of different quantities such as length, area, volume, capacity and mass using arbitrary units. Learners with blindness are guided to use tactile measuring or digital talking devices to undertake the activity. ● Learners with low vision are guided estimate and measure different quantities using appropriate instruments. Learners with blindness are guided to explore different quantities before estimating and measuring them using tactile measuring instruments or digital talking devices. ● Compare the estimates and the actual measurements and determine the error. ● Learners work out the percentage error from the estimated and the actual measurements. ● Learners work out errors using digital devices with assistive technology or other resources and relate this to consumer awareness.	1. How do we estimate measurements of different quantities? 2. Why do we appreciate approximations and errors in real life situations?
Core competencies to be developed: Creativity and imagination**:** The learner undertakes group tasks and gains new perspectives on how to measure different quantities such as length, area, volume, capacity and mass.				
Values: ● Integrity: The learner enhances accountability as they measure different quantities and minimise errors. ● Responsibility**:** The learner enhances accountability as they take care of tools for measuring different quantities.				
Pertinent and Contemporary Issues:(PCIs) Safety and security**:** The learner handles measuring tools with care.				
Link to other subjects: Integrated Science: The learner measures different quantities while carrying out experiments.				

Suggested Learning Resources:
Digital devices with assistive technology such as screen readers, screen magnifiers and adapted keyboard, measuring instruments such as meter rule, weighing scales, Print and Braille Course Book.

Suggested Assessment Rubric

Level / **Indicator**	**Exceeds Expectations**	**Meets Expectations**	**Approaches Expectations**	**Below Expectations**
Ability to: a) work out the surface area of triangular, rectangular and square-based pyramids, b) calculate the area of a sector and segment of a circle, c) determine the volume of a frustum in real life situations, d) determine mass, volume and density in different situations, e) determine local time of places on the earth along different longitudes, f) convert currency from one form to another in real life situations, g) determine percentage errors using actual measurements of quantities,	The learner demonstrates the seven skills.	The learner demonstrates five to six skills.	The learner demonstrates two to four skills.	The learner demonstrates one or no skill.

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)	By the end of the sub strand, the learner should be able to: a) identify general coordinates on the four quadrants of a Cartesian plane, b) plot out points on a Cartesian plane, *(for learners with low vision)* c) locate points on a Cartesian plane, *(for learners with blindness)*	● Learners explore pre-drawn print or braille Cartesian planes to identify the sign of x and y coordinates on each quadrant to form a general knowledge on plotting and locating points on a Cartesian plane. ● In groups, learners with low vision locate the point of intersection of the x coordinate and the y- coordinates on a Cartesian plane. ● Learners with blindness are guided to manipulate a tactile cartesian plane and locate the point of intersection of the x coordinate and the y- coordinates.	1. How do we draw graphs of straight lines? 2. How do we interpret graphs of straight lines?

		d) draw a straight-line graph given an equation, *(for learners with low vision)* e) interpret a tactile straight-line graph given an equation *(for learners with blindness),* f) draw parallel lines on the Cartesian plane, *(for learners with low vision)* g) interpret tactile parallel lines on the Cartesian plane *(for learners with blindness),* h) relate the gradients of parallel lines, i) draw perpendicular lines on the Cartesian plane, *(for learners with blindness),* j) interpret tactile perpendicular lines on the Cartesian plane *(for learners with blindness),* k) relate the gradients of perpendicular lines, l) apply graphs of straight lines in real life situations.	● Learners with low vision generate a table of values from the equation of a straight line, plot and join the points to form a straight line. Learners with blindness are guided to manipulate and interpret tactile line graphs. ● Learners with low vision generate a table of values for each of the given equations, plot and join them to form straight lines on the Cartesian plane. ● Learners with blindness are guided to manipulate and interpret tactile line graphs. ● Learners work out the gradients of each of the lines and compare them to establish the relationship of parallel lines. ● Learners with low vision generate a table of values for each of the given equations of perpendicular lines, plot and join them to form straight lines on the Cartesian plane. ● Learners with blindness are guided to manipulate and identify perpendicular lines on the tactile graph. ● Learners 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: The learner listen critically as they work in groups to locate the point of intersection of straight lines
- Critical thinking and problem solving: The learner follows instructions to complete tasks as they generate a table of values from equations of a straight line.

