Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

JUNIOR SECONDARY PHASE

MATHEMATICS SYLLABUS

GRADEs 8 & 9

For implementation:

Grade 8 in 2017
and
Grade 9 in 2018

Ministry of Education, Arts and Culture
National Institute for Educational Development (NIED)
Private Bag 2034
Okahandja
Namibia

Mathematics Syllabus Grade 8 - 9

ISBN: 978 – 99945 – 2 – 110 – 4

Printed by NIED

Publication date: December 2015

TABLE OF CONTENTS

1. Introduction

This syllabus describes the intended learning and assessment for Mathematics in the Junior Secondary level. As a subject, Mathematics is within the Mathematics area of learning in the curriculum, but has thematic links to other subjects across the curriculum. The mathematics learning area consists of preparatory Mathematics (Pre-Primary) and Mathematics (Grades 1-12).

The aims, learning objectives, and competencies which overlap between subjects are amongst the essential learning within the curriculum as a whole.

2. Rationale

Everybody uses mathematical practices in their daily lives, and the style of thinking that we recognise as mathematical is part of everyday functioning. We all make conjectures and test them using such means as classifying, enumerating, ordering and embedding and build them into generalizations. Mathematics itself is a powerful language, which provides access to viewing the world through number, shape, algebra, measures and statistics that is informative and creative.
All school graduates are expected to be numerate and the study of mathematics at the junior secondary level contributes to the learner's ability to think logically, work systematically and accurately and solve real-world problems. Since mathematics is a compulsory subject, the curriculum caters to a wide range of learner abilities, including those who are going to continue their studies in mathematics and other disciplines for which mathematics is a prerequisite.

The Junior Secondary Mathematics syllabus provides the learner with:

- the essential knowledge to cope with the numeracy demands of the modern world;
- the skills to understand, interpret and make sense of everyday situations in mathematical terms;
- the skills and competencies to solve problems to improve their own lives and the lives of the people around them.

In this phase the concepts and skills acquired at the primary school level are extended and refined. More abstract mathematical concepts and reasoned arguments will be introduced.

The number concept is formalised and includes the whole range of real numbers. **The calculator is introduced as a tool to handle more complex calculations as well as irrational numbers, numbers in standard form and the value of trigonometric ratios.** Learners will explore the essentials of household finances and calculate areas and volumes of most common everyday objects. Learners are introduced to proportional reasoning, algebraic techniques and symbols and the study of the linear function and its graph. Learners will use definitions and reasoning to understand geometrical objects and apply trigonometry to problems involving right-angled triangles. Learners will become familiar with the most important statistical averages and the concept of probability.

3. Aims

Mathematics promotes the following aims in the curriculum:

- develop their mathematical knowledge and skills in a way which encourages confidence and provides satisfaction and enjoyment;
- develop a feel for number and measurement, carry out calculations and understand the significance of the results obtained;
- develop an understanding of spatial concepts and relationships;
- develop their ability to apply mathematics, in the contexts of everyday situations and of other subjects that they may be studying;
- develop an understanding of mathematical principles;
- develop their ability to analyse problems logically, recognise when and how a situation may be represented mathematically, identify and interpret relevant factors and, where necessary, select an appropriate mathematical method to solve the problem;
- use mathematics as a means of communication with emphasis on the use of clear expression;
- appreciate patterns and relationships in mathematics;
- produce and appreciate imaginative and creative work arising from mathematical ideas;
- acquire the mathematical background necessary for further study in this or related subjects.

4. Inclusive education

Inclusive education is the right of every learner and promotes access to and participation in the full range of educational programmes and services offered by the education system in mainstream schools. It is based on the principle of supporting and celebrating the diversity found among all learners and removing all barriers to learning. The Mathematics teacher in the Junior Secondary Phase should therefore accommodate learners with special educational needs by adapting this syllabus to the needs of the learner through differentiation of teaching methods and material as indicated in the *Curriculum Framework for Inclusive Education: A Supplement to the National Curriculum for Basic Education (2014).* The adaptation for assessment of learners with special educational needs must be done as prescribed in the *Handbook for Centres (2014*) by the Directorate of National Examinations And Assessment (DNEA). The accommodations prescribed in this handbook are not only for external examinations, but apply to learners from Grade 1 to 12.

Learners who are so severely impaired that they cannot benefit from attending mainstream schools will be provided for according to their needs in learning support units, resource units or resource schools until such time that they can join a mainstream school structure, if possible.

The Junior Secondary phase of education promotes equality of opportunity in males and females, enabling both sexes to participate equally and fully. Teachers should know and understand how to treat learners equally, and all materials should support gender equity. Teachers must be aware of the ways in which boys or girls often become favouritised in the classroom interaction, and ensure that their role promotes gender equity. There are stereotype expectations that mathematics and science are more difficult for girls. However, it has been shown that “girls will not do so well as boys” becomes a self-fulfilling prophecy unless the teacher is aware of the problem. It is also known that the way problems are contextualised and exemplified in mathematics can act as a gender filter. It is essential that

the Junior Secondary phase create motivation and confidence in girls as much as in boys in mathematics.

5. Links to other subjects and cross-curricular issues

The cross-curricular issues include environmental education, HIV and AIDS, population education, education for human rights and democracy, information and communication technology (ICT) and road safety. These issues have been introduced to the formal curriculum, because each of the issues deals with particular risks and challenges in our Namibian society. They should be dealt with across all phases and in every subject where the topics overlap with the content of that subject.
All of our learners need to:

- understand the nature of these risks and challenges;
- know how they will impact our society and the quality of life of our people now and in the future;
- understand how these risks and challenges can be addressed on a national and global level; and
- understand how they can play a part in addressing these risks and challenges in their own school and local community.

The main risks and challenges have been identified as:

- the challenges and risks we face if we do not care for and manage our natural resources;
- the challenges and risks caused by HIV and AIDS;
- the challenges and risks to health caused by pollution, poor sanitation and waste;
- the challenges and risks to democracy and social stability caused by inequity and governance that ignores rights and responsibilities;
- the challenges and risks we face if we do not adhere to road safety measures; and
- the challenges and risks we face because of globalisation.

Since some subjects are more suitable to address specific cross-curricular issues, those issues will receive more emphasis in those particular syllabuses.

In this syllabus the following are links to cross-curricular issues:

Cross-curricular issues	Grade 8	Grade 9
Environmental Learning	Topic 1: **Numbers (Fractions)** Topic 3: **Mensuration(Area)** Topic 8: **Statistics and Probability**	Topic1: **Numbers (Fractions)** Topic 7: **Statistics and Probability**
HIV and AIDS	Topic 1: **Numbers (Fractions)** Topic 2: **Algebra** Topic 7: **Graphs and functions**	Topic 2: **Algebra** Topic 6: **Graphs and functions**
Population Education	Topic 1: **Numbers (Fractions)** Topic 7: **Graphs and functions** Topic 8: **Statistics and Probability**	Topic 1: **Numbers (Fractions)** Topic 7: **Statistics and Probability**
Education for Human Right and Democracy	Topic 3: **Money and Finance**	Topic 3: **Money and Finance**
ICT	Topic 1: **Numbers (Powers and roots)** Topic 3**: Money and finance**	Topic 1: **Numbers (Powers and roots)** Topic 3**: Money and finance**
Road Safety	Topic 1: **Numbers (Fractions)** Topic 8: **Statistics and Probability**	Topic 1: **Numbers (Fractions)** Topic 7: **Statistics and Probability**

6. Approach to teaching and learning

The approach to teaching and learning is based on a paradigm of learner-centred education (LCE) described in ministerial policy documents and the learner-centred education conceptual framework. This approach ensures optimal quality of learning when the principles are put into practice.

The aim of learner-centred education is to develop learning with understanding, and to impart the knowledge, skills and attitudes that contribute to the development of society. The starting point for teaching and learning is the fact that the learner brings to the school a wealth of knowledge and experience gained continually from the family, the community, and through interaction with the environment. Learning in school must involve, build on, extend and challenge the learner's prior knowledge and experience.

