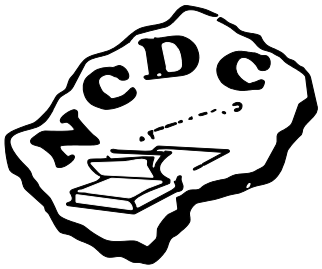
Ministry of Education and Training

Grade 8 Mathematics Syllabus



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Introduction

Grade 8 Mathematics Syllabus forms part of the integrated curriculum. This curriculum is basically intended to draw together knowledge, skills, attitudes and values from different subject areas to develop a more powerful understanding of key ideas which can be connected and related in meaningful ways by both learners and teachers. Development of this syllabus was based on five Curriculum Aspects which highlight the life challenges and contexts in which the learner is expected to function as an individual and a member of a society. These are: Effective Communication; Awareness of Self and Others; Environmental Adaptation and Sustainable Development; Health and Healthy Living; and Production and Work-related Competencies.

The solid foundations of Mathematics concepts and skills have been laid in previous grades. The syllabus materials for previous grades were intended to enable learners to take their first steps on a pathway of active and independent learning. These materials were also aimed at building on and reinforcing the skills and attitudes to learners. These curriculum materials are envisioned to prepare learners to become progressively more autonomous learners throughout their academic journey. The current Grade 8 Mathematics Syllabus has been developed in the manner that resonates with the previous curriculum materials. The designed Learning Outcomes and activities are age appropriate, and have been deliberately developed to advance mathematics conceptual development. In fact, they are intended to nurture learners and to foster positive and enthusiastic attitudes towards mathematics learning.

Teaching approaches

Teachers are encouraged to use a wide variety of teaching techniques, including group work, practical exercises and activities involving the wider community. The emphasis on practical activities is made because they promote mathematics conceptual development to learners, and also stimulate their curiosity and foster an active approach to learning. The role of the teacher is to facilitate active learning, rather than a teacher-centred didactic approach. Teachers are also advised to improvise and, where applicable, use concrete materials from the immediate environment to enhance learners' understanding of mathematics concepts. Mathematics concept development should start with manipulation of concrete objects before introducing the abstract ideas. The general aim of teaching mathematics concepts is to equip learners with knowledge and skills which can enable them to develop investigative and analytical skills. As a result, learners would acquire critical and logical thinking.

Promotion of values and attitudes

Grade 8 Mathematics syllabus was developed following the guidelines of curriculum and assessment policy framework (2009), which one of its goals is to promote values and attitudes to learners. The LOs as well as suggested activities have been developed with the purpose of addressing this issue. This syllabus targets to promote positive attitude, acceptable morals, teamwork and adherence to ethical issues. Considering that values and attitudes have been addressed extensively in relevant subject areas, this syllabus put more focus on the specific values and attitudes which are as follows: cooperation, confidence, honesty, appreciation, patience and objectivity. It is hoped that this will help learners to become credible individuals and also build good relations that will lead to their harmonious coexistence.

Promotion of Financial Literacy

The Grade 8 Mathematics Syllabus is committed to promoting financial literacy among the Basotho children. Mathematics teaching and learning processes have been considered as an appropriate platform to relay messages covering financial education. The intention is to equip learners with requisite skills which will enable them to manage their finances in a manner that could sustain them in future. In this syllabus, learners will be engaged in various activities that require them to calculate value of money, interpret information which empowers them to make informed financial decisions and be conscious of benefits of saving money. It is therefore believed that learners will understand the importance of money in their lives. They will also become critical consumers who will avoid wasteful spending and being drowned in unnecessary debts.

Consideration of inclusive education

The Ministry of Education and Training (MoET) is committed to ensure successful integration of learners with special educational needs (LSEN) into regular schools. Hence it has developed legal and policy frameworks which advocate for improving access to quality education to all learners, including LSEN. Teachers are therefore, advised to adapt suggested activities in the syllabus to cater for different educational needs of LSEN. Teachers are requested to ensure that the LSEN actively participate in all classroom activities. However, where necessary, teachers are advised to prepare individualised education programmes (IPE) for every learner with special educational needs present in the classroom.

Content presentation

The main areas covered by Grade 8 Mathematics syllabus include: numbers, shapes, measurements, transformations, sets, ratios, algebra, probability and statistics. The Learning Outcomes are arranged in such a way that concepts show logical connections in order to facilitate continuous learning. This arrangement also allows for the progressive development of content complexity. However, this is not binding, and teachers may follow a different pattern when planning their lessons. The Grade 8 Mathematics Syllabus has followed an approach which bears a resemblance of the syllabus materials of the previous grades.

The intention was to ensure continuity in Mathematics conceptual development. Apart from that, the aim is to promote strong understanding and connection between Mathematics concepts and content with those of other subject areas. When planning Mathematics lessons, teachers are expected to make some connections with content from other subject areas, where possible. This creates an overall learning opportunity that integrates and balances concept development, skill acquisition and application.

Mathematical skills help learners to make sense of the world in terms of order, beauty and consistency by noticing size, shape and position. They help to make connections, to see order and logic. Seeing patterns, making predictions, estimating, determining rates of change, demonstrating, problem-solving and critical thinking are all necessary in real-life situations. Learners should learn Mathematics in ways that allow them to discover relationships, develop understanding and the growth of thinking. Mathematics is a tool in other fields: it is a service subject, and therefore should be taught as a tool in the context of its application in real-life.

The Grade 8 Mathematics Syllabus promotes acquisition and application of mathematical skills for effective participation in scientific, technological and socio-economic development. It also develops appreciation among learners for contribution of mathematical skills in different fields. Most importantly, it promotes development of positive attitudes towards Mathematics as a foundation for further learning and career development.

Layout and presentation of syllabus and definitions of terminology

The subject matter is divided into a number of **Learning Outcomes** (the terms “learning objectives” or “learning intentions” are often used in other contexts. Learning outcome: a statement in measureable terms of what a learner should know, understand or be able to do by the end of a given segment of the syllabus. For each targeted **learning outcome**, details are given of: the key **concepts, skills, values and attitudes** which underpin its successful attainment.