Values:

Responsibility**:** The learner enriches determination as they take care of graphing instruments and other resources.

Pertinent and Contemporary Issues: (PCIs)

- Education for Sustainable Development (ESD): The learner acquires life skills as they generate tables of values and draw graphs of straight lines.
- Safety and **Security**: The learner enhances caution as they handle graphing instruments with sharp ends.

Link to other subjects: Integrated Science: The learner plots graphs of straight lines in different quantities.
Suggested Learning Resources: Tactile graphs, Tactile Cartesian plane, tactile line graph, graph books.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 GEOMETRY	**4.2 Scale Drawing** (14 lessons)	By the end of the sub-strand, the learner should be able to: a) identify compass and true bearings in real life situations, b) determine the bearing of one point from another in real life situations, c) locate a point using bearing and distance in real life situations, d) identify angles of elevation in real life situations, e) determine angles of elevation in different situations,	● Learners with low vision draw and discuss the compass directions and relate to the compass and true North bearings. Learners with blindness are guided to manipulate a tactile compass to identify its compass directions. ● Learners discuss and locate places from different points using bearings. Learners with blindness are given verbal descriptions of the location of different places. ● Learners with low vision discuss and locate a place using bearing and distance. Sketch	1. How do we use scale drawing in real life? 2. How do we apply scale drawing in simple surveying?

		f) identify angles of depression in real life situations, g) determine angles of depression in different situations, h) apply scale drawing in simple surveying, i) appreciate the use of scale drawing in real life situations.	and use scale drawing to show the position of places from given points. Learners with blindness to be given verbal description of the location of places using bearing and be guided to manipulate tactile sketch and locate position of places. ● Learners with low vision carry out 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. Learners with blindness are guided to manipulate and interpret a tactile sketch of angle of elevation. ● Learners carry out different activities involving angles of depression, for example observing different objects or points that are below. Learners with blindness are given verbal descriptions on angles of depression and be guided to manipulate and interpret tactile sketches of angles of depression. ● Learners with low vision discuss, sketch and make a scale drawing to determine the angles of depression. Learners with blindness are guided to manipulate and interpret tactile sketches and identify angles of depression. ● Learners discuss and use scale drawing in simple surveying. ● Learners with low vision observe maps or watch to videos on bearings and simple surveying. Learners with blindness are guided to manipulate tactile maps or listen to videos on bearings and simple surveying.	

Core competencies to be developed: Learning to learn: The learner builds their own learning experience as they sketch/ manipulate tactile sketches and determine angles of elevation and depression.
Values: ● Unity: The learner enriches cooperation as they sketch and agree on points in simple surveying. ● Social cohesion: The learner promotes coexistence as they observe maps and watch videos on land surveying.
Pertinent and Contemporary Issues: (PCIs) Education for Sustainable Development (ESD): The learner discusses with others and locates places from different points using bearings.
Link to other subjects: Social Studies: The learner works in groups to observe maps in surveying.
Suggested Learning Resources: Print and Tactile compass, tactile angles, digital devices with assistive technology such adapted keyboards, screen magnifiers and screen readers, Print and Braille Course Book.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
4.0 GEOMETRY	**4.3 Similarity and Enlargement** (10 lessons)	By the end of the sub-strand, the learner should be able to: a) identify similar figures and their properties, *b)* draw similar figures in different situations *(for learners with low vision),* *c)* identify similar figures in different situations (*for learners with blindness),* d) determine properties of enlargement of different figures,	● Learners collect objects and sort according to similarity. Learners with blindness are guided to manipulate objects and sort them. ● Learners with low vision use properties of similar objects to scale-draw similar figures. ● Learners with blindness are guided to manipulate similar objects of different sizes and relate them. ● Learners discuss and identify properties of enlargement. ● Learners with low vision use properties of enlargement to represent objects and their	1. How do we use enlargement in real life situations? 2. How do we use similarity and enlargement in real life situations?

