



Republic of Zambia

Ministry of Education, Science, Vocational Training and Early Education

Mathematics Syllabus

(Grades 8 and 9)



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VISION

Quality, lifelong education for all which is accessible, inclusive and relevant to individual, national and global needs and value systems.

PREFACE

The syllabus was produced as a result of the Curriculum review process carried out by the Ministry of Education, Science, Vocational Training and Early Education under the auspices of the Curriculum Development Centre (CDC). The curriculum reform process started way back in 1999 when the Ministry of Education commissioned five (5) curriculum studies which were conducted by the University of Zambia. These studies were followed by a review of the lower and middle basic and primary teacher education curriculum. In 2005 the upper basic education National survey was conducted and information from learners, parents, teachers, school managers, educational administrators, tertiary institutions traditional leaders civic leaders and various stakeholders in education was collected to help design a relevant curriculum .

The recommendations provided by various stakeholders during the Upper Basic Education National survey of 2005 and National symposium on curriculum held in June 2009 guided the review process.

The review was necessitated by the need to provide an education system that would not only incorporate latest social, economic, technological and political developments but also equip learners with vital knowledge, skills and values that are necessary to contribute to the attainment of Vision 2030.

The syllabus has been reviewed in line with the Outcome Based Education principles which seek to link education to real life experiences that give learners skills to access, criticize analyze and practically apply knowledge that help them gain life skills. Its competences and general outcomes are the expected outcomes to be attained by the learners through the acquisition of knowledge, skills, techniques and values which are very important for the total development of the individual and the nation as a whole.

Effective implementation of Outcome Based Education requires that the following principles be observed: clarity of focus, Reflective designing, setting high expectations for all learners and appropriate opportunities.

It is my sincere hope that this Outcome Based syllabus will greatly improve the quality of education provided at Grade 8 and 9 level as defined and recommended in various policy documents including Educating Our Future`1996 and the `Zambia Education Curriculum Framework `2013.

Chishimba Nkocha
Permanent Secretary

MINISTRY OF EDUCATION,SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION.

Acknowledgements

The syllabus presented here is a result of broad-based consultation involving several stakeholders within and outside the education system.

Many individuals, institutions and organizations were consulted to gather their views on the existing syllabus and to accord them an opportunity to make suggestions for the new syllabus. The Ministry of Education wishes to express heartfelt gratitude to all those who participated for their valuable contributions, which resulted in the development of this syllabus.

The Curriculum Development Centre worked closely with other sister departments and institutions to create this document. We sincerely thank the Directorate of Teacher Education and Specialized Services, the Directorate of Planning and Information, the Directorate of Human Resource and Administration, the Directorate of Open and Distance Education, the Examinations Council of Zambia, the University of Zambia, schools and other institutions too numerous to mention, for their steadfast support.

We pay special tribute to co-operating partners especially JICA and UNICEF for rendering financial technical support in the production of the syllabus.

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INTRODUCTION

Rationale

Mathematics is an important subject on the Zambian School curriculum. It is featured as one of the core subjects in all the options for both the academic as well as the practical career pathways.

Mathematics enhances the learners' understanding of the world around and prepares them for further education. It also plays a key role as a tool for learning other subjects and learning areas. The subject fosters the development and improvement of learners' intellectual competence in logical reasoning, spatial visualization, analysis and abstract thought. When learners have acquired enough knowledge in mathematics they develop reasoning, thinking and problem solving skills. Mathematics is also important in science and technology subjects which are vital for the development of the country. It therefore equips the learner to live in the age of Science and technology and enable them contribute to social, economic development of the country.

Mathematics can also be an interesting subject when learners appreciate basic concepts and insights that will equip them to pursue mathematics education at higher levels.

Suggested Teaching Methodology

This Syllabus for Junior Secondary schools aims at enabling learners acquire mathematical knowledge, values and skills for the further study of the subject at the Senior Secondary level as well as apply it in their daily lives. It is for this reason that teachers should focus on encouraging communication of mathematical ideas among learners, emphasise problem solving and application to real life situations besides cultivating interest in the subjects.

The mathematical concepts and principles presented in this syllabus aim to encourage learners to think logically and critically and make connections between topics and with other subjects. To achieve this, teachers should put emphasis on teaching the subject in a manner where learners communicate their mathematical ideas as well as misconceptions. This approach will enhance learners' understanding and appreciation of mathematical concepts and ideas as they construct their own knowledge. Teachers will also need to refocus their teaching approaches and continuously sharpen their pedagogical skills in line with contemporary approaches in the teaching of the subject.

Further, since Mathematics is a discipline with hierarchical concepts and skills, teachers should present it in a systematic manner. In the design of the syllabus, effort has been made to sequence the topics across the entire course of study. Successful interpretation and implementation of this syllabus however requires flexibility on the part of teachers in order for them to arrange the content in an easy to understand progression so as to improve mathematics education in the country.

Assessment

Assessment is an important diagnostic tool in the teaching and learning process used to determine whether teaching and learning have taken place or not. It requires well defined rubrics to facilitate a fair and consistent assessment of learner's work as well as clearly defined performance targets at key stages and during the process of teaching and learning.