Learners learn best when they are actively involved in the learning process through a high degree of participation, contribution and production. At the same time, each learner is an individual with his/her own needs, pace of learning, experiences and abilities. The teacher must be able to identify the needs of the learners and the learning that still needs to take place, and know how to shape learning experiences accordingly. Teaching strategies must therefore be varied and flexible within well-structured sequences of lessons.
Mathematical problems should always be exemplified in a context that is meaningful to the learners. The relationships between concepts and topics should continuously be developed throughout the phase. The learners' prior knowledge should always be elicited before commencing with a new topic.

The teacher must decide, in relation to the learning objectives and competencies to be achieved, when it is best to convey content directly; when it is best to let learners discover or explore information for themselves; when they need directed learning; when they need reinforcement or enrichment learning; when there is a particular progression of skills or information that needs to be followed; or when the learners can be allowed to find their own way through a topic or area of content.

Work in groups, in pairs, individually, or as a whole class must therefore be organised as appropriate to the task in hand. Co-operative and collaborative learning should be encouraged wherever possible. In such cases, tasks must be designed so that pair or group work is needed to complete it, otherwise the learners will not see any relevance in carrying out tasks together. As the learners develop personal, social and communication skills, they can gradually be given increasing responsibility to participate in planning and evaluating their work, under the teacher's guidance.

Mathematics is a universal language. It is only by local contextualization and application that younger learners will understand and appreciate the uses of mathematics. Where textbooks can only give general examples, it is up to the teacher to use and include local examples by developing appropriate worksheets and exercises.

7. End-of-phase competencies

A few learners might not be able to achieve all the specific objectives satisfactorily and must receive learning support through adapted teaching approaches, adapted materials, and assistance from peers. A small number of learners have special educational needs to a degree which requires greater individual attention, resources or assessment. Others will have impairments which do not necessarily limit cognitive and affective learning and development, e.g. the visually impaired, hearing impaired and physically challenged.

On completing the Junior Secondary phase, learners are expected to be able to:

Numbers:
Demonstrate confidence in working with real numbers; apply the concept of percentages, ratio, rate and proportion in solving problems, and use calculators and mental calculation strategies efficiently where appropriate

Algebra and Functions:
Use algebraic language and skills to represent patterns and relationships and generate and solve simple equations and inequalities. Draw and interpret graphs of linear, parabola and hyperbola.

Money and Finance:
Demonstrate the ability to recognise and use Namibian currency, and interpret simple everyday transactions

Measurement:
Recognise and convert between various standardized units of measurement and solve problems related to measurement in theoretical situations or in applications to everyday life. Determine perimeters and areas of regular and irregular plane figures as well as volumes of solids

Geometry and Trigonometry:
Develop learners' ability to visualize, describe and represent lines, angles, two-dimensional and three-dimensional shapes, and their properties. Develop an understanding of trigonometric methods. Use geometric properties and trigonometric methods to solve problems.

Statistics and Probability:
Gather, organize, tabulate and, graph data as well as interpret graphs and tables in meaningful ways, and draws inferences from statistical data and representations. Develop ability to solve problems involving chance.

Values and attitudes:
Apply mathematics to a variety of everyday problems.

8. Summary of the learning content

Topic	Grade 8	Grade 9
Numbers	Apply four main operations to whole numbers and directed numbers using efficient written and mental strategies including correct order of operations. Compare and order rational numbers. Solve problems involving rational numbers and ratio. Find and use prime factors, squares, cubes and their corresponding roots with and without a calculator	Use rational numbers to perform mental calculations. Apply index laws to numerical expressions Solve problems involving the use of percentage increases and decreases. Apply the concepts of ratio and rates.
Algebra	Use algebraic notations. Expand and simplify algebraic expressions. Construct simple algebraic formulae. Determine numerical value of expressions by substitution. Solve simple linear equations and represent linear inequalities on a number line.	Apply four basic operations to algebraic fractions. Expand algebraic expressions. Factorise algebraic expressions involving taking out common factors and grouping of terms. Construct and solve linear equations and inequalities. Find the nth term of a sequence and determine any term in the sequence.
Money and finance	Use percentages to solve problems involving profit, loss, discount mark-up and simple interest.	Solve problems involving personal income, VAT, compound interest and hire purchase. Perform conversion between Namibian and foreign currency.
Measures	Convert between units of area, convert between units of volume and convert between units of capacity.	

Topic	Grade 8	Grade 9
Mensuration	Calculate the perimeter of regular and irregular shapes. Find the circumference of a circle. Calculate the area of triangle, square, rectangle, parallelogram and rhombus. Determine the length of an unknown side, radius and diameter. Solve problems involving volume of cubes and cuboids.	Find the perimeter and area of trapezium and kite. Calculate the area of a circle and determine its radius given sufficient information. Solve problems involving surface area of cubes, cuboids and cylinders.. Solve problems involving volume and unknown dimension of cylinders.
Geometry	Perform geometric constructions of angles, lines and two-dimensional shapes. Apply angle properties to find unknown angles. Identify, draw and describe reflections. Draw and use the Cartesian Plane	Perform geometric construction of parallel lines, perpendicular lines, angle bisector and triangles. Identify polygons and solve problems involving angle properties of quadrilaterals and polygons. Draw and describe rotations and enlargements limited to positive scale factors. Apply the Theorem of Pythagoras.
Graphs and functions	Draw and interpret graphs of practical situations. Draw lines of the form $x = a$ and $y = b$ on the Cartesian plane	Construct tables of values and draw graphs of the form $y = mx + c$. Determine the gradient and equation of a linear graph.
Statistics and probability	Construct bar charts and pie charts. Read and draw conclusions from these and from pictograms. Calculate the mean of discrete data	Critically interpret and discuss statistics appearing in the media. Calculate and interpret the mean, the median and the mode and determine the range of discrete data. Calculate the simple probability of an event occurring.

9. Learning content

9.1 Introduction to learning content

1. The learning content outlined below is designed to provide guidance to teachers as to what will be assessed in the overall evaluation of learners. It is not meant to limit, in any way, the teaching programme of any particular school.

2. The learning content is set out in two columns headed by Topics and Sub-topics. The two columns are:

   (a) **General Objectives**

   (b) **Specific Objectives**

3. **Topics** and **Sub-topics** refer to those components of the subject which learners are required to study/master.

   The **General Objectives** are derived from the topic/skill and are the general knowledge, understanding and demonstration of skills on which learners will be assessed.

   The **Specific Objectives** are the detailed and specified content of the syllabus, which learners need to master to achieve the general objectives, and on which they will be assessed.

4. There are several ways for performing calculations in Mathematics: paper and pencil method, using a calculator, mental calculation and a combination of all of them. The ability to calculate mentally is an imperative aspect in mathematics and that would indeed enable learners to cope with various society demands in every day context. For learners to be able to perform mental calculations efficiently, they need to know some number facts and they should be able to recall them promptly in order to apply them when necessary. **Mental strategies that are appropriate for this phase of learning should be taught as an integral part of the topics to which they are appropriate, but not as a separate topic.**

5. For decimal fractions the decimal point should be placed on the line, e.g. 52.35. Whole numbers greater than or equal to 1 000 should be written without commas. A space should be left between each group of three whole numbers from left to right, e.g. 4 256 789.