		e) apply properties of enlargement to draw similar objects and their images, f) determine the linear scale factor of similar figures, g) promote use of similarity and enlargement in real life situations.	images. Learners with blindness use properties of enlargement to identify objects and their images. ● Learners determine the linear relationship of similar figures and objects.	
Core Competencies to be developed: ● Critical thinking and problem solving: The learner develops open mindedness and creativity as they draw similar and enlarged objects and figures. ● Digital literacy**:** The learner uses digital devices, software and services to effectively enlarge objects and figures.				
Values: ● Responsibility: The learner enriches determination as they collect similar objects and take care of them in the learning process. ● Social cohesion: The learner enhances co-existence as they work in groups to draw similar objects and figures.				
Pertinent and Contemporary Issues: • Environmental education: The learner appreciates the gift of nature as they collect similar objects from the environment.				
Link to other subjects: Pre-Technical Studies: The learner scale draws similar figures and objects.				
Suggested Learning Resources: Print and Braille Course Book, similar objects of different sizes.				

Strand	**Sub-Strand**	**Specific Learning Outcomes**	**Suggested Learning Experiences**	**Suggested Key Inquiry Question(s)**
4.0 GEOMETRY	**4.4 Trigonometry** (7 lessons)	By the end of the sub-strand, the learner should be able to: a) identify angles and sides of right-angled triangles in different situations, b) write braille symbol for Sine, Cosine and Tangent *(for learners with blindness),* c) identify Sine, Cosine and Tangent ratios from a right-angled triangle in different situations, d) read tables of trigonometric ratios for acute angles,	● Learners with low vision are guided to draw right-angled triangles and recognise angles and sides. Learners with blindness are guided to manipulate tactile right-angled triangles so as to identify angles and sides. Discuss the relationship between angles and sides. ● Learners with blindness are guided to identify braille symbols for Sine, Cosine and Tangent on braille cards and practice	1. How are angles and sides related in a right angled triangle? 2. How to apply trigonometric ratios to calculate length and

		e) determine trigonometric ratios of acute angles using calculators, f) apply trigonometric ratios to calculate lengths and angles of right-angled triangles in different situations, g) appreciate the use of trigonometric ratios in real life situations.	writing expressions involving Sine, Cosine and Tangent, present in class. ● Learners discuss and relate the trigonometric ratios to angles in a right-angled triangle. ● Learners use trigonometric ratios to determine lengths and angles of right-angled triangles. ● Learners use print or braille mathematical tables or digital devices with assistive technology to find trigonometric ratios of given angles.	angles of right-angled triangles in different situations?
Core competencies to be developed: ● Communication and collaboration: The learner speaks clearly and effectively by making several points in logical order as they discuss and relate the trigonometric ratios to angles in a right-angled triangle. ● Learning to learn: The learner shares what they have learnt when they present in class expressions involving Sine, Cosine and Tangent.				
Values: Responsibility: The learner enhances self-drive as they take care of digital devices, mathematical tables and drawing materials.				
Pertinent and Contemporary Issues: Safety and security**:** The learner take necessary precaution as they plug and use digital devices				
Link to other subjects: Pre-Technical Studies: The learner draws right-angled triangles and recognises angles and sides.				
Suggested Learning Resources: Geometrical Sets, Adapted Geometrical Sets, Tactile angles, Braille Elementary Mathematical Set, Digital devices with assistive technology such adapted keyboards, screen magnifiers and screen readers, Print and Braille Course Book				

Suggested Assessment Rubric

Level **Indicator**	**Exceeds Expectations**	**Meets Expectations**	**Approaches Expectations**	**Below Expectations**

Ability to: a) plot out points on a Cartesian plane, *(for learners with low vision)* or locate points on a Cartesian plane, *(for learners with blindness)* b) identify compass and true bearings in real life situations, c) determine properties of enlargement of different figures, d) apply trigonometric ratios to calculate lengths and angles of right-angled triangles in different situations,	The learner demonstrates the four skills.	The learner demonstrates three skills.	The learner demonstrates two skills.	The learner demonstrates one skill or none