Classroom based continuous assessment must form an integral part of the implementation of this syllabus. This is in view of the value that this adds to the modification of instruction delivery thereby contributing to best practices by the teacher. In order to attain this, teachers are urged to employ various techniques of assessment according to the topics and themes at various levels. These methods may include learner observation, projects, tests, portfolios and projects among others.

For terminal assessment, the Examinations Council will provide guidelines on the objectives to be assessed in at specific levels both for selection and certification.

Time and period allocation

Time allocation for this syllabus is will require at least seven-40 minutes periods per week to complete.

General Outcomes

- Mathematics fosters the development and improvement of learners' intellectual competence in logical reasoning, spatial visualization, analysis and abstract thought.
- Mathematics equips the learner to live in the age of Science and technology and enable them contribute to social, economic development of the country

GRADE 8

General Outcomes

- Provide clear mathematical **thinking** and expression in the learner
- Develop the learners' mathematical AND ICT **knowledge and skills**
- Enrich the learners' **understanding** of mathematical concepts in order to facilitate further study of the discipline
- Build up an appreciation of mathematical and ICT concepts so that the learner can **apply** these for problem solving in everyday life.
- Enable the learner **Represent**, interpret and use data in a variety of forms

Key Competences:

- Think mathematically and accurately in problem solving skills and apply these skills to formulate and solve mathematical and other related problems.
- Develop necessary skills needed to apply mathematical and ICT concepts and skills in other disciplines.
- Develop abilities and ideas drawn from mathematics to reason logically, communicate mathematically and technologically, and learn independently without too much supervision (self-discipline).
- Development positive attitudes towards mathematics and use it in other subjects such as science and technology.
- Apply mathematical tools such as information and communication technology in the learning of other subjects.
- Use mathematics for enjoyment and pleasure.
- Develop understanding of algebra, geometry, measurements and shapes.

