REVISED JUNIOR SECONDARY TEACHER EDUCATION MATHEMATICS SYLLABUS 2015

YEAR ONE			
TOPIC	**SUB-TOPIC**	**SPECIFIC OUTCOMES**	**SUGGESTD PEDAGOGY FOR SCHOOL**

1.1 SET THEORY	1.1.1 Notation and Presentation of a set. 1.1.2 Set operations: Union, Intersection, and Complement of a set. 1.1.3 Cartesian products 1.1.4 De Morgan's Law 1.1.5 Binary operations 1.1.6 Application of sets	1.1.1.1 Denote a set. 1.1.1.2 Represent a set in different forms. 1.1.2.1 Use the operational symbols of Union, intersection and complement to solve problems on sets. 1.1.2.2 Find subsets of a set. 1.1.3.1 Use cross product to find sets of ordered pairs. 1.1.4.1 Use laws of algebra to prove set equality. 1.1.4.2 Use the arbitrary element method to prove set equality. 1.1.5.1 Apply binary operations on sets. 1.1.6.1 Apply sets to real life situations.	• **Demonstration:** Demonstrate how to denote and represent a set by listing, describing, Venn diagrams and set builder notation. • **Discussion:** In pairs learners discuss union, intersection and complement of a set. Afterwards in groups of four they compare their answers. • **Game:** Give twenty learners numbers from 0 to 19. Ask those with even numbers, odd numbers to stand, multiples of 4, multiples of 3. Develop the concept of subsets from different combinations. **FOR STUDENTS:** • **Research:** Students in groups carry out research on Cartesian products, De Morgan's law and Binary Operations. • **Presentation:** Students present their findings to the entire class. • **Problem Solving:** Give learners a variety of activities related to real life on sets.
1.2 NUMBER AND NUMERATION	1.2.1 Sets of numbers: Integers, Natural and Whole numbers, Rational, Irrational Real numbers and properties like commutative and closure. 1.2.2 Number bases	1.2.1.1 Identify different sets of numbers. 1.2.1.2 Use arithmetic operations on different sets of numbers. 1.2.2.1 Convert numbers from one base to another.	• **Discussion:** In groups learners discuss different sets of numbers such Integers, Natural and Whole numbers, Rational, Irrational Real numbers. Thereafter, learners present their findings to the whole class. • **Discovery**: Ask learners to find the sum or product of any two numbers. Then ask them to reverse the order of addition or multiplication e.g. 3 + 4 =7, then 4 + 3 = 7

	1.2.2 Surds	1.2.2.2 Use the four arithmetic operations on number bases. 1.2.2.1 Describe a surd 1.2.2.2 Simplify surds	or 3 x 4 = 12, then 4 x 3 =12, this explains the commutative laws. • **Demonstration**: Teacher demonstrates to learners how different number bases can be converted from one base to another. Thereafter, in pairs learners are given activities to convert number bases. • **Problem solving**: Give learners various activities involving the four operations on number bases.
1.3 APPROXIMATION AND ESTIMATION	1.3.1 Approximation and estimation. 1.3.2 Scientific notation 1.3.3 Applications of approximation.	1.3.1.1 Approximate measurement. 1.3.1.2 Estimate measurements. 1.3.2.1 Write numbers in scientific notation. 1.3.2.2 Apply the concept of approximations in real life.	**FOR STUDENTS:** **Exploration**: Students explore surds. • **Demonstration**: Learners in groups demonstrate how to round off to the nearest decimal places. • **Discussion**: Learners in groups discuss how to write numbers in scientific notation.
1.4 RATIO AND PROPORTION	1.4.1 Ratio and Proportional Parts 1.4.2 Compound ratio .	1.4.1.1 Describe ratio. 1.4.1.2 Express ratio in the lowest terms. 1.4.1.3 Describe direct and indirect proportion. 1.4.2.1 Solve problems involving ratio and proportion.	• **Discussion**: Learners in groups to discuss how to solve problems involving ratio and proportion. • **Assimilation**: Learners individually to solve problems involving ratio and proportion using different methods.