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)	By the end of the sub-strand, the learner should be able to: a) determine appropriate class width for grouping data, b) prepare frequency distribution tables of grouped data, c) identify the modal class of grouped data, d) write symbol for summation in braille *(for learners with blindness)*, e) calculate the mean of a grouped data from real life situations, f) determine the median of a grouped data from real life situations, g) appreciate data interpretation in real life situations.	● Learners collect data and work out an appropriate class width. Learners with blindness are guided to write data appropriately in class width by separating upper and lower limit with mathematical hyphen. ● Learners with low vision tally data and represent it in a frequency distribution table. Learners with blindness are guided to align data appropriately in rows and columns using braille machine. ● Learners recognise the modal class from a set of grouped data. ● Learners with blindness identify symbols for summation in braille and practice writing expressions involving summation and present in class. ● In groups, learners work out the mean from different sets of grouped data. ● Learners use the frequencies to determine the median class of grouped data. ● Learners work out the median from different sets of grouped data. ● Learners use digital with assistive technology or other materials to determine the mean and median of grouped data.	1. How do we interpret data? 2. How do we determine the median of a grouped data from a real life situation?

Core competencies to be developed:

- Learning to learn: The learner develops independence as they collect, organise and interpret data.
- Communication and collaboration: The learner contributes to group decision making as they discuss and determine the modal class, mean and median of grouped data.

- Digital literacy: The learner develops interaction with technology as they use digital or other materials to determine the mean and median of grouped data.

Values:

Respect: The learner enhances patience as they work together in groups to collect data from the immediate environment.

Pertinent and Contemporary Issues:(PCIs)

- Citizenship: The learner develops responsibility as they collect data that may relate to the population.
- Education for Sustainable Development (ESD): A learner develops life skills as they choose career paths in statistics and other related fields.

Link to other subjects:

- Integrated Science: The learner interprets data related to different organisms and materials.
- Social Studies: The learner analyses and interprets data in different social aspects.

Suggested Learning Resources:

Digital devices with assistive technology such adapted keyboards, screen magnifiers and screen readers, print and braille mathematics text books.

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)	By the end of the sub-strand, the learner should be able to: a) describe the concept of probability as used in mathematical contexts, b) perform experiments involving equally and likely outcomes in different situations, c) determine the range of probability of an event, d) identify mutually exclusive events in real life situations, e) perform experiments of single chance involving mutually exclusive events, f) perform experiments involving independent events in different situations, g) draw a tree diagram for a single outcome *(for learners with low vision),* h) interpret a tactile tree diagram showing a single outcome *(for learners with blindness),* i) appreciate the probability of events occurring in real life situations.	● Learners to discuss the likelihood of different events to occur or not in a variety of real life situation to form knowledge on probability in mathematical problems. ● Learners discuss and carry out experiments of events involving equally and likely outcomes. Learners with blindness are given verbal descriptions of likely outcomes in events. ● Learners work out the range of probability of different events. ● Learners discuss and carry out experiments involving mutually inclusive events. Learners with blindness are given verbal descriptions of likely outcomes in events. ● Learners discuss and carry out experiments involving independent events. Learners with blindness are given one on one demonstration and verbal descriptions of likely outcomes in events. ● Learners with low vision practice representing probability occurrences in a tree diagram. Learners with blindness are given verbal descriptions of probability representations and calculations.	1. Why is probability important in real life situations? 2. How do we perform experiments involving independent events in different situations?

			● Learners use digital devices with assistive technology or other resources to explore more on probability.	

Core Competencies to be developed:

- Communication and collaboration: The learner develops speaking skills and teamwork as they discuss and carry out experiments of events involving equally likely outcomes.
- Self-efficacy: The learner exhibits confidence as they carry out experiments involving independent events and avoid harmful practices of gambling.

Values:

- Responsibility: The learner enriches determination as they discuss and carry out experiments involving mutually inclusive events.
- Social justice**:** The learner enhances co-existence as they work in groups and practice representing probability occurrences in a tree diagram.

Pertinent and Contemporary Issues: (PCIs)

Financial literacy: The learner carries out experiments involving independent events and avoids harmful practices of gambling using money.