GRADE 8

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.1 SETS	8.1.1 Set builder notation 8.1.2 Intersection of sets 8.1.3 Complement of a Set 8.1.4 Set Operations 8.1.5 Application on sets	8.1.1.1 Interpret the set builder notation; $\{x: x > 2, x \in Z\}$. 8.1.2.1 Find the intersection set involving up to 3 sets. 8.1.3.1 Interpret the set complement including its symbol (i.e. A' , B') 8.1.4.1 Use single set operation symbols (e.g. $A \cup B \cup C$ or $A \cap B \cap C$). 8.1.4.2 Use combined set operation symbols [e.g. $(A \cup B') \cap C$, $(A' \cap B) \cup C$, $A' \cap (B' \cup C)$] 8.1.5.1 Apply simple operations on sets.	<ul style="list-style-type: none"> • The set builder notation; $\{x: x > 2, x \in Z\}$ • Venn diagrams • The intersection set (should include up to 3 sets) • Set complement including its symbol (i.e. A', B') • Single set operation symbol (e.g. $A \cup B \cup C$ or $A \cap B \cap C$). • Combined set operation symbols [e.g. $(A \cup B') \cap C$, $(A' \cap B) \cup C$, $A' \cap (B' \cup C)$] • Set application in real life situations. 	<ul style="list-style-type: none"> • Computation of operations on sets • Interpretation of the set builder notation. • Problem solving using acquired knowledge of sets. 	<ul style="list-style-type: none"> • Appreciation of the use of sets. • Accuracy of classification and in set operations. • Team work through cooperative learning.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.2 INTEGERS	8.2.1 The four operations	8.2.1.1 Add and subtract integers without using the number line. 8.2.1.2 Multiply and divide integers.	<ul style="list-style-type: none"> • Adding and subtracting integers without using the number line. • Multiplying and dividing integers. 	<ul style="list-style-type: none"> • <i>Computation</i> of integers using the four operations. 	<ul style="list-style-type: none"> • <i>Accuracy</i> in computing integers using the four rules.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.3 APPROXIMATION & ESTIMATION	8.3.1 Approximation and Estimation 8.3.2 Scientific Notation 8.3.3 Apply the concept of approximation in real life	8.3.1.1 Express numbers to given significant figure. 8.3.1.2 Estimate measures or quantities 8.3.1.3 Round-off numbers to specified degree of accuracy. 8.3.2.1 Express numbers in scientific notation or standard form. 8.3.2.2 Approximate numbers in scientific notation to given degree of accuracy 8.3.3.1 Apply the concept of approximation in real life	<ul style="list-style-type: none"> • Meaning of significant figure (Highlight the Significance of zero) • Estimating measures or quantities • Rounding off numbers to given degree of accuracy (nearest unit, given number of decimal places). • Scientific notation (i.e. $A \times 10^n$ where n is an integer and $1 \leq A < 10$) • Scientific notation to given degree of accuracy (i.e. specified number of significant figures, decimal places) • Concept of approximation in real life (percentages, time, distance, temperature) 	<ul style="list-style-type: none"> • Identification of significant figures. • Estimation of numbers to given significant figure. • Problem solving using approximation in real life. 	<ul style="list-style-type: none"> • Appreciation of approximations in real life.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.4 RATIO & PROPORTION	8.4.1 Ratio and Proportional parts	8.4.1.1 Solve problems that involve ratio and proportion	<ul style="list-style-type: none"> • Interpretation of graphs • Problems in real life situations [e.g. using the representative fractions (RF), Foreign Exchange rates, mapping] 	<ul style="list-style-type: none"> • Computation of problems involving ratio and proportion • Application of ratio and proportion in solving real life problems. 	<ul style="list-style-type: none"> • Team work through cooperative learning • Accuracy in computations
8.5 ALGEBRAIC EXPRESSIONS & FORMULA	8.5.1 Algebraic expressions. 8.5.2 Substitutions 8.5.3 Simple Linear equations 8.5.4 Construction of formulae	8.5.1.1 Formulate algebraic expressions 8.5.1.2 Simplify algebraic expressions 8.5.1.3 Apply the distributive law in simplifying algebraic expressions 8.5.2.1 Evaluate algebraic expressions 8.5.3.1 Solve simple equations using the additive and multiplicative inverse 8.5.4.1 Construct formula from given statement.	<ul style="list-style-type: none"> • Relate letters to numbers and/ or vice versa. • Distinguish between variables and coefficients • Grouping like and unlike terms. • Applying Commutative, Associative and Distributive (CAD) Laws • Expanding and Factorising algebraic expressions. • Applying the four operations on algebraic expressions • Evaluating algebraic expressions by substituting variables with numbers • Applying additive and 	<ul style="list-style-type: none"> • Contrasting terms and constants. • Substitution or representation of letters for numbers. • Construction of equations. 	<ul style="list-style-type: none"> • Accuracy in computation of values. • Logical thinking in factoring. • Abstract reasoning in constructing formulae.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
			multiplicative inverses <ul style="list-style-type: none"> • Solving equations • Representation of mathematical sentences for symbols 		
8.6 SOCIAL & COMMERCIAL ARITHMETIC	8.6.1 Simple and compound interest 8.6.2 Utility bills, Bank and Post Office charges 8.6.3 Budgeting 8.6.4 Insurance and Assurance 8.6.5 Hire purchase	8.6.1.1 Calculate simple and compound interest 8.6.2.1 Calculate utility bills, Bank and Postal charges. 8.6.3.1 Generate simple budget 8.6.4.1 Calculate Insurance, premium, policy cover 8.6.5.1 Calculate cost of goods bought on hire purchase	<ul style="list-style-type: none"> • Calculating compound and simple interest • Loan repayments • Prepare simple budgets • Calculating the value of property Insured (e.g. Car, building, household), premiums, Insurance cover, Life assurance (Accident, medical, education), policy cover • Calculating the initial cost, instalments, interest, discount and total cost of goods bought on hire purchase 	<ul style="list-style-type: none"> • Entrepreneurship using simple and compound interest • Generating budgets • Calculation involving premium and policy cover. • Interpretation of bills • Planning and costing of goods bought on hire purchase 	<ul style="list-style-type: none"> • Appreciation of compound interest, insurance and assurance. • Teamwork • Accuracy in calculating utility bills, bank and postal charges. • Curiosity in hire purchase.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.7 CARTESIAN PLANE	8.7.1 The Cartesian Graph 8.7.2 Equation of straight line	8.7.1.1 Draw the XOY plane 8.7.1.2 Plot and read the ordered pair (x, y) on the XOY plane 8.7.1.3 Join different points on the Cartesian plane 8.7.2.1 Graph straight lines	<ul style="list-style-type: none"> • The Cartesian plane • Drawing the XOY plane • Plotting ordered pairs • Drawing shapes by joining ordered pairs • Drawing straight line graphs (e.g. $y = x$, $x = 4$, $y = 3$) 	<ul style="list-style-type: none"> • Identification of the X and Y plane. • Reading and plotting of coordinates. • Drawing of straight lines using on the XOY plane. 	<ul style="list-style-type: none"> • Curiosity in plotting points on XOY plane • Accuracy in plotting point on the XOY plane.
8.8 FUNCTIONS	8.8.1 Relations 8.8.2 Mappings 8.8.3 Set of ordered pairs 8.8.4 Linear graphs	8.8.1.1 Describe different types of relationships 8.8.2.1 Map functions to show relationship 8.8.2.2 Identify mappings from arrow diagrams. 8.8.2.3 Find the range of the function when domain is given 8.8.3.1 Find a function given a set of ordered pairs. 8.8.4.1 Draw graphs of linear functions 8.8.4.2 Solve problems involving functions	<ul style="list-style-type: none"> • Types of relationships(one to one, one to many , many to one many to many) • Mappings (one to one, many to one) • Representation of a function [$f: x \rightarrow a$; $f(x) = a$] • Making arrow diagrams to show relations and mappings for domain and range • Ordered pairs as object and image • Real life functional problems 	<ul style="list-style-type: none"> • Identification range and domain. • Matching relations. • Interpretation of functions. 	<ul style="list-style-type: none"> • Curiosity in drawing of graphs of linear equations. • Logical thinking in finding range and domain of functions.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.9 SOLID SHAPES	8.9.1 Three dimensional shapes	8.9.1.1 Identify cones and pyramids 8.9.1.2 Draw nets of cones and pyramids 8.9.1.3 Draw/sketch of cones and pyramids	<ul style="list-style-type: none"> Identifying and draw cones and pyramids Drawing nets of cones and pyramids Drawing/sketching of cones and pyramids. 	<ul style="list-style-type: none"> Identification of cones and pyramids. Comparison of nets of cones and pyramids. Interpretation of nets of cones and pyramids. Application 	<ul style="list-style-type: none"> Creativity in drawing nets of cones and pyramids. Appreciation of drawing cones and pyramids. Accuracy in finding point symmetry and centre of rotation.
8.10 MENSURATION	8.10.1 Area 8.10.2 Volume 8.10.3 Density	8.10.1.1 Find the total surface area of cylinder and triangular prism 8.10.2.1 Calculate the volume of cylinder and triangular prism 8.10.3.1 Describe density 8.10.3.2 Calculate density of regular objects	<ul style="list-style-type: none"> Finding the total surface area of a cylinder and triangular prism Finding volume of cylinder and triangular prism Calculating density of regular objects 	<ul style="list-style-type: none"> Calculation of surface area and volume of a cylinder and triangular prism. Interpretation of density of regular objects. 	<ul style="list-style-type: none"> Accuracy in calculations involving surface area and volume. Appreciation of density of objects.
ANGLES	8.11.1 Related angles 8.11.2 Angle associated with straight lines	8.11.1.1 Identify related angles 8.11.2.1 Find angles associated with straight lines 8.11.2.2 Find angles of elevation and depression 8.11.2.3 Solve problems related to real life	<ul style="list-style-type: none"> Complementary and supplementary angles Transversal and parallel lines Corresponding angles, vertically opposite angles, alternate angles, allied angles, angles at a point Angles of elevation and depression 	<ul style="list-style-type: none"> Identification of related angles and angles of elevation and depression. Interpretation of different types of angles. Computation of related angles. 	<ul style="list-style-type: none"> Curiosity in finding related angles.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
			<ul style="list-style-type: none"> • Angle properties of a triangle • Interior and exterior angles • Application of angles 		
8.12 GEOMETRICAL CONSTRUCTION	8.12.1 Construction of Angles 8.12.2 Construction of lines	8.12.1.1 Construct 60° , 90° angles using ruler and compass 8.12.1.2 Construct angle Bisectors using ruler and compass 8.12.2.1 Use ruler and compass to construct parallel lines 8.12.2.2 Construct perpendiculars using ruler and compass 8.12.2.3 Relate geometrical construction to real life problems	<ul style="list-style-type: none"> • Using a ruler and compass • Constructing 60°, 90° angles using ruler and pair of compass • Bisecting angles (giving rise to other angles; 45°, 30°, 15°, 75°) • Constructing perpendiculars (to a given line, perpendicular bisector and from given point) and parallel lines without using set squares • Relating geometrical construction to real life problems (floor plan of buildings) 	<ul style="list-style-type: none"> • Construction of 60°, 90° angles, parallel lines, perpendicular lines. • Bisecting angles • Dividing lines • Application of construction in real life problems 	<ul style="list-style-type: none"> • Accuracy in construction of angles. • Creativity and logical thinking in constructing angles, parallel lines and perpendicular bisectors. • Neatness when constructing