		1.4.2.2 Draw graphs to illustrate quantities in direct and indirect proportion.	• **Demonstration**: Student to demonstrate how to draw graphs illustrating quantities in direct and indirect proportion.
1.5 ALGEBRAIC EXPRESSIONS AND FORMULA	1.5.1 Algebraic expressions 1.5.2 Substitutions 1.5.3 Simple linear equations and inequalities 1.5.4 Construction of formulae 1.5.5 Factors, fractions and partial fractions.	1.5.1.1 Formulate algebraic expressions. 1.5.1.2 Simplify algebraic expressions. 1.5.2.1 Apply the distributive law in simplifying algebraic expressions. 1.5.2.2 Evaluate algebraic expressions. 1.5.3.1 Solve simple equations using additive and multiplicative inverse. 1.5.4.1 Construct formula from given statement. 1.5.5.1 Factorise expression. 1.5.5.2 Simplify algebraic fractions. 1.5.5.3 Decompose fractions into partial fractions.	• **Discussion:** Learners in groups are given a word problem to construct and simplify algebraic expression. • **Problem solving:** Learners individually solve problems involving algebraic expressions. **FOR STUDENTS:** • **Investigation:** Students investigate methods of decomposing fractions into partial fractions.
1.6 SOCIAL AND COMMERCIAL ARITHMETIC	1.6.1 Pension and Social Simple and compound Interest 1.6.2 Utility bills, Bank and Post Office charges. 1.6.3 Budgeting 1.6.4 Insurance and Assurance 1.6.5 Hire Purchase	1.6.1.1 Calculate simple and compound interest. 1.6.2.1 Calculate utility bills, Bank and Postal charges. 1.6.3.1 Generate simple budget. 1.6.4.1 Calculate insurance, premium, policy cover.	• **Discussion**: Learners in groups to discuss: • simple house hold bills. • Read and interpret water and electricity bills. • **Demonstration**: Learners in pairs demonstrate how to find Profit and Loss.

	1.6.6 Salaries and Wages. 1.6.7 Taxes. 1.6.8 Schemes 1.6.9 Investment	1.6.5.1 Calculate cost of goods bought on hire purchase. 1.6.6.1 Work out payments for piece work & work per hour. 1.6.6.2 Compute deduction from salaries. 1.6.6.3 Calculate over time. 1.6.7.1 Differentiate & calculate income tax and value added tax. 1.6.8.1 Calculate pension and compensation. 1.6.9.1 Calculate depreciation and appreciation.	• **Demonstration**: Student demonstrates: ○ How to calculate simple interest, discount and profit and loss percentages. ○ How to carry out conversions of currencies. ○ How to calculate income tax and value added tax. ○ How to calculate depreciation and appreciation. Thereafter, learners do the activities individually.
1.7 ANALYTIC GEOMETRY	1.7.1 The Cartesian Graph 1.7.2 Equation of straight line. 1.7.3 Parallel, Collinear and Perpendicular line. 1.7.4 Length and midpoint of a straight Line. 1.7.5 Angle between two straight lines.	1.7.1.1 Draw the Cartesian graph. 1.7.2.1 Construct equations of straight lines. 1.7.3.1 Use gradient to determine parallel collinear and perpendicular lines. 1.7.4.1 Find mid-point of a straight line 1.7.4.2 Find the length of a straight line 1.7.5.1 Calculate the angle between two straight lines.	**FOR STUDENTS:** • **Demonstration:** Student demonstrates : ○ How to draw the Cartesian graph ○ How to construct equations of a straight line. ○ How to use gradient to determine parallel, collinear and perpendicular lines. • **Discussion:** Students discuss in groups how to find mid-point, length and angle between two straight lines.
1.8 INDICES AND LOGARITHMS	1.8.1 Square roots and Cube roots.	1.8.1.1 Describe the meaning of square root and its symbol.	• **Discussion:** Learners in pairs discuss the meaning of square roots, cube roots and