Link to other subjects:

Agriculture and Nutrition**:** The learner works in groups to explore the weather patterns.

Suggested Learning Resources:

Digital devices with assistive technology such adapted keyboards, screen magnifiers and screen readers, dice, Coins, Print and Braille Course Book**.**

Suggested Assessment Rubrics

Level / **Indicator**	**Exceeds Expectations**	**Meets Expectations**	**Approaches Expectations**	**Below Expectations**
Ability to: a) calculate the mean of a grouped data from real life situations, b) determine the median of a grouped data from real life situations, c) determine the range of probability of an event,	The learner demonstrates the four skills.	The learner demonstrates three skills.	The learner demonstrates two skills.	The learner demonstrates one skill or none.

d) draw a tree diagram for a single outcome *(for learners with low vision),* or interpret a tactile tree diagram showing a single outcome *(for learners with blindness),*				

APPENDIX I: COMMUNITY SERVICE LEARNING PROJECT

Introduction

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

CSL Skills to be covered:

i) **Leadership**: A learner develops leadership skills as they undertake various roles during preparation.

ii) **Financial literacy and entrepreneurship skills:** A learner will gain skills on wise spending, saving and investing for sustained economic growth. They could consider ways of generating income as they undertake the CSL project through innovative ways. Moreover, they could identify business ideas and opportunities as well as resources to meet the needs of the community.

iii) **Research:** A learner will develop research skills as they identify a problem or a pertinent issue in the community, design a solution and plan how the problem will be solved. They will then do a report of the project accomplished.

iv) **Communication and collaboration:** A learner will develop these skills as they interrogate the problem in the community, research and brainstorm on a solution, and collaborate with the members of the community in the implementation process.

v) **Citizenship:** A learner will engage in the CSL activities, in appreciation of their responsibilities, rights and privileges as citizens, giving them a sense of belonging and attachment to the nation. They will also be empowered to engage and assume active roles in shaping a more cohesive, peaceful and inclusive society.

vi) **Life skills:** A learner will develop life skills in decision making, assertiveness, effective communication, and problem solving and stress management.

vii) **Community development:** A learner will be sensitised on the needs or gaps in the community and empowered to take responsibility within their means for stronger and more resilient communities.

Suggested PCIs	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Question(s)
● Environmental degradation ● Lifestyle diseases ● Communicable and non-communicable diseases ● Poverty ● Violence in community ● Food security issues ● Conflicts in the community **Note:** The suggested PCIs are only examples. Teachers should allow learners to identify PCIs as per their context and reality.	By the end of the CSL project, the learner should be able to: a) identify a problem in the community through research, b) design a solution to the identified problem, c) plan to solve the identified problem in the community, d) implement the plan to solve the problem, e) report and reflect on the concluded project, f) appreciate the need to belong to a community.	● In groups, learners brainstorm on pertinent and contemporary issues in their community that need attention. ● In groups, learners choose a PCI that needs immediate attention and explain why in groups. ● Learners carry out research using digital devices with assistive technology, print media, braille media or interactions with members of the community/resource persons in identifying a community problem to address in groups. ● In groups, learners discuss possible solutions to the identified issue. ● In groups, learners propose the most appropriate solution to the problem. ● In groups, learners be guided on ways and instruments they can use to collect data on the problem (Questionnaires, interviews, observation schedule, etc) ● Learners develop instruments for data collection. ● Learners identify resources needed for the CSL project (human, technical, financial). ● In groups, learners discuss when the project will begin and end. ● Learners prepare a programme/timetable of the entire project execution in print or braille. ● Learners assign roles to be carried by all group members. ● Learners reflect on how the project preparation enhanced learning.	1. How does one determine a community need? 2. Why is it necessary to make adequate preparations before embarking on a project?

Key Component of CSL developed;

a) identification of a problem in the community through research,
b) designing solution(s) to the identified problem,
c) planning to implement the solution,
d) implementing the plan to solve the problem,
e) concluding, reflecting, reporting on the project.