- **Concept:** a general idea which emerges from a specific situation; once understood it can be applied to different contexts to promote understanding.
- **Skills:** abilities which every learner is expected to acquire to help them learn and live well in society; they can be mental, physical or social.
- **Suggested learning experiences**: teaching and learning activities designed to enable learners to achieve a given learning outcome. This is not exhaustive and the teacher is free to use other complementary activities.
- **What to assess**: in this column**,** the **learning outcome** is broken down into several specific, measurable and observable points, against which the teacher can check the learners’ progress. These focus on the process and characteristics of learning rather than the final outcome.
- **Suggested resources:** a list of possible items, materials, persons etc. which may be used to help achieve a given learning outcome. This is designed to help all teachers, however many or few resources may be available in their schools and communities.

Principles of assessment

Assessment and curriculum are closely integrated and mutually supportive. The 2009 *Curriculum and Assessment Policy* introduces continuous assessment (CASS) as a key strategy to reform education. Continuous assessment is an on-going system of monitoring and assessing learners’ progress. It is closely integrated with the teaching and learning process and actually supports learning. It is formative assessment, done in the school environment through daily teaching. It can also be achieved through projects, quizzes, tests, interviews and observations.

In the context of Lesotho, it has been decided to merge formative assessment and assessment for learning, moving away from the traditional ways of testing, which have been found to be severely limiting. Testing through examinations and tests provides learners with marks or grades. However,

it does not give any indication of what the learner is actually able to do. Instead of marks or grades, the new methods of assessment will generate statements about each learner's progress and ability. These will help learners, their teachers and future teachers, their parents and guardians as well as education policy makers to know exactly what a learner has learned and is capable of doing, also indicating areas where remedial work is needed. A further disadvantage of conventional testing is that teachers feel under pressure to "teach for the exam" and ignore aspects of the curriculum which will not be examined.

The syllabus is presented in such a way that, along with each learning outcome, assessment criteria guide the teacher in what to assess to determine whether the learning outcome has been successfully achieved, partially achieved or not yet achieved. Teachers should share Learning Outcomes and success criteria with learners so that learners know what they are learning and the standards they are aiming for. They should also provide feedback (which may be oral or written) that helps learners to identify improvement. Both the teacher and the learner will reflect on learners' performance and learners will learn **self-assessment techniques** to discover areas for improvement. This promotes a more active approach to learning and recognises that both motivation and self-esteem are crucial for effective learning and progress, and that these can be increased through effective assessment techniques. In addition to self-assessment, peer-assessment is a useful tool which will be used where appropriate.

Overview

At the end of Grade 8, learners should be able to:
1. describe and interpret universal set using Venn diagrams and appropriate set notation. 2. form sets of different types of numbers. 3. form and interpret sets using ordered pairs. 4. express natural numbers as products of their prime factors. 5. demonstrate understanding of directed numbers in practical situations. 6. generate a sequence using a given rule. 7. demonstrate an understanding of place value up to trillion. 8. round off a number to a specified number of significant figures. 9. evaluate expressions. 10. simplify expressions. 11. construct line and angle bisectors. 12. construct parallel and perpendicular lines. 13. calculate angles using their properties. 14. describe polygons using their properties. 15. describe prisms using their properties. 16. describe and perform translation on simple plane figures. 17. describe symmetry in 2-D shapes. 18. describe and perform reflection on simple plane figures. 19. describe and perform rotation on simple plane figures. 20. demonstrate understanding of conversions involving percentages, fractions and decimals. 21. calculate quantities using ratios and percentages. 22. demonstrate an understanding of rate as a comparison of two measurements with different units. 23. calculate time in 12 and 24-hour clock. 24. read and use linear scale of different instruments. 25. calculate perimeter of up to 12-sided polygons. 26. calculate area of up to 12-sided polygons. 27. solve simple linear equations in one unknown. 28. solve fractional equations with numerical denominator(s). 29. change the subject of a simple formula. 30. demonstrate understanding of addition and subtraction of fractions and decimals. 31. demonstrate understanding of multiplication and division of fractions. 32. multiply and divide fractions and decimals by whole numbers. 33. solve probability problems of combined events.

34. use Pythagoras theorem to calculate sides in a right-angled triangle.
35. demonstrate understanding of addition and subtraction of vectors.
36. demonstrate understanding of calculations involving matrices.
37. find mean, mode and range from ungrouped data.
38. evaluate and generate linear mappings.
39. draw graphs of linear equations.
40. solve linear inequalities in one unknown.
41. express numbers in an index form.
42. draw and interpret bearing.

Activity plan

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
1. describe and interpret universal set using Venn diagrams and appropriate set notation.	**Concepts** Sets Universal set Compliment of a set Venn diagram Joint and disjoint sets Set notation: $\cup, \cap, \in, \notin, \emptyset, \{\}$ $\subseteq, \subset, \not\subset, n(A), A', \xi$ **Skills** Classification Manipulation Communication Interpretation	• Teacher and learners review set notation. • Learners bring materials from the immediate environment and sort them according to: colour, size, shape or any other common feature. • Under the guidance of the teacher, learners bring together their formed sets to form a bigger set. • Learners, under the teacher's guidance, deduce the universal set. • Learners use appropriate notation to describe the sets. • Learners represent the formed sets using a Venn diagram. • Learners form and describe sets from different scenarios using appropriate notation. • Learners form and describe sets of different types of numbers provided by the teacher. • Learners use the sets to form a universal set. • Learners establish relationship between any two sets in the universal set. • Learners solve problems involving set notations.	sort materials according to common features. form and describe the formed universal set. use appropriate notation to describe sets in the universal set. represent the formed sets using a Venn diagram. form and describe sets using different scenarios and appropriate notation. form and describe sets of different types of numbers. use the sets to form a universal set. establish the relationship between any two sets in the universal set. solve problems involving set notations.	Materials from the immediate environment Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
2. form sets of different types of numbers.	**Concepts** Sets Types of numbers: natural, odd, even, prime, square, cube Multiple Factor Venn diagram Set notation: $n(A)$, A', ξ **Skills** Classification Manipulation Communication Interpretation	• Teacher and learners review types of numbers. • Learners list sets of types of numbers using set braces - { }. • Learners represent members of a universal set using Venn diagram of up to two sets. • Learners establish the relationship between any two sets in the universal set. • Learners describe sets of numbers in words. • Learners describe sets of numbers using set notation. • Learners find the number of elements in each set in the universal set. • Learners identify compliment(s) of each set.	list sets of types of numbers using set braces - { }. show members of a universal set using Venn diagram. establish the relationship between any two sets in the universal set. describe sets of numbers in words. describe sets of numbers using set notation. find the number of elements in each set in the universal set. identify compliment(s) of each set.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
3. form and interpret sets using ordered pairs.	**Concepts** Universal set Ordered pairs **Skills** Classification Manipulation Communication Interpretation	• Teacher and learners review set notation used to describe two sets. • Learners form two sets in a universal, one being made out of natural numbers and the other one made up of square numbers. • Learners establish relationship of the pairs of elements in the two sets. • Learners under the guidance of a teacher deduce a set of ordered pairs. • Learners list the ordered pairs as elements of a set. • Teacher provides learners with a variety of scenarios that will require them to form a set of ordered pairs. • Learners form and describe sets of ordered pairs from different scenarios. • Learners solve problems involving sets of ordered pairs.	form two sets in a universal, one being made out of natural numbers and the other one made up of square numbers. recognise relationship of the pairs of elements in the two sets. list the ordered pairs as elements of a set. form and describe sets of ordered pairs from different scenarios. solve problems involving sets of ordered pairs.	Mathematics kit Teacher's Guide