9.2.1 Grade 8 learning content

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
Topic 1: Numbers	
(a) Calculator skills **NOTE: Calculator skills should be taught in the contexts where the use of the calculator is appropriate to ease calculations and not necessarily as a separate topic.**	
• understand the features of a scientific calculator and use the calculator when appropriate	• use the calculator for calculations involving several digits • select the correct key sequence for calculations with more than one operation • apply the clear, clear-entry and memory keys when appropriate
(b) whole numbers	
• know and use the concept of factor, multiple, common factor, lowest common multiple, highest common factor, prime and composite numbers	• list multiples of numbers smaller than 10 • find the factors of a number • determine if any number in the range of 1 – 100 is prime or composite • find prime factors of numbers and express numbers as products of their prime factors in index notation • determine the Lowest Common Multiple (LCM) and Highest Common Factor (HCF) of up to three given whole numbers • apply the four basic operations to whole numbers including the application of BODMAS {brackets, of, division and multiplication (from left to right) is done first, and then addition and subtraction (from left to right)} • determine an answer to another calculation e.g. if 30 × 25 = 750, work out 31 × 25 or work out 32 × 25 • apply multiplication and division facts to multiply and divide decimals e.g. 0.05 × 7 gives 0.35 since 5 × 7 = 35 and 4.2 ÷ 6 gives 0.7 since 42 ÷ 6 = 7 • recognise where to place decimal point for equivalent calculations e.g. 4.37 × 0.3 = (4.37 ×3) ÷ 10 = 1.311

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
(c) Directed numbers	
• understand and use negative numbers	• represent and locate integers on a number line • order integers by magnitude and on a number line • use negative numbers in practical situations e.g. temperature below freezing point, distance below sea level • apply the four basic operations to positive and negative integers including the application of BODMAS {brackets, of, division and multiplication (from left to right) is done first, and then addition and subtraction (from left to right)}
(d) Powers and roots	
• understand and use the notation and terminology for squares, square roots, cubes, cube roots	• distinguish between power, base, exponent or index • use the notations of squares, cubes, square roots and cube roots e.g. 5^2, 3^3, $\sqrt{64}$, $\sqrt[3]{125}$ • recall and use square numbers from 1^2 to 20^2 and cube numbers from 1^3 to 10^3 • determine the square and cube roots of real numbers by decomposing numbers into prime factors (without the use of a calculator)
(e) Common and decimal fractions	
• acquire further understanding of common and decimal fractions	• simplify common fractions • find equivalent fractions • express one quantity as a fraction of another • add and subtract common and decimals fractions • multiply and divide common fraction by another common fraction including mixed numbers • multiply and divide decimal fractions (with up to two decimal places) by another decimal fraction

<table>
<tr><td>GENERAL OBJECTIVES
Grade 8 Learners will:</td><td>GRADE 8 SPECIFIC OBJECTIVES
Grade 8 Learners should be able to:</td></tr>
<tr><td colspan="2">(f) Percentages</td></tr>
<tr><td>• understand and use percentages</td><td>• recognise that percentages are fractions with a denominator of 100
• calculate the percentage of a quantity
• express one quantity as a percentage of another
• convert between common fractions, decimals and percentages or vice versa
e.g.
<table>
<tr><td>Common fraction</td><td>Decimal fraction</td><td>percentages</td></tr>
<tr><td>$\frac{1}{5}$</td><td>0.2</td><td>20%</td></tr>
<tr><td>$\frac{7}{20}$</td><td>0.35</td><td>35%</td></tr>
</table></td></tr>
<tr><td colspan="2">(g) Comparing, ordering and estimation</td></tr>
<tr><td>• acquire further knowledge on comparing, ordering and estimation of integers and fractions</td><td>• use =, <(strictly less than) and >(strictly greater than) to compare integers and/or fractions
• order integers and/or fractions in ascending and descending order
• round numbers to the nearest whole number and power of 10
• round decimal fractions up to two decimal places</td></tr>
<tr><td colspan="2">(h) Ratio</td></tr>
<tr><td>• understand the concept of ratio</td><td>• interpret and use ratio notation
• express quantities as ratio
• simplify ratios (given in decimals, fractions or whole numbers only, and of different units)</td></tr>
</table>

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
Topic 2: Algebra	
(a) Algebraic expressions and formulae	
• develop an understanding of algebraic representation	• use basic algebraic terms such as constant, coefficient, variables, expression, a term • distinguish between a coefficient, constant and a variable in an algebraic expression • represent arithmetic operations in algebraic notation e.g. the product of x and y is expressed as xy and the product of x and x is expressed as x^2 • substitute positive and negative numbers into algebraic expressions and formulae to calculate values e.g. evaluate a^3 when $a = 2$ • construct simple formulae from practical situations, e.g. the cost C of n apples at x cents each as $C = nx$
(b) Algebraic manipulation	
• understand that the transformation of algebraic expressions obeys and generalises the rules of arithmetic with numbers	• identify like and unlike terms • add and subtract algebraic expressions • multiply a single term over a bracket, e.g. $3(a+b)$ and $2x(3x-2y)$
(c) Algebraic linear equations and inequalities	
• understand that letter symbols represent definite unknown numbers in equations and inequalities	• solve simple linear equations where the unknown appears on one side of the equation • represent a given simple inequalities on a number line e.g. $x > 2$ *or* $x < 4$ *or* $x \leq -1$ *or* $x \geq 6$ and vice versa

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
Topic 3: Money and finance	
(a) Buying and selling	
• understand that transactions involve profit and /or loss • understand and use the concepts of mark-up and discount	• calculate the difference between cost and selling price and classify this as profit or loss • calculate the selling price if the profit or loss is stated as a percentage • calculate the profit and loss as a percentage of the cost price • solve problems involving mark-up and discount expressed as percentages
(b) Simple interest	
• realise that someone can earn or pay interest	• calculate interest earned or interest paid on an amount of money, given the rate of interest and the time (in full years and /or months)
Topic 4: Measures	
(a) Area, volume and capacity	
• understand and apply the units for expressing area, including hectares • understand and apply the units for expressing volume and capacity	• convert between mm^2, cm^2, , dm^2, m^2 and km^2 • convert square units to hectares (1 ha = 10 000 m^2) • convert between mm^3, cm^3, dm^3 and m^3 • convert between units of volume and units of capacity (1000 cm^3 = 1ℓ)

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
Topic 5: Mensuration	
(a) Perimeter	
• understand and apply the formulae for the calculation of perimeter and circumference	• calculate perimeters of parallelograms, rhombus and irregular two-dimensional shapes • find the approximate value of π as the ratio between the circumference and the diameter of a circle • calculate the circumference of a circle when the diameter or radius is given **(For mental arithmetic practice purpose and when learners are asked to use $\frac{22}{7}$ for the value of a π , the diameter should be given as a multiples of 7)** • find the length of an unknown side of two-dimensional shapes when the perimeter and other sufficient information is given • find the length of an unknown radius and diameter when sufficient information is given
(b) Area	
• understand and apply the formula for the calculation of area	• calculate areas of triangles, squares, rectangles, parallelograms and rhombus using the formula • calculate areas of simple combined shapes made from combining squares, rectangles and triangles only • find the length of a side or the height when the area and sufficient other information is given (only for squares, rectangles and triangles)
(c) Volume	
• understand and apply the formulae for the volume of cubes and cuboids	• calculate volume of cubes and cuboids • solve word problems involving volume • calculate the value of an unknown dimension, if the volume of cubes and cuboids, and sufficient other information is given

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
Topic 6: Geometry	
(a) Constructions	
• know how to perform geometrical constructions using a straight edge, a compass and a protractor	• use and interpret the geometrical terms such as point, a line, a line segment, a ray and a plane • measure different lines and angles accurately • identify and construct different types of angles accurately (acute, obtuse, right, straight and reflex angles) • construct squares, rectangles and circles from given data
(b) Angles properties	
• know and understand angle properties to solve problems	• identify pairs of angles as complementary or supplementary • calculate unknown angles by applying the following angle properties - angles formed on a straight line - angles at a point - angles formed at intersecting lines - angles formed within parallel lines intersected by transversal - interior angles of triangles
(c) Symmetry and transformation	
• understand the reflection of shapes and symmetry	• identify reflections from given diagrams • draw and describe reflections of simple shapes limited to horizontal and vertical lines of reflection • identify and draw lines of symmetry for any given shapes

GENERAL OBJECTIVES Grade 8 Learners will:	**GRADE 8 SPECIFIC OBJECTIVES** Grade 8 Learners should be able to:
(d) Coordinate geometry	
• develop an understanding of a Cartesian plane and the concept of coordinates	• draw and label the four quadrants of a Cartesian plane • label axis and plot given points on the Cartesian plane • plot given co-ordinates in all the four quadrants and join them accordingly to form different shapes • describe the location of a given point in terms of its coordinates
Topic 7: Graphs and functions	
(a) Graphs in practical situations	
• understand how to interpret continuous graphs of practical situations	• label axes, plot and join points to show the relation between two variables, e.g. temperature against time of day • interpret information from continuous graphs showing the relation between two variables
(b) Function graphs	
• understand and draw simple graphs of functions on the Cartesian plane	• draw lines of equations $x = a$ and $y = a$ where a is an integer • find the equations of vertical and horizontal lines drawn parallel to the coordinate axes • find the coordinates of the point of intersection of horizontal and vertical lines