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.13 STATISTICS	8.13.1 Methods of Data Collection 8.13.2 Data presentations 8.13.3 Measures of central tendency 8.13.4 Application	8.13.1.1 Identify methods of data collection 8.13.2.1 Present data on Histograms and frequency polygons 8.13.2.2 Draw frequency tables of grouped data 8.13.2.3 Construct and interpret graphs of given data 8.13.3.1 Find Mean for grouped and ungrouped data 8.13.4.1 Identify uses of statistics	<ul style="list-style-type: none"> • Data collection instruments(questionnaire, interviews, observation) • Frequency tables • Graphing (Histograms and frequency polygons) • Statistical presentations • Central tendency (Mean, Mode, Median, Modal class) as representative values • Constructing and interpreting graphs of given data (i.e. Line graph, Pie chart, Compound bar chart) • Uses of statistics in real life 	<ul style="list-style-type: none"> • Presentation of ungrouped and grouped data in statistical graphs • Interpretation of statistical graphs • Computation of measures of central tendency. 	<ul style="list-style-type: none"> • Curiosity of representation of collected data. • Accuracy in computation of measures of central tendency.
8.14 NUMBER BASES	8.14.1 Conversions of number bases. 8.14.2 Multiplication and Division	8.14.1.1 Convert from denary to bicimal numbers of the form 1110.1, up to 3 'bicimal places. 8.14.1.2 Convert number in bicimal to base 10 8.14.2.1 Multiply and Divide numbers in base 2 and base 5.	<ul style="list-style-type: none"> • Conversion from denary to bicimal numbers of the form 1110.1, up to 3 'bicimal places' and vice versa. • Conversion of bicimal numbers to base 10 • Multiplication and division in base 2 and base 5. 	<ul style="list-style-type: none"> • Conversions of number bases to other bases. • Multiplication and Division of number bases. • 	<ul style="list-style-type: none"> • Accuracy in conversions of number bases. • Appreciation of bicimal numbers.