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
4. demonstrate understanding of directed numbers in practical situations.	**Concepts** Directed numbers: positive (+) negative (-) **Skills** Recording Presentation Classification Manipulation Communication Interpretation	• Teacher and learners review natural numbers. • Teacher pastes papers numbered from zero to the right and unnumbered ones to the left on the wall. • Learners, under the guidance of the teacher, engage in activities that require them to move forward and backward from the reference point marked zero. • Learners move a given number of steps forward and backwards from the reference point. • Learners substitute forward steps with the **+** sign and backwards steps with the **-** sign. • Learners, under the guidance of the teacher, engage in activities that require them to count upwards and downwards from the reference point marked zero. • Learners count a given number of steps upwards and downwards from the reference point. • Learners substitute the upward steps with the **+** sign and downward steps with a **-** sign. • Teacher and learners deduce the meaning of positive and negative numbers in directed numbers. • Learners do an experiment, using a laboratory thermometer, and measure the temperature of ice.	move a given number of steps forward and backwards from the reference point. substitute the forward steps with the **+** sign and backward steps with a **-** sign. carry out an experiment using a laboratory thermometer and measure the temperature of ice. record and present the results. arrange directed numbers in order of size. write directed numbers on vertical and horizontal number lines appropriately. solve problems from real life situation involving the use of directed number.	Mathematics kit Thermometer

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
4. continues.		• Learners record the results and present them for discussion. • Learners sort the given directed numbers according to size. • Learners show directed numbers on vertical and horizontal number lines. • Teacher provides different scenarios depicting the use of directed numbers from real life experiences. • Learners interpret scenarios, from real life situation, involving use of directed number.		
5. express natural numbers as products of their prime factors.	Concepts Natural numbers Prime factors Skills Manipulation Communication Calculation Interpretation	• Teacher and learners review natural and prime numbers. • Learners identify factors of a given number using number cards. • Learners select prime factors. • Learners repeat the procedure with different numbers. • Learners, under the teacher's supervision, express a given number as a product of its prime factors using chosen number cards. • Learners list prime factors of a given number. • Learners express the number as a product of its prime factors. • Learners express their chosen natural numbers as products of their prime factors. • Learners solve problems involving	list factors of a given number using number cards. identify factors that are prime numbers. express numbers as products of their prime factors. list prime factors of a given number. express numbers as products of their prime factors. solve problems involving prime factorisation.	Mathematics kit

		prime factorisation.		
Learning Outcomes: at the end of Grade 8, learners should be able to:	**Concepts, skills, values and attitudes**	**Suggested learning experiences**	**What to assess: the teacher should assess learner's ability to:**	**Resources**
6. generate a number sequence using a given rule.	**Concepts** Sequences General rule **Skills** Ordering Manipulation Calculation Interpretation Logical thinking Critical thinking	• Teacher and learners review geometric patterns, arithmetic and geometric sequences. • Learners generate patterns using counters following a given rule. • Learners formulate a number sequence from the formed patterns. • Learners find missing terms in a given number sequence. • Learners deduce a rule including multiplication and/or division from given number sequence. • Learners generate number sequences from a given rule.	generate patterns using counters following a given rule. formulate a number sequence from the formed patterns. find missing terms in a given number sequence. generate number sequences from a given rule.	Mathematics kit
7. demonstrate an understanding of place value up to trillion.	**Concepts** Place value Trillion **Skills** Ordering Manipulation Communication Interpretation Logical thinking	• Teacher provides learners with number cards written 10- to 13-digit numbers. • Teacher guides learners through determining the place value of numbers up to trillion. • Learners read numbers verbally. • Learners write numbers in expanded notation. • Learners write numbers in words. • Learners find out situations in which the use of trillion is practical. • Learners write numbers in order of size. • Learners approximate numbers to a given place value. • Learners apply the idea of place value for interpreting budgets and financial records.	read numbers verbally. write numbers in expanded notation. write numbers in words. mention scenarios in which trillion is practical. write numbers in order of size. approximate numbers to a given place value. write the place value of numbers up to trillion. apply the idea of place value for interpreting budgets and	Mathematics kit

			financial records.	