Core Competencies to be developed:

- **Communication and collaboration**: A learner develops speaking skills and teamwork as they make the preparations in groups and conduct discussions on best ways of carrying out the project.
- **Self-efficacy**: A learner develops the skills of self-awareness and leadership as they undertake the CSL project
- **Creativity and imagination**: A learner will come up with creative ways of solving the identified community problem
- **Critical thinking and problem solving**: A learner will demonstrate autonomy in identifying a community need, exploring plausible solutions and making necessary preparations to address the problem.
- **Digital literacy:** A learner can use technology as they research on a community problem that they can address.
- **Learning to learn**: A learner gains new knowledge and skills as they identify a community problem to be addressed and prepare to carry out the project.
- **Citizenship:** A learner enhances responsibility to the community as they choose a PCI that needs immediate attention in the community.

Values

- **Integrity:** Learners enhance discipline as they carry out research using digital devices and print media as they identify a community problem to address.
- **Respect:** Learners enhance patience as they brainstorm on pertinent and contemporary issues in their community that need attention

Pertinent and Contemporary Issues

- **Social cohesion:** A learner discusses possible solutions to the identified issue.
- **Critical thi**nking: A learner discusses possible solutions to the identified issue.

Suggested Learning Resources

Digital devices with assistive technology.

Suggested Assessment Rubric				
Level / **Indicator**	**Exceeds Expectation**	**Meets Expectation**	**Approaches Expectation**	**Below Expectation**
Ability to: • identify a problem in the community through research, • design a solution to the identified problem, • plan to solve the identified problem in the community, • implement the plan to solve the problem, • report and reflect on the concluded project,	The learner demonstrates the five skills.	The learner demonstrates three to four skills.	The learner demonstrates the two skills.	The learner demonstrates the one or no skill.

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

Strand	Sub-strand	Suggested Assessment Methods	Suggested Non-Formal Activities
NUMBERS	Integers	● Class activities ● Class written tests in print and braille. ● Home or extended assignments or activities. ● Project	Prepare or improvise number lines games on charts.
	Cubes and cube roots	● Class activities ● Class written tests in print and braille. ● Home or extended assignments or activities.	
	Indices and logarithms	● Class activities ● Class written tests in print and braille. ● Home or extended assignments or activities.	
	Compound proportions and rates of work	● Class activities ● Class written tests in print and braille. ● Home or extended assignments or activities.	
ALGEBRA	Matrices	● Class activities ● Class written tests in print and braille. ● Home or extended assignments or activities.	Carry out activities involving arranging objects from their immediate environment into rows and columns. This can be done at home. Take photos and share with class or school. Use the concept of organising objects/items at school and home.
	Equations of a straight line	● Class activities ● Class written tests in print and braille.	

Strand	Sub-strand	Suggested Assessment Methods	Suggested Non-Formal Activities
		• Home or extended assignments or activities.	
	Linear inequalities	• Class activities • Class written tests in print and braille. • Home or extended assignments or activities.	
MEASUREMENT	Area	• Class written tests in print and braille. • Home or extended assignments or activities.	
	Volume of solids	• Class written tests in print and braille. • Home or extended assignments or activities • Project	Make models of prisms, pyramids, cones and spheres that can be used as learning resources for Mathematics and other subjects.
	Mass, volume, weight and density	• Class written tests in print and braille. • Home or extended assignments or activities.	
	Time, distance and speed	• Class written tests in print and braille. • Home or extended assignments or activities • Project	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	Prepare dummies or paper cut-outs of currencies from different countries and role-play currency exchange activities.

Strand	Sub-strand	Suggested Assessment Methods	Suggested Non-Formal Activities
	Approximation and errors	• Class activities • Home or extended assignments or activities.	
GEOMETRY	Coordinates and graphs	• Class activities • Class written tests in print and braille. • Home or extended assignments or activities.	
	Scale drawing	• Class activities • Class written tests in print and braille. • Home or extended assignments or activities • Project	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 in print and braille. • Home or extended assignments or activities • Project	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 in print and braille	
DATA HANDLING AND PROBABILITY	Data interpretation (Grouped data)	• Class activities • Class written tests in print and braille.	
	Probability	• Class activities • Class written tests in print and braille.	

APPENDIX III: 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 resources.