TOPIC/ THEME	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
8.15 COMPUTERS	8.15.1 Introduction to computers 8.15.2 Flow charts	8.15.1.1 Describe computer processes 8.15.2.1 Construct flow charts	<ul style="list-style-type: none"> • Defining the computer process (Input, Process, Output) • Construction of: Flow charts and decision boxes 	<ul style="list-style-type: none"> • <i>Designing</i> flow charts • <i>Sequencing</i> of computational stages. 	<ul style="list-style-type: none"> • <i>Curiosity</i> in defining computer processes • <i>Logical thinking</i> in constructing flow charts.

GRADE 9

General Outcomes

- Provide clear mathematical **thinking** and expression in the learner
- Develop the learners' mathematical AND ICT **knowledge and skills**
- Enrich the learners' **understanding** of mathematical concepts in order to facilitate further study of the discipline
- Build up an appreciation of mathematical and ICT concepts so that the learner can **apply** these for problem solving in everyday life.
- Enable the learner **Represent**, interpret and use data in a variety of forms

Key Competences:

- Think mathematically and accurately in problem solving skills and apply these skills to formulate and solve mathematical and other related problems.
- Develop necessary skills needed to apply mathematical and ICT concepts and skills in other disciplines.
- Develop abilities and ideas drawn from mathematics to reason logically, communicate mathematically and technologically, and learn independently without too much supervision (self-discipline).
- Development positive attitudes towards mathematics and use it in other subjects such as science and technology.
- Apply mathematical tools such as information and communication technology in the learning of other subjects.
- Use mathematics for enjoyment and pleasure.
- Develop understanding of algebra, geometry, measurements and shapes.

TOPICS	SUBTOPICS	SPECIFIC OUTCOMES	KNOWLEDGE	SKILLS	VALUES
9.1 SQUARE ROOTS AND CUBE ROOTS	9.1.1 Square roots 9.1.2 Cube roots 9.1.3 Roots of Squares and Cubes	9.1.1.1 Describe the meaning of square root and its symbol 9.1.2.1 Describe the meaning of cube root and its symbol 9.1.3.1 Find roots of Squares and Cubes	<ul style="list-style-type: none"> • Describing square root and cube root symbols. • Square and cubes numbers (ONLY PERFECT SQUARES AND CUBES AT THIS LEVEL) 	<ul style="list-style-type: none"> • <i>Interpretation</i> of root symbol. • <i>Evaluation</i> of square roots and cube roots. 	<ul style="list-style-type: none"> • <i>Awareness</i> of root and its symbol. • <i>Curiosity</i> in using root symbol
9.2 INDEX NOTATION	9.2.1 Indices 9.2.2 Laws of indices	9.2.1.1 Interpret the positive and zero indices. 9.2.2.1 Apply the laws of indices	<ul style="list-style-type: none"> • Interpreting positive and Zero indices ($5^0 = 1$) • Laws of indices (addition and subtraction of powers) 	<ul style="list-style-type: none"> • <i>Interpretation</i> of the meaning of zero and positive indices • <i>Computation</i> of numbers in index notation 	<ul style="list-style-type: none"> • <i>Awareness</i> of zero and positive indices
9.3 REAL NUMBERS	9.3.1 Rational numbers 9.3.2 Irrational numbers	9.3.1.1 Identify Rational numbers 9.3.2.1 Identify Irrational numbers	<ul style="list-style-type: none"> • Identifying rational numbers as numbers of the form $\frac{a}{b}$ ($b \neq 0$) • Irrational numbers such as π, $\sqrt{3}$. 	<ul style="list-style-type: none"> • <i>Relating</i> rational numbers to irrational numbers. • <i>Estimation</i> of irrational numbers. 	<ul style="list-style-type: none"> • <i>Awareness</i> of rational and irrational numbers.
9.4 PYTHAGORAS' THEOREM	9.4.1 Right Angled triangle 9.4.2 Application	9.4.1.1 Identify sides in the Right angled triangle 9.4.1.2 State the Pythagoras' theorem 9.4.2.1 Solve real life problems involving Pythagoras' theorem	<ul style="list-style-type: none"> • Background to Pythagoras' theorem • Sides in the Right angled triangle (i.e. two adjacent sides and hypotenuse) • Area of squares (i.e. $a^2 + b^2 = c^2$) • Using Pythagoras' theorem to solve problems in real life 	<ul style="list-style-type: none"> • <i>Identification</i> of sides in a right angles triangle. • <i>Application</i> of the Pythagoras' theorem. 	<ul style="list-style-type: none"> • <i>Curiosity</i> in use of Pythagoras theorem. • <i>Awareness</i> of the Pythagoras theorem. •
9.5 DIRECTIONS	9.5.1 Directions	9.5.1.1 Identify the cardinal points	<ul style="list-style-type: none"> • Points on the 	<ul style="list-style-type: none"> • <i>Identification</i> of 	<ul style="list-style-type: none"> • <i>Awareness</i>