GENERAL OBJECTIVES Grade 8 Learners will:	GRADE 8 SPECIFIC OBJECTIVES Grade 8 Learners should be able to:
Topic 8: Statistics and probability	
(a) Data representation	
• know how to collect, classify, tabulate and represent data • know how to extract information from graphs and diagrams	• collect, classify and tabulate discrete data obtained from questionnaires, surveys or secondary sources • represent data by constructing bar graphs or pie charts • read and draw conclusions from bar graphs, pie charts and pictograms
(b) Measure of central tendency and dispersion	
• understand the use of the arithmetic mean	• calculate the arithmetic mean of small sets of discrete data • compare two sets of similar data by calculating the arithmetic mean

9.2.2 Grade 9 learning content

General Objectives Grade 9 Learners will:	Grade 9 Specific Objectives Grade 9 Learners should be able to:
Topic 1: Numbers	
(a) Powers and roots	
• understand, use and apply the notation and terminology of powers and roots	• convert powers with positive, negative and zero indices to numbers and vice versa • convert powers with fractional indices to numbers • apply correct order of operations to numbers with powers and roots • use a calculator to find powers, square roots and cube roots of numbers
(b) Estimation	
• understand the principle of rounding to significant figures	• round decimal fractions up to three decimal places • round numbers up to three significant figures • use rounded numbers to estimate answers to calculations
(c) Percentages	
• understand the concept of percentage increase and decrease	• calculate quantity increase or decrease by a given percentage • calculate percentage increase or decrease for a given situation • calculate a percentage (only multiples of 5) of a total up to 1000 (only multiples of 10) mentally, through working out 10% first. e.g. 15% of 460 is 46 + 23 = 69
(d) Ratio and rates	
• understand and apply the concept of ratio as a tool to solve real life problems • understand common measures of rate	• distinguish between ratio and rate • find an unknown quantity if a ratio is given • divide a quantity in a given ratio • apply the concept of ratio as a tool to solve problems • solve a variety of everyday life problems involving rates, e.g. average speed, wages, fuel consumption etc. • interpret the steepness of a graph as a rate of change

General Objectives Grade 9 Learners will:	**Grade 9 Specific Objectives** Grade 9 Learners should be able to:
Topic 2: Algebra	
(a) Algebraic manipulation	
• understand that the transformation of algebraic expressions obeys and generalises the rules of arithmetic	• apply the index laws to simplify algebraic expressions, including expressions with positive, negative and zero • expand and simplify linear algebraic expressions by; - multiplying a binomial by a binomial e.g. $2a + 3$ multiplied by $a - 1$ - multiplying a binomial by a trinomial e.g. $2b + 3$ multiplied by $a - b + 1$ • factorise expressions by taking out a common factor and by grouping terms with simple grouping
(b) Algebraic equations and inequalities	
• understand how to transform linear equations to find their solutions • realise that the solution of an inequality is a set of real numbers	• solve simple linear equations including when the unknown is appearing on both sides of the equation • solve word problems by translating them into linear equations • substitute directed numbers into given equation • construct and solve simple linear inequalities
(c) Sequences	
• know how to find the n^{th} terms of an arithmetic sequence	• recognise patterns in sequences and continue common integer sequences, including squares, cubes, powers and triangular numbers • find the first three terms of a sequence when the n^{th} term is given e.g. $2n + 3$ • determine the n^{th} term of a given sequence (linear form e.g. $3n + 2$)and use it to find the value of any term in the sequence

General Objectives Grade 9 Learners will:	Grade 9 Specific Objectives Grade 9 Learners should be able to:
Topic 3: Money and finance	
(a) Earning, saving and spending	
• develop further knowledge of handling money in everyday life	• calculate personal income through wages, salaries, piece-work and commission • calculate Value Added Tax (VAT) as a percentage of expenditure on goods and services • calculate the compound interest (compounded yearly) earned on an amount over a period of 2 or 3 years • calculate the difference in cost when paying cash for an item and when buying the item on a hire purchase agreement • convert between Namibian and foreign currencies
Topic 4: Mensuration	
(a) Perimeter and area	
• gain further knowledge of calculating area and perimeter	• calculate the perimeter and area of trapezium and kite • calculate the area of a circle using the formula • find the diameter or radius of a circle when the area is given • calculate the surface area of cubes, cuboids and closed cylinders • calculate the area of the nets of cubes, cuboids and (closed) cylinders
(b) Volume	
• know how to find the volume of prisms	• calculate the volumes of closed cylinders • calculate unknown dimension of cylinders, if the volume and other sufficient information is given

General Objectives Grade 9 Learners will:	**Grade 9 Specific Objectives** Grade 9 Learners should be able to:
Topic 5: Geometry	
(a) Constructions	
• know how to perform geometrical constructions of parallel and perpendicular lines and of angle bisectors	• use a pair of compasses and straight edge to construct: - parallel lines - the perpendicular from a point to the line - the perpendicular from a point on the line - perpendicular bisector of a line segment - an angle bisector • construct triangles, given three sides; two sides and the included angle; a right angle and any two sides; or two angles and an included side
(b) Polygons and angle properties	
• know different kinds of polygons and understand angle properties of quadrilaterals and polygons	• identify and name regular and irregular polygons **(only polygons with up to ten (10) sides will be taught)** • calculate unknown interior and exterior angles using the geometrical properties of the parallelogram, rectangle, rhombus, kite and square • calculate the sum of interior and exterior angles of polygons • calculate the sizes of the interior and exterior angles of regular polygons • calculate the sizes of interior and exterior angles of irregular polygons
(c) Symmetry and transformation	
• understand how plane figures are rotated and enlarged	• draw and describe rotations of plane figures around the origin, a vertex or the midpoint of a line and through angles which are multiples of 90° (the centre of rotation only at grid point) • draw and describe enlargements with positive whole numbers as scale factors • state the order of rotational symmetry for any given shape

General Objectives Grade 9 Learners will:	**Grade 9 Specific Objectives** Grade 9 Learners should be able to:
(d) Geometrical relationships	
• understand how to apply the Theorem of Pythagoras	• use the Theorem of Pythagoras to find the third side of a right-angled triangle if two sides are given
Topic 6: Graphs and functions	
(a) Graphs of functions	
• acquire the knowledge of drawing function graphs and how to interpret them	• construct tables of values and draw graphs of linear functions ($y = mx + c$) • determine the independent (what you are changing) and dependent (what you are calculating or finding) variables in a function • find the y – intercept from the linear graph • find the gradient of a straight line graph • find the equation of a straight line graph
Topic 7: Statistics and probability	
(a) Data representation	
• understand the use of statistical information	• critically interpret and discuss statistical information appearing in the media or elsewhere in everyday life
(b) Measures of central tendency and Dispersion	
• understand the purpose of different measures of central tendency and dispersion	• find the mean, median and mode for a set of discrete data • determine the range of a set of data • choose the most suitable statistical average to describe data
(c) Probability	
• understand what is meant by "the probability of an event occurring" • understand and use the probability scale from 0 to 1	• estimate the probability of an event occurring • calculate the probability of a simple event occurring • express probability as a fraction in its lowest terms

10. Assessment

A learner-centred curriculum and learner-centred teaching encompass a broad range of knowledge and skills which are relevant to the knowledge-based society. The specific objectives in the syllabus state what understanding and skills a learner must demonstrate as a result of this teaching-learning process, and which objectives will be assessed. However, it is intended that the curriculum should focus on learning, not on assessment and examination. Assessment and examination are only to support learning. For more information on differentiated assessment, please refer to the Promotion Policy and promotion circulars.