		1.8.1.2 Describe the meaning of cube root and its symbol. 1.8.1.3 Find roots of Squares and Cubes.	their symbols. Thereafter, give learners activities on square roots and cube roots. • **Research**: Learners to research on the laws of indices.
	1.8.2 Index notation	1.8.2.1 Index notation 1.8.2.2 Law of indices	**FOR STUDENTS** • **Demonstration**: Student illustrates how to change a number in index form to expanded notation.
	1.8.3 Indices and Logarithms	1.8.3.1 Interpret positive, negative, fractional and zero indices. 1.8.3.2 Apply the law of indices. 1.8.3.3 Write numbers in logarithmic form. 1.8.3.4 Convert index number to logarithm and logarithm to index. 1.8.3.5 Change base of logarithms.	
	1.8.4 Equations involving Indices and Logarithms.	1.8.4.1 Solve equations involving indices and logarithms. 1.8.4.2 Apply indices and logarithms to real life.	
1.9 PYTHAGORAS' THEOREM	1.9.1 Right Angled triangle.	1.9.1.1 Identify sides in the Right angled triangle.	• **Discussion:** Learners in pairs discuss triangles and use Pythagoras theorem to find sides of right angled triangle.
	1.9.2 Application.	1.9.2.1 State the Pythagoras' theorem. 1.9.2.2 Solve real life problems involving Pythagoras' theorem.	

1.10 ANGLES, DIRECTIONS AND BEARINGS	1.10.1 Related angles. 1.10.2 Angle associated with straight lines. 1.10.3 Directions. 1.10.4 Bearings. 1.10.5 Application.	1.10.1.1 Identify related angles. 1.10.2.1 Find angles associated with straight lines. 1.10.2.2 Find angles of elevation and depression. 1.10.3.1 Identify the cardinal points on the compass. 1.10.4.1 Find three figure bearings of one point from another. 1.10.5.1 Solve problems related to real life.	• **Discussion**: In pairs, learners explore the idea of angles by making movements of the arm. • **Demonstration:** Learners using the model of a clock face demonstrates how to identify the types of angles. • **Demonstration**: Using a board protractor, student demonstrates how to measure angles up to 180^0.
1.11 **SIMILARITY AND CONGRUENCY**	1.11.1 Similar figures. 1.11.2 Congruent figures.	1.11.1.1 Illustrate properties of different figures in order to determine similarity. 1.11.1.2 Establish conditions of similarity. 1.11.1.3 Solve problems involving similarity. 1.11.2.1 Illustrate properties of different figures in order to determine congruency 1.11.2.2 Establish conditions of congruency. 1.11.2.3 Solve problems involving congruency. 1.11.2.4 Use similarity and congruency to solve problems in real life	• **Exploration:** Learners investigate the properties of similar and congruent figures. Then give learners activities to solve problems involving similar figures and congruent figures. Give learners activities on similar and congruent figure.

1.12 GEOMETRICAL CONSTRUCTION	1.12.1 Construction of angles. 1.12.2 Construction of lines.	1.12.1.1 Construct triangles, circum-circles and inscribed circles. 1.12.1.2 Design patterns. 1.12.2.1 Identify the cardinal points on the compass. 1.12.2.2 Find three figure bearings one point from another.	• **Demonstration:** Learners illustrate how to construct triangles and design patterns.
1.13 PERMUTATION AND COMBINATION	1.13.1 Fundamental principle of counting. 1.13.2 Permutations: linear and circular arrangements 1.13.3 Combinations	1.13.1.1 Identify principles of counting. 1.13.1.2 Use fundamental principles of counting. 1.13.2.1 Identify types of permutation. 1.13.2.2 Solve problems involving permutations. 1.13.3.1 Distinguish between permutation and combination. 1.13.3.2 Solve problems involving combinations.	**FOR STUDENTS:** • **Exploration:** Students discuss situations when each of the principles of counting can be used. • **Demonstration:** Students demonstrate with examples in real life situations how to use the fundamental principle of counting. • **Demonstration:** Using objects students demonstrate to explain the two types of permutations. • **Problem solving:** Students use the permutation and combination formulae to solve problems such as counting objects, assigning number plates to vehicles and phone numbers to individuals. • **Discussion:**