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
8. evaluate expressions.	**Concepts** Letters for numbers Expression Term Variable Coefficient **Skills** Manipulation Calculation Logical thinking	• Teacher and learners review basic operations involving natural numbers. • Learners, under the guidance of the teacher, engage in activities that involve the use of basic operations on natural numbers. • Learners hold cards labelled with letters and numbers on opposite sides. • Learners, under the teacher's guidance, formulate expressions with letters on their cards. • Learners distinguish term, variable, coefficient and expression. • Learners evaluate expressions by substituting letters with their corresponding numbers. • Learners solve problems involving expressions.	use letters for numbers. formulate expressions with letters on their cards. distinguish term, variable, coefficient and expression. evaluate expressions. solve problems involving expressions.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
9. simplify expressions.	**Concepts** Like and unlike terms Collection of like terms Variable Coefficient Expression **Skills** Analysis Manipulation Calculation Logical thinking	• Teacher and learners review formulation of expressions. • Learners, under the guidance of the teacher, form two groups, each with varying number of pens and pencils. • Learners formulate expressions by adding pens and pencils in both groups. • Learners identify like and unlike terms in an expression. • Learners collect like terms. • Learners simplify expressions. • Learners solve problems involving simplification of expressions.	formulate expressions by adding pens and pencils in both groups. identify like and unlike terms in an expression. collect like terms. simplify expressions. solve problems involving simplification of expressions.	Mathematics kit
10. round off a number to a specified number of significant figures.	**Concepts** Place value Rounding off Significant figure **Skills** Ordering Manipulation Calculation Interpretation Logical thinking Critical thinking	• Teachers and learners review place value and rounding off. • Teacher introduces learners to significant figures. • Learners measure lengths of different objects and write them to the nearest 10. • Learners state a number of significant figures in a given number. • Learners round off numbers to a specified number of significant figures.	measure lengths of different objects and write them to the nearest 10. state a number of significant figures in a given number. round off number to a specified number of significant figures.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
11. construct line and angle bisectors.	**Concepts** Construction Bisectors: line angle **Skills** Manipulation Measurement Accuracy Logical thinking Critical thinking	• Teacher and learners review drawing of circles using a compass and construction of perpendicular lines. • Learners draw a line and mark two end points. • Learners draw two equal circles, from the end points, with radius more than half the length of the line. • Learners join the intersections of the circles. • Learners measure the length of the line from each end point to the point of intersection. • Teacher and learners deduce the concept of a line bisector. • Learners construct angles of required dimensions. • Learners draw a circle with a centre at the vertex. • Learners draw two equal circles with centres lying where the first circle touches arms of the angle. • Learners draw a line joining intersection of the two circles to the vertex of the angle. • Learners measure the sizes of the newly formed angles. • Teacher and learners deduce the concept of angle bisector. • Learners solve problems involving construction of line and angle bisectors.	draw two equal circles, from the end points, with radius more than half the length of the line. join the intersections of the circles. measure length of the line from each end point to the point of intersection. construct angles of required dimensions. draw a circle with a centre at the vertex. draw two equal circles with centres lying where the first circle touches arms of the angle. draw a line joining intersection of the two circles to the vertex of the angle. measure the sizes of the newly formed angles. solve problems involving construction of line and angle bisectors.	Mathematics kit Mathematical set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
12. construct parallel and perpendicular lines.	**Concepts** Construction Lines: parallel perpendicular **Skills** Manipulation Measurement Accuracy Logical thinking Critical thinking	• Learners identify parallel lines from their immediate environment. • Learners report their findings for discussion. • Teacher and learners revise construction of parallel lines using: both sides of a ruler. a ruler and a set square. • Learners, under the guidance of the teacher, construct parallel lines by folding papers. • Learners, under the guidance of the teacher, draw two circles of the same dimensions. • Learners join centres of the circles with a straight line. • Learners join the circles with a straight line from the circumferences. • Learners construct parallel lines. • Learners identify perpendicular lines from their immediate environment. • Learners report their findings for discussion. • Learners construct perpendicular lines by folding a paper. • Learners construct perpendicular lines using a ruler and a set square.	identify parallel lines from their immediate environment. construct parallel lines using both sides of a ruler. construct parallel lines using a ruler and a set square. construct parallel lines by folding papers. construct parallels lines using circles. identify perpendicular lines from their immediate environment. construct perpendicular lines by folding a paper. construct perpendicular lines using a ruler and a set square. draw two overlapping circles of the same dimensions. join centres of the two overlapping circles. draw a straight line joining the overlapping points.	Papers Immediate environment Mathematical set Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
12. continues.		• Learners, under the teacher's supervision, draw two overlapping circles of the same dimensions. • Learners join centres of the two overlapping circles. • Learners draw a straight line joining the overlapping points. • Learners construct perpendicular lines using given dimensions. • Learners interpret given scenarios which lead to the drawing of parallel and perpendicular lines.	construct perpendicular lines using the given dimensions. interpret given scenarios which lead to the drawing of parallel and perpendicular lines.	
13. calculate angles using their properties.	**Concepts** Angles Properties of angles: complementary supplementary angles at a point **Skills** Manipulation Measurement Accuracy Logical thinking Critical thinking	• Teacher and learners review types of angles. • Teacher and learners discuss the size of an angle at a vertex of an exercise book or any other straight edged object. • Learners, under the guidance of the teacher, use a straight-edged object to divide the angle into two parts and find the sum of the formed angles. • Learners slide the straight object either to the right or left and then find the sum of the formed angles. • Learners repeat the same procedure for other angles. • Learners, under the guidance of the teacher, deduce the concept of complementary angles.	list types of angles. divide the angle into two parts and find their sum. slide the straight object either to right or left and then workout the sum of the two formed angles. divide the straight angle into two angles and workout their sum. calculate angles from given complementary and supplementary angles. solve problems involving either complementary or supplementary angles.	Mathematics kit

		• Teacher and learners discuss the size of a straight angle.		

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
13. continues.		• Learners, under the guidance of the teacher, use a straight-edged object to divide the straight angle into two parts and deduce the sum. • Learners slide the straight object either right or left and then deduce the sum. • Learners repeat the same procedure for other angles. • Learners, under the guidance of the teacher, deduce the concept supplementary angle. • Learners calculate angles from given complementary and supplementary angles. • Learners solve problems involving either complementary or supplementary angles.		
14. describe polygons using their properties.	**Concepts** Polygons: irregular regular circles Properties of polygons: angle size number of sides Angle sum Interior angles **Skills** Manipulation	• Teacher and learners review polygons. • Learners draw and cut polygons up to 12 sides using a plain paper or form polygons by folding papers. • Learners explore properties of polygons by folding papers. • Learners describe polygons in terms of their properties. • Learners solve problems involving properties of polygons	draw and cut different polygons up to 12 sides using a plain paper or form polygons by folding papers. explore properties of polygons by folding papers. describe polygons using their properties. solve problems involving properties of polygons.	Mathematics kit Chard paper Flip chart Plain paper Maths set