10.1 Continuous assessment

In order to capture the full range and levels of competence, a variety of formal and informal continuous assessment situations is needed to give a complete picture of the learner's progress and achievements in all subjects. Continuous assessment must be clear, simple and manageable, and explicitly anchored in learner-centred principles and practice. Teachers must provide a reliable and valid assessment of the learner's performance in the specific objectives. The information gathered about the learners' progress and achievements should be used to give feedback to the learners about their strong and weak points, i.e. where they are doing well, and why, and where, how and why they need to improve. The parents should be informed regularly about the progress of their children in all subjects, be encouraged to acknowledge achievements, and given suggestions as to how they can support the child's learning activities.

The learner's progress and achievements in this subject must be reported to parents in the school report.

10.2 Formative and summative assessment

The two modes of assessment used are formative continuous assessment and summative assessment. Formative continuous assessment is any assessment made during the school year in order to improve learning and to help shape and direct the teaching-learning process. Assessment has a formative role for learners if and when:

- it is used to motivate them to extend their knowledge and skills, establish sound values, and to promote healthy habits of study
- assessment tasks help learners to solve problems intelligently by using what they have learnt
- the teacher uses the information to improve teaching methods and learning materials

Summative assessment is an assessment made at the end of the school year based on the accumulated total of the progress and achievements of the learner throughout the year in a given subject, together with any end-of-year tests or examinations. The result of summative assessment is a single end-of-year promotion grade.

10.3 Informal and formal methods

The teacher must assess how well each learner is mastering the specific objectives described in the syllabus and from this gain a picture of the all-round progress of the learner. To a large extent, this can be done in an informal way and in their participation in general, through structured observation of each learner's progress in learning and practice situations

while they are investigating things, interpreting phenomena and data, applying knowledge, communicating and making value judgements.

When it is necessary to structure assessment more formally, the teacher should as far as possible use situations similar to ordinary learning and practice situations to assess the competency of the learner. Formal written and oral tests can be used to assess only a limited range of specific objectives and therefore should not take up a great deal of time. Short tests in any subject should be limited to part of a lesson and only in exceptional cases use up a whole lesson. End-of-term tests should only be written in the first lesson of the day, so that teaching and learning can continue normally for the rest of the time.

In Grade 9 a mock examination may be held to learn examination skills and to identify areas of the syllabus which may need extra attention. Mock examinations only serve a useful purpose if they are used as a learning experience in how to organise oneself, how to read the paper, how to interpret and answer examination-type questions, and how to allocate time in an examination. This involves the teacher going through the paper systematically with the class when their answers are returned.

10.4 Evaluation

Information from informal and formal continuous assessment is to be used by the teacher to ascertain where it is necessary to adapt methods and material to the individual progress and needs of each learner. At the end of each main unit of teaching and at the end of each term, the teacher, together with the learners, should evaluate the learning-teaching process in terms of tasks completed, participation, what the learners have learnt, and what can be done to improve the working atmosphere in and achievements of the class.

10.5 Criterion-referenced grades

When grades are awarded in continuous assessment, it is essential that they reflect the learner's actual level of achievement in the specific objectives, and are not related to how well other learners are achieving these objectives or to the idea that a fixed percentage of the learners must always be awarded a Grade A, B, C, and so on (norm-referencing). In criterion-referenced assessment, each letter grade must have a descriptor for what the learner must demonstrate in order to be awarded the grade. Grade descriptors must be developed for each subject for each year. It is important that teachers in each department/section work together to have a shared understanding of what the grade descriptors mean, and how to apply them in continuous assessment, so that grades are awarded correctly and consistently across subjects. Only then will the assessment results be reliable.

10.6 Grade descriptors

The learner's summative achievement in the specific objectives will be shown in letter grades A to E, where A is the highest and E the lowest grade. When letter grades are awarded, it is essential that they reflect the learner's actual level of achievement in relation to the competencies. The relation between the letter grades and specific objectives is shown in the table below. As far as possible a letter grade should be used as the mark instead of a percentage.

Grade	% Range	Grade descriptors
A	80%+	**Achieved objectives exceptionally well.** The learner is outstanding in all areas of competency.
B	70-79%	**Achieved objectives very well.** The learner's achievement lies substantially above average requirements and the learner is highly proficient in most areas of competency.
C	60-69%	**Achieved objectives well.** The learner has mastered the specific objectives and can apply them in unknown situations and contexts.
D	50-59%	**Achieved objectives satisfactorily.** The learner's achievement corresponds to average requirements. The learner may be in need of learning support in some areas.
E	40-49%	**Achieved the minimum number of objectives to be considered competent.** The learner may not have achieved all the specific objectives, but the learner's achievement is sufficient to exceed the minimum competency level. The learner is in need of learning support in most areas.
U	0-39%	**Ungraded.** The learner has not been able to reach a minimum level of competency in the objectives, even with extensive help from the teacher. The learner is seriously in need of learning support.

10.7 Conducting and recording assessment

Continuous assessment should be planned and programmed at the beginning of the year, and kept as simple as possible. Marks given for class activities, practical activities, project work, assignments, homework and short tests may be recorded for continuous assessment.

10.8 Assessment objectives

The assessment will include, wherever appropriate, personal, social, environmental, economic and technological applications of Mathematics. The assessment must take into account the learner's ability to communicate clearly and logically and apply conventions where appropriate.

The assessment objectives for Mathematics are:

Assessment Objective A **Basic Knowledge and Technical Skills**	Numeracy and algebraic skills	Place value, +, - , *, / , and order of operation, number sense and approximation, operations with fractions and decimals and conversions, percentages, roots and powers, handling algebraic expressions, solving equations, functions
	Mental arithmetic skills	Multiplication tables, simple + , - , * ,/ exercises
	Measuring skills	Using measuring instruments (i.e. length, mass, capacity, time) estimating, accuracy
	Drawing skills	Using drawing instruments, i.e. ruler, compass, protractor, accuracy 1 mm, 1°
	Sketching skills(spatial perception)	Recognising and representing key features, i.e. right angles, equi-distance, parallel, proportionality
	Maths language skills	Key words (sum, product, ..., more, less, equal, large, small), correct use of symbol notations, conventions
	Knowledge of key concepts of Maths in life	Special concepts from money, time and measurements used in real-world problems
Assessment Objective B: **Analysing, Abstraction and Synthesising skills**	Problem analysis skills	Identify relevant and irrelevant elements, recognise the problem
		Analyse real world situations, connect correctly to mathematical concepts and translate into mathematical language
	Data analysis skills	Recognise patterns and algebraic relationships, make logical deductions
		Recognise and use spatial relationships in two and three dimensions
	Strategy finding skills	Use exploration strategies, like brain-storming, visualisation, exploring examples, testing and identifying steps
	Summarising and abstraction skills	Recognise an abstract mathematical rule in series of examples and formulate mathematical concepts in words, diagrams and formula
	Combination skills and transfer skills	Combine a variety of appropriate mathematical concepts in solving problems
Assessment Objective C: **Presentation skills**	Formal presentation skills	Write mathematical work in a clear form using appropriate symbols and terminology
	Logical presentation skills	Organise information, document steps and present problem solutions clearly
	Logical argumentation skills	Judge outcomes of investigations supported by convincing reasons

10.9 Continuous assessment: detailed guidelines

A specified number of continuous assessment activities per term should be selected, graded and recorded. Not more than two assessments per term are to be topic tests. These continuous assessments must be carefully planned and marked according to a marking scheme, marking criteria or memorandum. Detailed guidance can be found in the Continuous Assessment Manual for Mathematics. The criteria used to assess activities other than tests should be given to the learner before the assessment activity. Evidence of the work produced by good, average and low-achieving learners, as well as the written assignment and marking scheme, has to be kept at school until the end of the next year. Teachers can choose to grade and/or record more than the required continuous assessments if it is necessary for formative purposes. An end-of-year summative grade will be based only on the assessment tasks described in the syllabus. Not more than forty percent (40%) of the summative grade may be based on tests, which include topic tests and end-of-term tests.