AND BEARINGS	9.5.2 Bearings	<p>on the compass</p> <p>9.5.2.1 Find three figure bearings of one point from another</p>	<p>Compass (N, E, W and S)</p> <ul style="list-style-type: none"> Using North and South points to find compass bearings (N65⁰E or N75⁰W) Presentation of three figure bearing of one point from another (060⁰) 	<p>cardinal points on the compass</p> <ul style="list-style-type: none"> Interpretation of the three figure bearings 	<p>of direction and bearings.</p> <ul style="list-style-type: none"> Curiosity in use of compass bearings.
9.6 EQUATIONS AND INEQUALITIES	<p>9.6.1 Subject of formula.</p> <p>9.6.2 Equations and inequations</p> <p>9.6.3 Systems of Linear equations</p> <p>9.6.4 Application of equations and Inequations</p>	<p>9.6.1.1 Change subject of the formula</p> <p>9.6.2.1 Solve equations and inequations in one variable</p> <p>9.6.2.2 Solve equations and Inequations in two variables</p> <p>9.6.2.3 Sketch the graph of Inequations and shade the wanted region</p> <p>9.6.3.1 Solve simultaneous linear equations in two variables</p> <p>9.6.4.1 Apply equations and inequations in real life</p>	<ul style="list-style-type: none"> Subject of the formula Equations and inequations (in one and two variables) include those with fractions Graphs of Inequations (shade the wanted region) Solutions of Simultaneous linear equations (Elimination, substitution and graphical methods) Application 	<ul style="list-style-type: none"> Representation of subject of formula in one and two variables. Application of change of subject of formula to linear equations and inequations in two variables. Interpretation of the shading of the wanted region. 	<ul style="list-style-type: none"> Curiosity in solving linear equations and inequations Decisiveness in choosing the right subject of formula when solving simultaneous linear equations in two variables.

<p>9.7 SOCIAL & COMMERCIAL ARITHMETIC</p>	<p>9.7.1 Salaries and Wages 9.7.2 Taxes 9.7.3 Pension and Social Schemes 9.7.4 Investments</p>	<p>9.7.1.1 Work out payments for piece work & work per hour 9.7.1.2 Compute deduction from salaries 9.7.1.3 Calculate over time 9.7.2.1 Differentiate & calculate income tax and value added tax 9.7.3.1 Calculate pension and compensation 9.7.4.1 Calculate depreciation and appreciation</p>	<ul style="list-style-type: none"> • Salary from wages • Payslips and wage sheets • Salaries deductions • Over time, commission, bonus • Income tax and value added tax (VAT) • Pension and compensation • Depreciation and appreciation 	<ul style="list-style-type: none"> • Computation of Salary and wages • Problem solving involving pension and social schemes. • Decision making in depreciation and appreciation. 	<ul style="list-style-type: none"> • Awareness of taxes, salaries and social schemes. • Appreciation of taxes and social schemes.
<p>9.8 MATRICES</p>	<p>9.8.1 Introduction to Matrices. 9.8.2 Order of matrices 9.8.3 Operations on matrices 9.8.4 Application of matrices</p>	<p>9.8.1.1 Present data from real life in matrix form. 9.8.2.1 State order of matrices 9.8.3.1 Add and subtract matrices 9.8.3.2 Multiply a matrix by a scalar 9.8.3.3 Multiply matrices 9.8.4.1 Apply matrices in real life</p>	<ul style="list-style-type: none"> • Meaning of matrices • Order of matrices • Adding and subtracting matrices • Multiplying a matrix by a scalar • Multiplication of matrices (up to 2x2 matrices) • Matrices in real life 	<ul style="list-style-type: none"> • Interpretation of order of matrices. • Presentation of matrices. • Record keeping using matrices. 	<ul style="list-style-type: none"> • Awareness of matrices. • Orderliness in writing columns and row of matrices. •

9.9 MENSURATION	9.9.1 Regular polygons 9.9.2 Irregular polygons	9.9.1.1 Describe properties of interior & exterior angles of regular polygons 9.9.1.2 Calculate Interior and exterior angles of regular polygons. 9.9.2.1 Describe irregular polygons	<ul style="list-style-type: none"> • Interior and exterior angles of regular polygons • Sum of interior angles of regular polygons • Irregular polygons 	<ul style="list-style-type: none"> • Identification of regular polygons. • Computation of interior and exterior of regular polygons. 	<ul style="list-style-type: none"> • Accuracy in calculating interior and exterior angles.
9.10 SIMILARITY & CONGRUENCY	9.10.1 Similar figures 9.10.2 Congruent figures	9.10.1.1 Illustrate properties of different figures in order to determine similarity 9.10.1.2 Establish conditions of similarity. 9.10.1.3 Solve problems involving similarity. 9.10.2.1 Illustrate properties of different figures in order to determine congruency 9.10.2.2 Establish conditions of congruency 9.10.2.3 Solve problems involving congruency. 9.10.2.4 Use similarity and congruency to solve problems in real life	<ul style="list-style-type: none"> • Properties determining similarity • Properties determining congruency • Calculations relating to application of similarity and congruency in real life • Ratio properties 	<ul style="list-style-type: none"> • Comparison of similar shapes. • Interpretation of congruency and similarities in figures. • Drawing similar and congruent figures. 	<ul style="list-style-type: none"> Awareness of similar and congruent shapes. • Logical thinking in determining similarities and congruency of figures.
9.11 GEOMETRICAL CONSTRUCTION	9.11.1 Circum- circles and Inscribed circles 9.11.2 Application of Geometrical Constructions	9.11.1.1 Construct triangles, circum- circles and inscribed circles 9.11.2.1 Design patterns	<ul style="list-style-type: none"> • Use of mathematical instruments • Constructing triangles, circum-circles and inscribed circles • Designing patterns (derived from 	<ul style="list-style-type: none"> • Construction of triangles, circum-circles and inscribed circles • Designing of different patterns. 	<ul style="list-style-type: none"> • Accuracy in measurements involved. • Neatness in constructions. • Curiosity in designing patterns.