	Measurement Accuracy Logical thinking			

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
15. describe prisms using their properties.	**Concepts** Regular-based prisms: rectangular triangular pentagonal hexagonal Properties of prisms: number of faces, edges and vertices **Skills** Manipulation Measurement Accuracy Logical thinking Critical thinking	• Teacher and learners review faces, edges and vertices of prisms. • Learners identify prisms obtained from the immediate environment. • Learners count and record number of faces, edges and vertices of a cuboid and cube. • Learners count and record number of faces, edges and vertices of triangular, pentagonal and hexagonal prisms. • Learners differentiate and name types of prisms using their properties.	identify prisms obtained from the immediate environment. count and record number of faces, edges and vertices of a cuboid and cube. count and record number of faces, edges and vertices up to hexagonal prism. differentiate and name types of prisms using their properties.	Mathematics kit Mathematical set
16. describe and perform translation on simple plane figures.	**Concepts** Translation Translation vector Object Image Orientation **Skills** Manipulation Measurement Plotting Drawing Accuracy Logical thinking Critical thinking	• Teacher and learners review translation of shapes on the first quadrant of xy –plane with positive vector $\binom{a}{b}$. • Learners draw a scaled xy – plane with four quadrants. • Learners plot and join given pairs of coordinates to form shapes. • Learners translate shapes using given column vectors, including those negative vectors. • Learners describe translation of the shapes given object and image.	draw a scaled xy – plane with four quadrants. plot and join given pairs of coordinates to form shapes. translate shapes using given column vectors, including those negative vectors. describe translation of the shapes given both object and image. solve problems involving	Mathematics kit Square paper Graph Mathematical set

		• Learners solve problems involving translation.	translation.	

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
17. describe symmetry in 2-D shapes.	**Concepts** Symmetry: line rotational Axis of rotation Order of rotation **Skills** Manipulation Measurement Accuracy Logical thinking Critical thinking	• Teacher and learners review line(s) of symmetry in a plane. • Learners draw diagonals within a rectangle to identify its centre. • Learners trace the rectangle on a tracing paper. • Learners, under the guidance of the teacher, rotate the rectangle through the centre using tracing paper. • Learners count number of times which the rectangle on the tracing paper fit into the original rectangle. • Teacher introduces the concept of rotational symmetry and the order of rotational symmetry. • Learners find the order of rotational symmetry of a rectangle. • Learners find order of rotational symmetry of 2-D shapes.	draw diagonals within a rectangle to identify its centre. trace the rectangle on a tracing paper. rotate the rectangles through their centres using trace papers. count number of times which the rectangles on the tracing paper fit into the original rectangles. find the order of rotational symmetry of the rectangle. find order of rotational symmetry of 2-D shapes.	Mathematics kit Squared paper Mathematics set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
18. describe and perform reflection on simple plane figures.	**Concepts** Reflection Mirror line/line of reflection Object Image Orientation Four quadrants **Skills** Manipulation Measurement Plotting Drawing Accuracy Logical thinking Critical thinking	• Teacher and learners review lines of symmetry. • Teacher introduces the four quadrants of the xy −plane. • Learners plot and join given points to form a shape. • Learners, under the teacher's guidance, reflect shapes along the axes in four quadrants. • Learners reflect objects along a line parallel to the axes. • Learners fully describe the reflection given object and image.	plot and join given points to form a shape. reflect shapes along the axes in four quadrants. reflect objects along a line parallel to the axes. fully describe the reflection given object and image.	Mathematics kit Squared paper Graph paper
19. describe and perform rotation of simple plane figures.	**Concepts** Rotation Centre of rotation Angle of rotation Direction: clockwise anticlockwise Orientation **Skills** Manipulation Measurement Plotting	• Teacher and learners review rotation through angles $90°$ and $180°$ and a centre located at one vertex of a shape. • Teacher creates a scenario in which a tied horse is fed from four different basins. • Learners find angle(s) in which the horse moves from one basin to another.	find angle(s) in which the horse moves from one basin to another. distinguish between clockwise and anticlockwise directions. solve problems involving rotation with a centre at the origin.	Mathematics kit Squared paper Mathematical Set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
18. continues.	Drawing Accuracy Logical thinking Critical thinking	• Learners state whether the direction made by the horse from one basin to another is clockwise or anticlockwise. • Learners solve problems involving rotation with a centre at the origin.		
19. demonstrate understanding of conversions involving percentages, fractions and decimals.	**Concepts** Conversions Percentages Fractions Decimals **Skills** Manipulation Measurement Estimation Accuracy Comparison Logical thinking Critical thinking	• Teacher and learners review conversion of two decimally placed numbers into fractions. • Learners convert decimals into fractions. • Teacher and learners review the concept of percentage. • Learners convert fractions to their equivalents with denominator 100. • Learners, under the guidance of the teacher, write the percentage using its symbol - %. • Learners, under the guidance of the teacher, convert fractions into decimals and percentages. • Learners convert percentage into decimals and fractions. • Learners solve problems involving conversion of percentages, fractions and decimals.	convert decimals into fractions. convert fractions to their equivalents with denominator 100. write the percentage using its symbol – %. convert fractions into decimals and percentages. convert percentage into decimals and fractions. solve problems involving conversion of percentages, fractions and decimals.	Mathematics kit Fraction board

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
20. calculate quantities using ratios and percentages.	**Concepts** Ratio Percentage Comparison of quantities **Skills** Manipulation Measurement Estimation Accuracy Comparison Logical thinking Critical thinking	• Teacher and learners review ratio, percentage and equivalent fractions. • Teacher creates scenarios involving financial transactions leading to comparison of two quantities. • Learners engage in activities involving comparison of two quantities using ratio. • Learners form equivalent ratios. • Teacher and learners deduce simplification of ratios. • Learners represent ratios in fractional form. • Learners, in teams, play a shooting game using netball. • Learners record results in tabular form. • Learners write the ratio of scores to number of attempts as a fraction. • Learners determine a better team. • Learners, under the teacher's guidance, determine a better team by calculating percentages. • Learners solve problems involving ratio and percentage.	form equivalent ratios. represent ratios in fractional form. write the ratio of scores to number of attempts as a fraction. determine a better team by calculating percentages. solve problems involving ratio and percentage.	Mathematics kit Mathematical set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
21. demonstrate understanding of rate as a comparison of two measurements with different units.	**Concepts** Rate Time **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review speed as one form of rate. • Teacher and learners engage in activities involving different forms of rate. • Learners express quantities as rates measured in different units. • Learners, under the teacher's guidance, deduce rate using different units. • Learners convert at least one unit using a given rate. • Learners solve problems involving calculations of rates.	express quantities as rates measured in different units. convert at least one unit using a given rate. solve problems involving rates.	Mathematics kit Trundle wheel Tape measure Stop watch
22. calculate time in 12 and 24-hour clock.	**Concepts** Time scales: 12-hour clock 24-hour clock a.m. Noon p.m. Units of time: second minute hour **Skills** Estimation Measurement	• Teacher and learners review conversion of time units. • Teacher and learners review both analogue and digital time presentations. • Learners draw models of 12 and 24-hour clock scales. • Learners establish the relationship between 12 and 24-hour clocks. • Learners convert time from 12-hour clock to 24-hour clock, and vice versa. • Teacher and learners differentiate between duration and time on the clock.	draw models of 12 and 24-hour clock scales. establish the relationship between 12 and 24-hour clocks. convert time from 12 to 24-hour clock, and vice versa. determine the duration of an event. read and interpret different timetables.	Mathematics kit Models of clocks Analogue and digital clock