Types of continuous assessment tasks

Continuous assessment should be planned and programmed at the beginning of the year, and kept as simple as possible. Marks given for class and homework activities may be recorded for continuous assessment.

In Mathematics in the Junior Secondary phase the continuous assessment tasks are as follows:

Practical Investigations: These assess the learners' ability to think and reason independently and to reflect critically on their own thinking. For more examples please consult the Continuous Assessment Manual for Mathematics.

Projects: A project is a longer assignment than a topic task, and gives learners an opportunity to complete an investigation into one of the themes /topics (e.g., HIV and AIDS) outlined in the syllabus. This type of investigation will enable the teacher and learner to pursue a topic in greater depth and in a more lively and creative way than possible with short discrete topic tasks or investigations. Projects assess the ability of learners to solve problems and apply mathematics processes to everyday life.

Topic Tasks: These are activities that most teachers already use in their day-to-day teaching. These are recorded, assessed activities that could introduce a topic, be used during the teaching of a topic and /or revision of a topic. They may well include assessment involving skills to do with locating information, conducting surveys, analysing information or presenting information. For more information please consult the Continuous Assessment Manual for Mathematics. Topic tasks that are given for the purpose of recording them in assessment record sheets in order to contribute to summative assessment mark at the end of the year should be well planned. They should not be given as homework.

Topic Tests: Completed topics should be concluded with a test indicating the achievements of the learners in these topics. Written tests are specifically set by the teacher to assess the learners' achievements in relation to competencies specified in the syllabus and should consist of both short questions and more structured questions.

End-of-term test: This will be a more comprehensive topic test of the term's work. No homework should be assigned during the time of writing the End-of-term tests.

Summary of continuous assessment tasks

Grade 8						
Components	**Term 1**		**Term 2**		**Term 3**	
	Number & Marks	**Total CA**	**Number & Marks**	**Total CA**	**Number & Marks**	**Total CA**
Investigations	2×15	30	1×15	15	1×15	15
Projects			(1×30)÷2	15		
Topic tasks	2×10	20	2×10	20	1×10	10
Topic tests	(2×20)÷2	20	(2×20)÷2	20	1×25	25
End-of-term Tests	65	(65×2) 130	65	(65×2) 130		
Term mark		200		200		50
Weighted term mark	200÷2	100	200÷2	100		

Grade 9				
Components	**Term 1**		**Term 2**	
	Number & Marks	**Total CA**	**Number & Marks**	**Total CA**
Investigations	2×15	30	1×15	15
Projects			(1×30)÷2	15
Topic tasks	2×10	20	2×10	20
Topic tests	(2×20)÷2	20	(2×20)÷2	20
End-of-term test	65	(65×2) = 130	Paper 1(45) + Paper 2 (85)	130
Term mark		200		200
Weighted term mark	200÷2	100	200÷2	100

The continuous assessment (CA) marks for one term (trimester) is converted to a mark out of 100 (weighted mark). Only this should be used for the report at the end of term 1 and 2. Learners should not write an examination at the end of the first two trimesters (grade 8 term 1 and 2, and grade 9 term 1), but only an end of term test.

10.10 End-of-year examinations: detailed guidelines

In Grade *8* there will be internal end-of-year examination. The purpose of this examination is to focus on how well learners can demonstrate their thinking, communication, and problem-solving skills related to the areas of the syllabus which are most essential for continuing in the next grade. Preparing for and conducting this examination should not take up more than two weeks altogether right at the end of the year.
The short-answer questions in Paper 1 of the examination fulfil a particularly important function in ensuring syllabus coverage and allowing the testing of Objective A: Basic Knowledge and Technical Skills, while greater emphasis is placed on Objective B: Analysing, Abstraction and Synthesising Skills in the structured questions in Paper 2.

Written examination Grades 8 - 9			
Grades	**Description of papers**	**Duration**	**Marks**
8 and 9 Mathematics	**This will consist of two papers consisting of:**		
	Paper 1: Short questions and include calculations using mental strategies or paper and pencil algorithms. Learners are not allowed to use a calculator	1 h 30 min	45
	Paper 2: Structured questions and problems	2 hours	85

There will be a semi-national external examination at the end of Grade 9. These papers will be set by DNEA and will be marked regionally. Samples will be moderated by DNEA. The purpose of the examination is to assess how far each learner can demonstrate his/her achievement in reaching the specific objectives as a preparation for everyday life and for further studies or training, and to what extent the system as a whole is enabling learners to achieve optimally.

10.11 Promotion marks

For Mathematics in Grade 8-9 Continuous Assessment contributes 35% to the summative assessment mark and the end-of-year examination contributes 65%.The weighting of each assessment component is as follows:

Component	**Description**	**Marks**	**Weighting**
Written examination	*Paper 1 *Paper 2	45 85	22.5% 42.5%
Continuous assessment	*Topic Tasks, Topic Tests, Practical Investigations/Projects, End-of-term Test	70	35%
Total Marks		**200**	**100%**

The promotion marks are calculated as follows:

Promotion mark Grade 8				
	Term 1	**Term 2**	**Term 3**	**Total**
Term mark	200	200	50	450
CA mark	(450 ÷ 45) × 7			70
End-of-year examination	(45 + 85) =130 Marks			130
Promotion mark	Average Term Mark + End-of-Year Examination ÷ 2 200÷2			100

Promotion mark Grade 9			
	Term 1	**Term 2**	**Total**
Term mark	200	70 + (45 + 85) = 200	400
CA mark	(400 ÷ 40) × 7		70
End-of-year examination	(45 + 85) =130 Marks		130
Promotion mark	Average Term Mark + End-of-Year Examination ÷ 2 200÷2		100

10.12 Specification grid

A rigid association between particular assessment objectives and individual components of assessment is not appropriate since any of the objectives can be assessed in any question. Nevertheless the components of the scheme will differ in the emphasis placed on the various objectives. The Specification Grid below is for general guidance only and illustrates where particular objectives might receive most emphasis on the various components for both the Written Examination and for Continuous Assessment.
The Specification grid below indicates the weighting allocated to each objective for both Continuous Assessment and for the Written Examination.

Assessment objectives for written examination	
Components	**Weighting**
Objective A Basic Knowledge and Technical Skills	40%
Objective B Analysing, Abstraction and Synthesising skills	60%
Total	100%
Assessment Objectives for Continuous Assessment	
Components	**Weighting**
Objective A Basic Knowledge and Technical Skills	20%
Objective B Analysing, Abstraction and Synthesising skills	60%
Objective C Presentation skills	20%
Total	100%

10.13 Assessment rubrics/criteria

The marking rubrics should ideally be less than one page altogether and will meet the following criteria:

For a topic task:
- There must be an Objective A rubric
- There must be an Objective B rubric
- There is NO Objective C rubric

For an investigation:
- There must be an Objective A rubric
- There must be an Objective B rubric
- There may be an Objective C rubric – this is optional and will not happen often

For a project:
- There must be an Objective A rubric
- There must be an Objective B rubric
- There must be an Objective C rubric

Each Objective A, Objective B and Objective C rubric must meet the following criteria:

- Each rubric must address at least one skill (see 10.8)
- Each Objective A and Objective B rubric should ideally address more than one skill.
- A particular skill on a rubric may be assessed more than once
- The maximum marks allocated to each Objective rubric must be a multiple of 5 (5, 10, 15, etc. marks)
- Each rubric should independently assess the whole task. For example, if a topic task has a rubric A and rubric B, then both rubrics should allocate marks to all the questions in the task (remember: this is because only one might be used in a particular year).

Example of an Assessment rubric: Whole numbers (Grade 8)

Assessment Objective A Basic Knowledge and Technical Skills	Numeracy and algebraic skills. (Q1; Q2)	7 All answers are correct	6 - 4 Most answers are correct	3 – 0 Few or no answers are correct.
	Mental arithmetic skills (Q3.1)	2 All answers are correct	1 2 answers are correct	0 One or none of the answers are correct.
	Maths language skills (Q3.2)	2 All answers are correct	1 1 answer is correct	0 None of the answers is correct
	Numeracy and algebraic skills (Q3.3)	3 All answers are correct.	1 Most answers are correct	0 Few or none of the answers are correct
	Mental arithmetic skills (Q4)	3 Correct answer with a correct method shown.	2 - 1 Correct answer without a method shown or incorrect (part) answer with correct method	0 Wrong answer
	Numeracy and algebraic skills (Q5)	3 All answers are correct.	1 Most answers are correct.	0 Few or none of the answers are correct.