			construction)		
9.12 PROBABILITY	<p>9.12.1 Introduction to probability</p> <p>9.12.2 Experimental Probability</p> <p>9.12.3 Theoretical probability</p>	<p>9.12.1.1 Describe the meaning and importance of probability</p> <p>9.12.2.1 Determine outcomes of an experiment.</p> <p>9.12.3.1 Demonstrate favourable and possible outcomes</p> <p>9.12.3.2 Interpret probability values.</p>	<ul style="list-style-type: none"> • Meaning and importance of probability - Chances in coins, playing cards and dice • Terms related to probability(occurrence, favourable outcome, possible outcome, certainty and impossibility) • Complement of probability • Probability values 	<ul style="list-style-type: none"> • Demonstration of experiments in probability. • Interpretation of probability and chance. • Observation of probability experiments. • Interpretation of probability values. 	<ul style="list-style-type: none"> • Curiosity in probability experiments. • Logical thinking in Interpreting probability values. • Team work when carrying out experiments and recording of results.
9.13 COMPUTER	<p>9.13.1 Decision boxes</p> <p>9.13.2 Loops</p> <p>9.13.3 Simple programs</p>	<p>9.13.1.1 Construct decision boxes</p> <p>9.13.2.1 Identify and create loops in flow charts</p> <p>9.13.3.1 Write simple computer programmes</p> <p>9.13.3.2 Use simple programmes to calculate area, volume, find averages and resolve linear equation</p>	<ul style="list-style-type: none"> • Sequencing activities • Basic programming (Writing simple computer programmes) • Using simple programs to calculate area, volume, averages and linear equations 	<ul style="list-style-type: none"> • Designing of decision flow charts • Application of flow charts to real life. • Analysis of decisions 	<ul style="list-style-type: none"> • Curiosity in use of flow charts • Logical thinking in constructing flow charts. • Reasoning in writing simple computer programs.

APPENDIX 1: GRADE 8 AND 9 SCOPE AND SEQUENCE

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
8.4 SETS	8.1.1.2 Interpret the set builder notation; $\{x: x > 2, x \in Z\}$. 8.1.2.2 Find the intersection set involving up to 3 sets. 8.1.3.2 Interpret the set complement including its symbol (i.e. A' , B') 8.1.4.3 Use single set operation symbols (e.g. $A \cup B \cup C$ or $A \cap B \cap C$). 8.1.4.4 Use combined set operation symbols [e.g. $(A \cup B') \cap C$, $(A' \cap B) \cup C$, $A' \cap (B' \cup C)$] 8.4.1.1 Apply simple operations on sets.	
9.1 SQUARE ROOTS AND CUBE ROOTS		9.1.1.2 Describe the meaning of square root and its symbol 9.1.2.2 Describe the meaning of cube root and its symbol 9.2.1.1 Find roots of Squares and Cubes
8.5 INTEGERS	8.5.1.1 Add and subtract integers without using the number line. 8.5.1.2 Multiply and divide integers.	
8.6 APPROXIMATION AND ESTIMATION	8.3.1.1 Express numbers to given significant figure. 8.3.1.4 Estimate measures or quantities 8.3.1.5 Round-off numbers to specified degree of accuracy. 8.3.2.1 Express numbers in scientific notation or standard form. 8.3.2.3 Approximate numbers in scientific notation to given degree of accuracy 8.6.1.1 Apply the concept of approximation in real life	

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
RATIONAL AND IRRATIONAL NUMBERS		9.3.1.2 Identify Rational numbers 9.3.2.2 Identify Irrational numbers
8.4 RATIO AND PROPORTION	8.7.2.1 Solve problems that involve ratio and proportion	
9.4 PYTHAGORAS' THEOREM		9.4.1.3 Identify sides in the Right angled triangle 9.4.1.4 State the Pythagoras' theorem 9.6.4.1 Solve real life problems involving Pythagoras' theorem
8.8 ALGEBRAIC EXPRESSIONS AND FORMULA	8.5.1.1 Formulate algebraic expressions 8.5.1.4 Simplify algebraic expressions 8.5.1.5 Apply the distributive law in simplifying algebraic expressions 8.5.2.2 Evaluate algebraic expressions 8.5.3.2 Solve simple equations using the additive and multiplicative inverse 8.8.1.1 Construct formula from given statement.	9.6.1.2 Change subject of the formula 9.6.2.4 Solve equations and inequations in one variable 9.6.2.5 Solve equations and Inequations in two variables 9.6.2.6 Sketch the graph of Inequations and shade the wanted region 9.6.3.2 Solve simultaneous linear equations in two variables 9.6.4.2 Apply equations and inequations in real life
8.12 ANGLES AND BEARINGS	8.11.1.1 Identify related angles 8.15.2.1 Find angles associated with straight lines 8.15.2.2 Find angles of elevation and depression 8.15.2.3 Solve problems related to real life	9.5.1.1 Identify the cardinal points on the compass 9.6.4.2 Find three figure bearings of one point from another