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
22. continues.	Recording Reporting Critical thinking Logical thinking Manipulation	• Learners determine the duration of an event. • Learners, under the teacher's guidance, read and interpret different timetables. • Teacher provides learners with problems that involve calculation of time in 12 and 24-hour clock scales. • Learners solve problems involving calculation of time in 12 and 24-hour clock scales.	solve problems involving calculation of time in 12 and 24-hour clock scales.	
23. read and use linear scale of different instruments.	**Concepts** Linear scale Measurement **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review measurement of lengths, angles, capacity, temperature, time and mass. • Teacher and learners review conversion of units. • Learners identify the smallest division on the scale. • Learners, in turns, read different scales and compare results. • Teacher demonstrates the proper way of reading the scale. • Learners use scales to measure. • Learners solve problems involving measurement and scale reading.	convert different units. identify the smallest division on the scale. read different scales. use scales to measure given objects. solve problems involving measurement and scale reading.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
24. calculate perimeter of up to 12-sided polygons.	**Concepts** Perimeter Polygons: pentagon hexagon heptagon octagon nonagon decagon hendecagon dodecagon **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review perimeter of triangles and quadrilaterals. • Learners identify and name polygons. • Learners construct regular polygons using straws or match sticks. • Learners measure lengths of all sides of given regular polygons. • Learners, under the guidance of the teacher, deduce that perimeter of a regular polygon is a product of length of a side times the total number of sides. • Learners find the sum of lengths of sides of regular polygons. • Learners measure lengths of all sides of given irregular polygons. • Learners find the sum of the measured lengths of each polygon. • Learners solve problems involving calculation of perimeter of polygons.	identify and name polygons. construct regular polygons using straws or match sticks. measure lengths of all sides of given regular polygons. find the sum of the lengths of the sides of the regular polygons. measure lengths of all sides of given irregular polygons. find the sum of the lengths of the sides of the irregular polygons. solve problems involving calculation of perimeter of polygons.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
25. calculate area of up to 12-sided polygons.	**Concepts** Area Polygons **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review area of triangles and quadrilaterals. • Teacher and learners review construction of perpendicular bisectors. • Teacher provides learners with drawings of regular polygons. • Learners find the centre, where the bisectors intersect, by bisecting at least two sides of a regular polygon. • Learners join the vertices of the polygon to the centre to divide the polygon into triangles. • Learners measure dimensions of all sides of the triangle. • Learners calculate the area of one triangle. • Learners, under guidance of the teacher, deduce that the area of the regular polygon is the product of the area of triangle and the number of sides of the polygon. • Learners solve problems involving calculation of area of polygons.	calculate area of triangles and quadrilaterals. find the centre by bisecting at least two sides of a regular polygon. join the vertices of the polygon to the centre to divide the polygon into triangles. measure dimensions of all sides of the triangle. calculate the area of one triangle. solve problems involving calculation of area of polygons.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
26. solve simple linear equations in one unknown.	**Concepts** Four basic operations Variable Unknown Coefficient **Skills** Calculation Critical thinking Logical thinking Manipulation	• Teacher and learners review finding an unknown number represented by a letter in equations involving addition and subtraction. • Learners put known mass on one side of a scale balance to measure the unknown mass on the other side. • Teacher and learners deduce variable and unknown in an equation. • Learners solve equations involving addition and subtraction. • Teacher and learners review equations involving multiplication and division. • Learners solve equations involving multiplication and division. • Teacher and learners discuss a concept of variables on both sides of an equation. • Learners evaluate equations with variables on both sides. • Teacher and learners discuss a concept of coefficient. • Learners solve equations involving coefficients and two basic operations.	measure the unknown mass on the scale balance. record the results. solve equations involving addition and subtraction. solve equations involving multiplication and division. solve equations involving variables on both sides of an equation. solve equations involving coefficients of the variables. solve equations involving two basic operations.	Mathematics kit Scale Balance

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
27. solve fractional equations with numerical denominator(s).	**Concepts** Fractional equations Numerator Denominator BODMAS **Skills** Calculation Critical thinking Logical thinking Manipulation	• Teacher and learners review simplification of fractions and expressions. • Teacher and learners discuss the idea of BODMAS for simplifying numerical expressions. • Learners simplify numerical expressions involving more two basic operations applying BODMAS. • Learners solve simple equations with more than two basic operations. • Learners solve fractional equations with numerical denominators.	simplify numerical expressions involving more than two basic operations applying BODMAS. solve simple equations with more than two basic operations. solve fractional equations with numerical denominators	Mathematics kit
28. change the subject of a simple formula.	**Concepts** Formula Subject of the formula Four basic operations **Skills** Critical thinking Logical thinking Manipulation	• Teacher introduces the concept of formula as a form of an equation which comprises more than one variable. • Teacher introduces the subject of the formula. • Learners distinguish between variables and subject of the formula. • Teacher demonstrates how to change the subject of simple formula. • Learners make d subject of the formula using $s = \frac{d}{t}$.	distinguish between variables and subject of the formula. make d subject of the formula using $s = \frac{d}{t}$. make t subject of the formula using $s = \frac{d}{t}$ change subject of simple formula.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
28. cont.		• Learners make t subject of the formula using $s = \frac{d}{t}$. • Learners change the subject of a simple formula.		
29. demonstrate understanding of addition and subtraction of fractions and decimals.	**Concepts** Lowest Common Multiple (LCM) Place value Conversion Order of fractions **Skills** Accuracy Simplification Critical thinking Logical thinking Manipulation	• Teacher and learners review LCM, place value and conversion of numbers. • Teacher and learners review equivalent fractions. • Teacher introduces identification of fractions and decimals. • Learners solve problems involving identification of fractions and decimals. • Teacher introduces improper fractions and decimals. • Learners add and subtract improper fractions and decimals. • Teacher demonstrates how arrange fractions in order of size. • Learners solve problems involving arrangement of fractions in order of size.	identify fractions and decimals. add and subtract improper fractions and decimals. solve problems involving arrangement of fractions in order of size.	Mathematics kit Fraction board