Annexe 1: Glossary of terms used in Mathematics teaching and assessment

Add Up	Perform mathematical addition of figures
Analyse	Examine information in detail to discover patterns and relationships, or to study and determine relationship or accuracy
Apply/Use	Use *Example: as in "apply the commutative property of addition", e.g.* 3 + 27 = 27 + 3 *– for most children it is not obvious that one can do this, but it makes calculation easier, especially when children still count on – instead of going from 3..to 4, 5, 6, 7, etc, go from 27 .. to 28, 29, 30*
Arrange	Put in a particular order or grouping *Example: arrange objects in groups of 10*
Calculate	To compute; to perform the indicated operation(s)
Classify	To arrange or organize according to systematic groups, classes or categories
Collect Data	Pose questions, select sources and/or design questionnaires
Discrete Data	Individually separate data, e.g. colour of cars – as opposed to continuous data, such as height
Compare	To state the similarities or differences between two or more numbers, objects, or figures by considering their attributes/characteristics; or to determine if two or more items, entries are the same and if not, identify differences
Compute	To calculate a quantity or a number
Construct	Make an accurate drawing or representation by using mathematical instruments and/or rules *Example: Construct a triangle with given measurements, construct a sequence with a given rule*
Convert	Change from one unit of measure to another
Correctly Use	Emphasises the correct use of a procedure, rule or fact, e.g. a child may be able to use a protractor, but not do so correctly
Count	To name the numbers in order up to and including a given number (e.g., count to 10); to determine the total number or amount of a collection of objects
Create	Produce something using your own ideas or imagination
Deduce	Use the information provided to come to a conclusion, e.g. reference to a law or principle
Define	Describe the exact nature or meaning of something in words
Describe	Give a detailed account in words of what you do, observe or see
Design	Make a plan or drawing to show the appearance of something before it is made
Determine	Establish by calculation or research to decide or to make a conclusion
Derive	Obtain an unknown answer from a known fact *Example: 16 × 4: Double 16 is 32 and double 32 is 64, so 16 × 4 = 64* *Comment: The competency to derive unknown answers from a known facts plays a big role in finding answers by mental methods*
Discover	Become aware of a fact or situation; gain knowledge of something previously unseen or unknown
Discuss	Give a critical account of the points involved in the topic
Distinguish	Tell apart, show the difference between *Example: Distinguish between a rectangle and a square*

Divide	Mathematically: To share or group quantities to find a quotient. Generally: separate into parts
Do Mental Arithmetic Calculations	Apply mental arithmetic strategies *Comment: Mental arithmetic calculations are: Computations done "in the head," either in whole or in part* *This should not be confused with basic facts knowledge such as multiplication tables and number bonds! Basic facts knowledge is used to do mental calculations, e.g. 34 × 8 = (30 × 8) + (4 × 8) = 240 + 32 = 272* *The development of mental calculations is regarded one of the most important objectives in mathematics – but sadly missing in our syllabuses, because nobody understands how it works!*
Double	Increasing by adding an equal amount *Comment: the ability to quickly and correctly recall doubles of numbers is important for multiplication and division of numbers as well as for learning multiplication tables* *Example: If a child knows the 3 times table and can double numbers, it is easy to derive the 6 times table*
Draw	Produce a picture or a diagram on paper
Draw Up	Prepare a table or a plan
Estimate	Produce an approximate answer using rational, logical procedures (e.g., rounding for numbers and benchmarks for measures)
Evaluate	Use the information provided to make a judgement about something
Explain	Give a reason for your answer
Extract	*Extract information from tables or graphs" would mean that you should use the given information to come to some conclusions*
Find	a general term which means calculate, determine or measure
Give/State/Write Down/Express	write down your answer *Comment: in maths we say for example "express your answer as a fraction in its simplest form"*
Half	Halve – divide or separate into two equal parts *Comment: the ability to quickly and correctly recall halves of numbers is important for multiplication and division of numbers as well as for learning multiplication tables*
Identify	Find out what is unique about a material or situation
Indicate	Point out, show, give a reading of a measurement
Interpret	Reasoning or some reference to theory, depending on the content ; explain the meaning of something
Investigate	Examine a problem in a systematic way
List	Give a number of points, generally one word for each
Locate	Find the exact place or position
Make Up	Put together or prepare from parts
Measure	Find out the size, amount or degree of something by comparing it with a standard
Multiply	To combine equal groups to find one quantity called a product
Name	Identify by mentioning the name of something
Order	To place numbers or objects in a sequential arrangement Example: least to greatest or heaviest to lightest
Organise	Rearrange according to a plan or system

Organize Data In Tally Forms And Tables	Rearrange / summarise data to make it easier to understand and analyse
Outline	Give a brief answer, writing down the main points
Place	Put in a particular position
Plot	Difference between plot, draw, sketch and draw?
Predict	To determine the next step or value (to make an educated guess), based on evidence or a pattern; make a logical deduction either from your own knowledge or from the information given in the question or both
Pronounce	Say correctly *Comment: this is important in early years – children often mispronounce the ..teen and the .., ty (thir<u>teen</u> and thir<u>ty</u>)*
Read	*Comment: In early years learners must 'read' numbers which means translate the symbols into words – you read 126 as one-hundred and twenty-six*
Rearrange	Changing an arrangement of objects *Example: Rearrange a grouping of objects from groups of 2 to groups of 5*
Recall	Retrieve from memory without having to think for a long time *Comment: basic facts should be recalled quickly and correctly*
Recognise	Know something from having come across it before; be aware of a fact or problem
Record	Enter, transcribe, write down
Relate	find the relationship between one or more variables
Represent	Show or describe in a particular way
Represent Data	Data can be represented just as a list of numbers or in tables or graphs
Round	To approximate the value of a whole number or decimal to a specific place value
Select	Choose from a number of alternatives
Simplify	To make simple, to make less complex or complicated; make plainer or easier. To reduce (an equation, fraction, etc) to a simpler form by cancellation of common factors, regrouping of terms in the same variable, etc
Sketch	Make a rough drawing that shows the salient or distinguishing features of an object; in diagrams, make a simple, freehand drawing and in graph work, the shape and/or position of the curve
Solve	Find an answer to or a way of dealing with a problem or to find the answer to an equation *Comment: Calculating implies the use of arithmetic operations and has a numerical answer. Solving is more general and implies the use of different methods and procedures – the answers might not be a number. Methods should always be written down unless a calculation or procedure can be done mentally.*
Study	use the information provided or data to investigate a problem in a systematic way
Subitise	Determine the quantity of a small group of objects rapidly without counting.
Subtract	To take one or more quantities away from another; to find one quantity known as the difference

Suggest	Use your knowledge of the context of the problem and mathematical procedures to give what you think is the best strategy to use or answer to the question use your knowledge of science and the information in the question to give what you think is the best answer
Summarise	Give a brief account of the most important points
Treat	To deal with in a certain way; to apply a process to
Write	*Comment: this is often used to indicate a translation from one representation to another* *Example: " Write the numbers from 1 to 100 in words" – here the child should translate the mathematical symbol into words*