			1. Students in groups discuss the difference between permutation and combination. 2. Students discuss the connection between permutation and combination.
1.14 SEQUENCES AND SERIES	1.14.1 Sequences and series. 1.14.2 Arithmetic progression.(A.P.) 1.14.3 Geometric progression (G.P.) 1.14.4 Mathematical induction. 1.14.5 Binomial theorem.	1.14.1.1Describe a sequence and a Series. 1.14.1.2 Generate a sequence in a decreasing and increasing order. 1.14.1.3Generate a series. 1.14.2.1 Find the common different of a series (Arithmetic Progression, AP). 1.14.2.2 Find the n^{th} term of the series 1.14.2.3 Evaluate the sum of the series. 1.14.3.1 Determine the common ratio of a G.P. 1.14.3.2Find sum of n terms of a G.P. 1.14.3.3 Find the sum to infinity of a G.P. 1.14.4.1 Prove by Mathematical Induction. 1.14.5.1 Use binomial theorem to expand binomial expressions.	• **Discussion:** Students discuss the difference between sequences and series. • **Exploration:** Students explore different types of sequences and series. • **Discovery:** Students explore situations which are Arithmetic or Geometric Progression in nature. • **Problem Solving:** Individually or in small groups students solve problems involving the ideas of the Common Difference, the Common Ratio, the n^{th} term and the Sum to Infinity. • **Discussion:** Students discuss - 1. How to use the Binomial theorem and Pascal's triangle to expand algebraic expressions.

			2. How to prove statements using Mathematical Induction
1.15 DIFFERENTIAL CALCULUS	1.15.1 Limits 1.15.2 Derivative notation 1.15.3 Derivative of a function. 1.15.4 Gradients, tangent and normal. 1.15.5 Maximum and minimum and their implication. 1.15.6 Applications	1.15.1.1 Explain the meaning of limit. 1.15.2.1 Define a derivative of a function. 1.15.3.1 Find the derived function using first principles and other techniques. 1.15.4.1 Use derivatives to find gradient, tangent and normal of a function. 1.15.5.1 Determine the nature of turning points. 1.15.6.1 Apply the idea of derivatives to solve problems related to real life situation.	**FOR STUDENTS:** • **Discussion:** 1. Students discuss statements (such as: *'The sky is the Limit'*) to understand the meaning of the idea of limit. 2. Students discuss the various ways of denoting derivates. • **Demonstration:** 1. Use diagrams to demonstrate the idea of limit. 2. Use differentiation rules to sketch curves. • **Exploration**: In groups students explore various differentiation rules which are used to find derivatives of algebraic functions, exponential functions, implicit functions, logarithmic functions and trigonometric functions. • **Problem solving:** Use differentiation rules to solve problems involving ideas of maximum and minimum.

1.16 **COMPUTERS**	1.16.1 Introduction to computers. 1.16.2 Flow charts 1.16.3 Decision boxes. 1.16.4 Simple programs.	1.16.1.1 Describe computer processes. 1.16.2.1 Construct flow charts. 1.16.2.2 Design simple loops. 1.16.3.1 Construct decision boxes 1.16.4.1.1 Design simple computer programmes. 1.16.4.1.2 Use simple computer programmes to calculate area and volume. 1.16.4.1.3 Use simple computer programmes to find average. 1.16.4.1.4 Solve linear equations using simple computer programmes.	• **Inquiry:** learners are given finished product and are asked where the products were produced. • **Hands on method:** Ask learners to hand in a typed assignment.