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
30. demonstrate understanding of multiplication and division of fractions.	**Concepts** Four operations Place value Reciprocal **Skills** Simplification Critical thinking Logical thinking Manipulation	• Teacher and learners review multiplication and division of decimals by powers of 10. • Teacher and learners review multiplication and division of fractions with denominator less than 10. • Teacher guides learners through multiplication of fractions with any denominator using slides. • Learners multiply fractions using slides. • Teacher guides learners through dividing fractions using slides. • Learners divide fractions using slides. • Learners solve problems involving multiplication and division of fractions. • Learners multiply fractions with whole numbers greater than 10.	multiply fractions using slides. divide fractions using slides. solve problems involving multiplication and division of fractions. multiply fractions with whole numbers greater than 10.	Mathematics kit Fraction board Slides Tracing paper

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
31. multiply and divide fractions and decimals by whole numbers.	**Concepts** Place value Reciprocal **Skills** Critical thinking Logical thinking Manipulation	• Teacher and learners review multiplication and division of fractions and decimals by whole numbers less than 10. • Teacher guides learners through multiplying fractions with whole numbers greater than 10 using slides. • Learners multiply fractions by whole numbers greater than 10 using slides. • Teacher guides learners through multiplying decimals with whole numbers greater than 10 using slides. • Learners multiply decimals with whole numbers greater than 10 using slides. • Teacher guides learners through dividing fractions with whole numbers greater than 10 using slides. • Learners divide fractions with whole numbers greater than 10 using slides. • Learners solve problems involving multiplication and division by whole numbers.	multiply fractions by whole numbers greater than 10 using slides. multiply decimals with whole numbers greater than 10 using slides. divide fractions with whole numbers greater than 10 using slides. solve problems involving multiplication and division by whole numbers.	Mathematics kit Fraction board Slides Tracing paper Squared book

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
32. solve probability problems of combined events.	**Concepts** Probability Combined events **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review simple experimental probability. • Teacher creates scenarios that promote awareness of the consequences of gambling. • Learners undertake an experiment of double events and state the possible outcomes using 2 coins. • Learners represent the outcomes in a possibility space. • Learners use possibility space to calculate the probabilities. • Learners undertake an experiment of double events and state the possible outcomes using 2 dice. • Learners represent the outcomes in a possibility space. • Learners calculate the probabilities using possibility space. • Teacher guides learners through combining two different events in which a coin and die are used.	represent the outcomes in a possibility space. calculate the probabilities using possibility space. represent the outcomes in a possibility space. calculate the probabilities using possibility space. calculate probability of combined events using different events. solve probability problems depicting real-life situations.	Mathematics kit Dice Coins Cards

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
32. continues.		• Learners calculate probability of combined events using different events. • Learners solve probability problems depicting real-life situations.		
33. use Pythagoras theorem to calculate sides in a right-angled triangle.	**Concepts** Perfect square roots Hypotenuse Adjacent sides Right-angled triangle Pythagoras theorem **Skills** Drawing Accuracy Critical thinking Logical thinking Manipulation	• Teacher and learners review square numbers. • Teacher introduces the square roots. • Learners find the square roots of the first 20 perfect squares. • Teacher and learners review types of triangles. • Learners draw a right-angled triangle. • Learners draw squares on each side of the right-angled triangle. • Learners find the area of each square. • Learners establish the relationship of areas of the 3 squares. • Teacher guides learners through naming sides of the right-angled triangle. • Learners compare the results of the areas to the sides a, b and c.	find the square roots of the first 20 perfect squares. draw a right-angled triangle. draw the squares on each side of the right-angled triangle. find the area of each square. establish the relationship between areas of the three squares. compare the results of the areas to the sides a, b and c. write the relationship in terms of a, b and c : $c^2 = a^2 + b^2$.	Mathematics kit Mathematical set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
33. continues.		• Learners write the relationship in terms of a, b and c : $c^2 = a^2 + b^2$. • Learners, under the guidance of the teacher, state the Pythagoras theorem. • Learners use the Pythagoras theorem to calculate the hypotenuse. • Learners use the Pythagoras theorem to calculate one of the adjacent sides. • Learners solve problems involving Pythagoras theorem.	state the Pythagoras theorem. calculate length of the hypotenuse. calculate the length of one of the adjacent sides. solve problems involving Pythagoras theorem.	
34. evaluate and generate linear mappings.	**Concepts** Mappings Input Output Machine **Skills** Manipulation Calculation Critical thinking	• Teacher creates a scenario where a number of things are used to make a particular object. • Teacher explains the relationship between materials used and object. • Learners, under the guidance of the teacher, show the relationship between the materials and the object using arrow diagrams. • Learners calculate the output given the input. • Learners solve linear mapping problems.	show the relationship between the materials and the object using arrow diagrams. calculate the output given the input. solve linear mapping problems.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
35. demonstrate understanding of addition and subtraction of vectors.	**Concepts** Vectors Representation Naming Cardinal points Navigation **Skills** Sketching Drawing Accuracy Critical thinking Logical thinking Manipulation	• Teacher and learners review use of column vectors in translation. • Learners draw lines to represent their journey from their classroom to the staffroom and from the staff room back to their classroom. • Learners show the direction of their journey to and from the staffroom. • Learners, under the guidance of the teacher, find number of vertical and horizontal steps taken to and from the staffroom. • Teacher introduces representation of vectors using directed line, underscore and column vectors. • Learners represent vectors using directed line, underscore and column vectors ($\overrightarrow{AB}$, $\underline{a}$, $\begin{pmatrix} a \\ b \end{pmatrix}$). • Learners represent vectors diagrammatically.	draw lines to represent their journey from their classroom to the staffroom and from the staffroom back to their classroom. show the direction of their journey to and from the staffroom. find number of vertical and horizontal steps taken to and from the staffroom. represent vectors using directed line, underscore and column vectors ($\overrightarrow{AB}$, $\underline{a}$, $\begin{pmatrix} a \\ b \end{pmatrix}$). represent vectors diagrammatically. use directed lines to represent the journey diagrammatically.	Mathematics kit Squared book Mathematical set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
35. continues.		• Teacher creates a scenario where a learner moves from point A to B and then to C in a right-angled triangle. Another learner moves from A to C directly. • Learners represent the journey diagrammatically using directed lines. • Learners, under the guidance of the teacher, establish the idea of starting point and destination. • Learners express the three journeys in column vectors. • Learners establish the relationship between the three column vectors. • Teacher guides learners through geometric and algebraic representation of adding vectors. • Learners add vectors. • Teacher guides learner through drawing vectors $\underline{a}$ and $-\underline{a}$. • Learners subtract vectors using diagrams. • Learners solve problems involving addition and subtraction of vectors.	express the three journeys in column vectors. establish the relationship between the three column vectors. add vectors. subtract vectors using diagrams. solve problems involving addition and subtraction of vectors.	