Annexe 2: Glossary of Terms

Angle	The space between two converging straight lines. Types of angles include: a) acute angle which is less than 90°, b) obtuse angle which is more than 90°.c) right angle which is 90° and straight angle which is 180°.
Angle of depression and elevation	Angles measured from a horizontal line downwards (depression) and upwards (elevation)
Approximate Approximation Approximately	Giving the number which is nearest in value. Giving the distance, mass or volume to the nearest round number
Arc	A part of the circumference of a circle or any curved line
Area	A two dimensional measure of the surface covered measured in square units
Ascending Order	Placing things in order from the smallest to the largest
Average	Average is found by taking the sum of a group of numbers and then dividing by the total number of items
Base (Of A Shape)	The side which is at the bottom of a two – dimensional shape or a three – dimensional object
Bearings	Angles measured in degrees from North, turning clockwise direction
BODMAS and BEDMAS	BODMAS and BEDMAS describe the order in which arithmetic operations must be carried out. This technique helps us to complete calculations involving more than two operations in a way that makes the solution the same for everyone. **NOTE: Multiplication and division should be performed first before addition and subtraction but in their order of appearance from left to right and addition and subtraction should also be performed in their order of appearance from left to right.**
Capacity	The amount something can hold
Circle	A round figure, every point on the edge (circumference) of which is the same distance from the centre.
Comma	Punctuation mark used in Southern Africa to indicate the slight separation between whole numbers and decimal fractions. A full stop is used for the same purpose in Europe and America
Circumference	The perimeter or the distance around the circle
Common Denominator	A number divisible (without leaving a remainder) by all the denominators involved
Cone	A three – dimensional figure like a pyramid but with a circular base
Congruent	Exactly alike of equal
Continuous (data)	Data that has an infinite value. e.g. the weight of a tomato can be 1.38726 grams or the length of a tea spoon can be 14.37291 cm
Criterion, Criteria	Standards, rules or tests by which something can be judged
Cube	A three – dimensional shape with six congruent faces. The six faces are congruent squares
Cylinder	A three – dimensional shape which is bounded by a circular surface and whose end faces are parallel circles
Data	Information in the form of facts or statistics which can be analysed

Decimal	A fraction with a denominator of ten, or some power of ten, shown by a comma. (see also comma)
Denominator	The number indicated below the line in a fraction. It tells a number of parts into which the whole has been divided
Descending Order	Placing things in order from the biggest first to the smallest. Counting downwards too.
Diagonal, Diagonally	A slanting line from the top corner to the bottom corner in a rectangle for instance
Diagram	A sketch, plan, graph that explains something
Diameter	A straight line which joins two points on the circumference of a circle and passes through the centre
Difference	The amount by which one numbers differs from another or the answer you get when you subtract two numbers
Digit	The written symbol for any of the numbers
Dimension	The measurable part of the shape. Length, breadth, width, height, depth are the main measures of dimension
Direct proportion	Refers to a relationship between two variables where in a given context all quantities either increase or decrease
Discrete (data)	Data that has finite values. e.g. the number of cars a person has can be 2 cars but can never be 2. 345 cars
Edge	The line where two surfaces of a solid shape meet
Equilateral	Having all sides equal. An equilateral triangle has three sides that are equal
Equivalent	The same according to a given criterion
Face	Each individual surface that make up a solid shape
Factor	One of the numbers to be multiplied in multiplication
Fraction	A quantity less than a whole or a small amount or proportion of something
Graph	A picture used to illustrate a given collection of data
Height	The distance from the bottom to the top
Hexagon	A two-dimensional shape with six straight sides
Horizontal	Parallel to the base or to the ground
Indirect/inverse proportion	Refers to a relationship between two variables where in a given context some of the quantities increase while others decrease.
Length	The distance along the longest side of an object
Lowest Term	A fraction with its numerator and denominator not having a common factor greater than 1
Net	A 3D net is a pictorial representation of a three-dimensional figure on a two dimensional plane so that each and every edge and face is in front of us. A 3D net has no height or width. It only has length and breadth. With the help of a 3D net, a three-dimensional shape is converted into a two-dimensional diagram. It can be given to us with an easy way to analyse the different bases, edges, faces and even dimensions of any space figure.

Notation	A system of recording numbers by using symbols
Numeral	A symbol used to stand for a number
Octagon	A two-dimensional figure that has eight sides
Ordinal Numbers	Numbers used to indicate the order of objects
Parallelogram	A four – sided figure whose pairs of opposite sides are parallel, and equal in length
Pattern	A model or plan identified in a mathematical situation
Pentagon	A two-dimensional shape that has five sides
Perimeter	The distance around an object
Prime Number	A whole number greater than 1 that has exactly two factors – the number itself and one
Prism	A three-dimensional shape whose cross sections are all the same and parallel
Pyramid	A three-dimensional figure with triangular faces meeting at a single point whose base is two-dimensional
Quadrilateral	A two-dimensional figure that has four sides
Radius	A straight line from the centre of any circle to the point on the circumference of that circle
Reverse percentages	Sometimes a question will ask you to work backwards and find the original price of something after the price has increased. If you are given a quantity after a percentage increase or decrease, and you need to find the original amount, use this method: **Example 1** A radio sells for N$659, after a 40% increase in the cost price. Find the cost price.
Sphere	A round three-dimensional shape whose surface is at every point an equal distance from a point called the centre of the sphere
Tessellate	Lay out in a mosaic pattern of small patterned blocks
Three-Dimensional	Having measurable dimensions in three independent directions (height, width, length)
Two-Dimensional	Having measurable dimensions in two independent directions (length and width)
Variable	The number or numbers indicated by a placeholder in the form of a letters
Vertex/Vertices	The point where lines , or edges, meet to form an angle
Width	The distance something measures from one side to the other side

Annexe 3: Metric and SI units

Quantity	Metric units	SI unit
Length	*mm, cm, dm, m, km*	metre(m)
Mass	*mg, g, kg, ton*	kilogram(kg)
Time	*ms, s, min, hr, d, wk, mo, yr*	second(s)
Area	mm^2, cm^2, m^2, *ha*, km^2	m^2
Volume	mm^3, cm^3, dm^3, m^3	m^3

Annexe 4: International system prefixes

Factor		Factor in words
1 000 000 000 000	or 10^{12}	trillion
1 000 000 000	or 10^9	billion
1 000 000	or 10^6	million
1 000	or 10^3	thousand

Annexe 5: Miscellaneous symbols

=	Is equal to
≠	Is not equal to
≡	Is identical or is congruent to
≈	Is approximately equal to
∝	Is proportional to
<	Is strictly less than
≤	Is less than or equal to
>	Is strictly greater than
≥	Is greater than or equal to

Annex 6: Continuous Assessment Harvest Record Sheet

Harvest Record Sheet: Mathematics **Grade: .....**

Teacher: ..... **Year: .....**

School: ..... **Term: ……**

Name	Practical Investigations/ Projects						Topic Tasks						Topic Tests						

Annexe 7: Assessment record sheet for Grade 8 terms 1 & 2

ASSESSMENT RECORD SHEET FOR MATHEMATICS (TERM 1 & 2) Year: ……………………….									Grade: …………….. Teacher: ……………………………………		
Name of learner	Term	Investigations/ projects		Topic task		Topic tests		Total	End-of-term test	Term mark	Weighted term mark (200÷2)
		15	15	10	10	10	10	70	(65 x2)=130	200	100
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										
	1										
	2										

Annexe 8: Assessment record sheet for Grade 8 term 3

ASSESSMENT RECORD SHEET FOR MATHEMATICS (TERM 3) **Grade: ……..**

Year: …… **Teacher: ……**

Name of learner	Investigations	Topic task	Topic test	Term 3	Term 2	Term 1	Total term mark	CA Mark (450÷45)×7	Exam mark	Total	Promotion mark (200÷2)	Promotion Grade
	15	10	25	50	200	200	450	70	(45+85)=130	200	100	

Annexe 9: Assessment record sheet for Grades 9 terms 1 & 2

ASSESSMENT RECORD SHEET FOR MATHEMATICS (TERM 1 & 2) **Grade: ……………..**

Year: ………………………. **Teacher: …………………………………….**

Name of learner	Term	Investigations/ projects		Topic task		Topic tests		Total	End-of-term test	Term mark	Weighted term mark	CA Mark (400÷40)×7	Exam mark	Total	Promotion mark (200÷2)	Promotion Grade
		15	15	10	10	10	10	70	130	200	100	70	130	200	100	
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															

The National Institute for Educational Development
Private Bag 2034
Okahandja
NAMIBIA

Telephone: +264 62 509000
Facsimile: +264 62 509073

Website: http://www.nied.edu.na