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
8.9 CARTESIAN PLANE	8.9.1.1 Draw the XOY plane 8.9.1.2 Plot and read the ordered pair (x, y) on the XOY plane 8.9.1.3 Join different points on the Cartesian plane 8.7.2.1 Graph straight lines	
8.10 SOCIAL & COMMERCIAL ARITHMETIC	8.6.1.1 Calculate simple and compound interest 8.6.2.2 Calculate utility bills, Bank and Postal charges. 8.6.3.2 Generate simple budget 8.6.4.2 Calculate Insurance, premium, policy cover 8.10.1.1 Calculate cost of goods bought on hire purchase	9.7.1.4 Work out payments for piece work & work per hour 9.7.1.5 Compute deduction from salaries 9.7.1.6 Calculate over time 9.7.2.2 Differentiate & calculate income tax and value added tax 9.7.3.1 Calculate pension and compensation 9.9.2.1 Calculate depreciation and appreciation
8.10 FUNCTIONS	8.8.1.1 Describe different types of relationships 8.8.2.4 Map functions to show relationship 8.8.2.5 Identify mappings from arrow diagrams. 8.8.2.6 Find the range of the function when domain is given 8.8.3.2 Find a function given a set of ordered pairs. 8.10.1.1 Draw graphs of linear functions 8.10.1.2 Solve problems involving functions	
9.8 MATRICES		9.8.1.2 Present data from real life in matrix form. 9.8.2.2 State order of matrices 9.8.3.4 Add and subtract matrices

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
		9.8.3.5 Multiply a matrix by a scalar 9.8.3.6 Multiply matrices 9.9.2.2 Apply matrices in real life
8.11 SOLID SHAPES	8.9.1.1 Identify cones and pyramids 8.9.1.2 Draw nets of cones and pyramids 8.9.1.4 Draw/sketch of cones and pyramids	
8.10 MENSURATION	8.10.1.2 Find the total surface area of cylinder and triangular prism 8.10.2.2 Calculate the volume of cylinder and triangular prism 8.12.1.1 Describe density 8.12.1.2 Calculate density of regular objects	9.9.1.1 Describe properties of interior & exterior angles of regular polygons 9.9.1.2 Calculate Interior and exterior angles of regular polygons. 9.9.2.2 Describe irregular polygons
9.10 SIMILARITY AND CONGRUENCY		9.10.1.4 Illustrate properties of different figures in order to determine similarity 9.10.1.5 Establish conditions of similarity. 9.10.1.6 Solve problems involving similarity. 9.10.2.5 Illustrate properties of different figures in order to determine congruency 9.10.2.6 Establish conditions of congruency 9.10.2.7 Solve problems involving congruency. 9.10.2.8 Use similarity and congruency to solve problems in real life
8.16 GEOMETRICAL CONSTRUCTION	8.12.1.3 Construct 60° , 90° angles using ruler and compass	9.11.1.1 Construct triangles, circum-circles and

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
	8.12.1.4 Construct angle Bisectors using ruler and compass 8.16.1.1 Use ruler and compass to construct parallel lines 8.16.1.2 Construct perpendiculars using ruler and compass 8.16.1.3 Relate geometrical construction to real life problems	inscribed circles 9.11.2.1 Design patterns
9.12 PROBABILITY		9.12.1.2 Describe the meaning and importance of probability 9.12.2.2 Determine outcomes of an experiment. 9.13.3.1 Demonstrate favourable and possible outcomes 9.13.3.2 Interpret probability values.
8.17 STATISTICS	8.13.1.2 Identify methods of data collection 8.13.2.4 Present data on Histograms and frequency polygons 8.13.2.5 Draw frequency tables of grouped data 8.13.2.6 Construct and interpret graphs of given data 8.13.3.2 Find Mean for grouped and ungrouped data 8.17.1.1 Identify uses of statistics	
8.18 NUMBER BASES	8.14.1.3 Convert from denary to bicimal numbers of the form 1110.1, up to 3 'bicimal places. 8.14.1.4 Convert number in bicimal to base 10 8.18.1.1 Multiply and Divide numbers in base 2 and base 5.	

SPECIFIC OUTCOMES		
TOPIC	GRADE 8	GRADE 9
8.19 COMPUTERS	8.15.1.2 Describe computer processes 8.15.2.2 Construct flow charts	9.13.1.2 Construct decision boxes 9.13.2.1 Identify and create loops in flow charts 9.13.3.1 Write simple computer programmes 9.13.3.3 Use simple programmes to calculate area, volume, find averages and resolve linear equation