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
36. demonstrate understanding of calculations involving matrices.	**Concepts** Matrix Row Column Types Elements Order of matrix Scalar **Skills** Critical thinking Logical thinking Manipulation	• Teacher introduces the concept of matrix using different scenarios. • Learners identify a row and column in a matrix. • Learners, under the guidance of the teacher, represent information in matrix form. • Learners create and represent their scenarios in matrix form. • Teacher introduces the order of matrix. • Learners state the order of matrix. • Teacher guides learners through stating types of matrices. • Learners name types of given matrices. • Teacher introduces the concept of element(s) of a matrix. • Learners, under the guidance of the teacher, add matrices. • Learners subtract matrices considering their order and position of elements. • Teacher introduces the concept of a scalar of matrix. • Learners multiply matrices by a positive scalar.	identify element in a matrix by stating its row and column. represent information in matrix form. create and represent their scenarios in matrix form. state the order of matrix. name the types of the given matrices. add matrices considering their order and position of elements. subtract matrices considering their order and position of elements. multiply matrices by a positive scalar.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
37. find mean, mode and range from ungrouped data.	**Concepts** Tally marks Range Mode Mean Distribution Frequency table Diagrams: pictogram bar chart **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation Logical thinking	• Learners, under the guidance of the teacher, collect data from their immediate environment in groups. • Learners tabulate their results using frequency table including tally marks. • Learners find the mode using distribution and table. • Learners, under the guidance of the teacher, calculate range and mean. • Teacher and learners review bar chart. • Learners draw bar using table. • Teacher introduces the concept of pictogram. • Learners construct pictogram. • Learners solve problems involving pictogram and bar chart. • Teacher introduces the concept of mapping. • Learners calculate the output given the input. • Learners solve linear mapping problems.	collect data from the immediate environment. tabulate results using frequency table including tally marks. find the mode using distribution and table. calculate range and mean. draw bar using table. construct pictogram. solve problems involving pictogram and bar chart.	Mathematics kit Chart Square books Graph books Mathematical set

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
38. draw graphs of linear equations.	**Concepts** xy –plane Coordinates Lines: horizontal vertical **Skills** Plotting Calculation Critical thinking Logical thinking Manipulation	• Teacher and learners review xy –plane and plotting of points. • Learners plot and join points to form straight lines parallel to axes. • Learners write equations of lines parallel to the axes. • Teacher writes equations of lines parallel to the axes and guides learners through drawing the lines. • Learners draw lines parallel to the axes given the equations. • Learners, under the guidance of the teacher, calculate coordinates given equations that involve two variables. • Learners, under the guidance of the teacher, plot and join the coordinates to form lines. • Learners draw graph given linear equations.	plot and join points to form straight lines parallel to axes. write equations of lines parallel to the axes. draw lines parallel to the axes given the equations. calculate coordinates given equations that involve two variables. plot and join the coordinates to form lines. draw graphs of linear equations.	Mathematics kit Graph papers Squared paper

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
39. solve linear inequalities in one unknown.	**Concepts** Linear inequality Inequality signs: > < Algebraic expression **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review linear equation. • Teacher and learners review the use of inequality signs. • Teacher and learners brainstorm words that are usually used to describe inequality. • Learners fill one litre container with water using a container of an unknown capacity. • Learners find the number of times they poured water into the litre. • Learners form the expression from the above activity. • Learners establish the relationship between the formed expression and the capacity of the larger container. • Teacher and learners deduce the inequality concept. • Learners solve problems involving inequalities.	mention phrases that are usually used to describe inequalities. differentiate between the capacity of an unknown container and the known one. form the expression from the given activity. establish the relationship between the formed expression and the capacity of the larger container. solve problems involving inequalities.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
40. express numbers in an index form.	**Concepts** Indices Base Power **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review factors and multiples of numbers. • Learners express a number as a product of its factors. • Learners calculate area of squares and volume of cubes. • Learners, under the teacher's supervision, represent area of squares as $a \times a$ and a^2 and volume of cubes as $b \times b \times b$ and b^3. • Teacher and learners deduce representation of numbers in expanded and index forms. • Learners write a given numeral in expanded and index form, and vice versa. • Learners solve problems involving representation of numbers in standard numerals, expanded and index forms, and vice versa.	express a number as a product of its factors. represent area of square as $a \times a$ and a^2 and volume of cube as $b \times b \times b$ and b^3. write a given numeral in expanded and index form, and vice versa. solve problems involving representation of numbers in standard numerals, expanded and index forms.	Mathematics kit

Learning Outcomes: at the end of Grade 8, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learner's ability to:	Resources
41. draw and interpret bearing.	**Concepts** Bearings Angle North line **Skills** Estimation Measurement Recording Reporting Critical thinking Logical thinking Manipulation	• Teacher and learners review construction and measurement of angles. • Teacher and learners review conversion of units of length. • Teacher and learners engage in treasure finding game using bearing. • Learners establish strategies for locating treasure. • Teacher introduces the idea of bearings for locating positions. • Learners interpret given diagrams illustrating bearings. • Learners measure length between two points. • Learners measure angle between north line and line of journey. • Learners represent bearing diagrammatically from given information. • Learners solve problems involving interpretation and drawing of bearings.	measure and construct angles. convert units of length. establish strategies for locating treasure. interpret given diagrams illustrating bearings. measure length between two points. measure angle between north line and line of journey. represent bearing diagrammatically from given information. solve problems involving interpretation and drawing of bearings.	Mathematical set