YEAR ONE

METHODOLOGY

TOPIC	SUB-TOPIC	OUTCOMES

1.1 NATURE OF MATHEMATICS	1.1.1 Mathematical reasoning 1.1.2 Symbolism and language 1.1.3 Goals and objectives 1.1.4 Facts, concepts, principles and skills	1.2.1.1 Use inductive, deductive, analogy etc. 1.2.1.2 Use mathematical language and symbols correctly. 1.2.1.3 Outline goals and objectives of learning mathematics. 1.2.1.4 Identify facts, concepts, principle, and skills in mathematics.
1.2 HISTORY OF MATHEMATICS	1.2.1 The history of numbers 1.2.2 Development of Mathematics	1.2.2.1 Describe the origin of numbers 1.2.2.2 Discuss different types of numeration systems. 1.2.2.3 Research on different mathematicians' contribution to the development of mathematics 1.2.2.4 Explore the use of mathematics that time.
1.3 PHILOSOPHY OF MATHEMATICS EDUCATION	1.3.1 Personal and Public views of the nature of mathematics 1.3.2 The influence on the teaching of Mathematics	3.2.1.1 Interpret and critique Mathematical realism, Platonism, Logicism, Formalism, Intuitionism and Fallibilism schools of thought. 3.2.1.2 Analyse the influence the philosophies have on the teaching of mathematics.
1.4 THEORIES OF LEARNING	**1.4.1 B**ehaviorists e.g. B.F Skinner **1.4.2** Cognitive e.g. Jean Piaget, J.Brunner, Z. Dienes, R.Skemp 1.4.3 Constructivism e.g. Vygotsky, van Hiele	1.4.3.1 Interpret ideas proposed by Behaviorist, Cognitivists and constructivists in relation to the learning of mathematics.
1.5 MOTIVATION	1.5.1 Theories and implication of motivation 1.5.2 Techniques for motivating learners	1.4.1.1 Identify various ways of motivating learners. 1.4.1.2 Use different techniques to motivate the study of mathematics.
1.6 CROSS-CUTTING ISSUES	1.6.1 Cross cutting issues e.g. Gender and environmental issues, HIV/AIDS, Drug abuse.	1.5.1.1 Discuss the effect of cross-cutting issues on the learning of mathematics.

YEAR 2

TOPIC	SUB TOPIC	SPECIFIC OUTCOME	SUGGESTED PEDAGOGY FOR SCHOOL
2.1 NUMBER AND NUMERATION	2.1.1 Complex numbers	2.1.1.1 Define a complex number. 2.1.1.2 Present complex numbers on an Argand diagram. 2.1.1.3 Write the identity element of a complex number. 2.1.1.4 Determine equality of complex numbers. 2.1.1.5 Apply the four operations of addition, subtraction, multiplication and division. 2.1.1.6 Evaluate the modulus of a complex number. 2.1.1.7 Express a complex number in polar form.	**FOR STUDENTS:** • **Inquiry:** Give students activities to research on complex numbers. • **Presentations:** Students present their findings to the class. • **Problem solving:** Give students a variety of activities on complex numbers to find solutions.
2.2 ALGEBRAIC EXPRESSIONS AND FORMULA	2.2.1 Simultaneous equations.	2.2.1.1 Solve systems of equations simultaneously using elimination, substitution and graphs.	**Discussion:** Give learners a variety of problems to solve in small groups. This is followed by a class discussion led by the teacher.
	2.2.2 Application of equations and inequations.	2.2.2.1 Apply simultaneous equations to real life situations.	**FOR STUDENTS:** • **Exploration:** Students in groups explore on how to solve quadratic equations by different methods.
	2.2.3 Quadratic equations.	2.2.3.1 Solve quadratic equations using factorization, graphically, completing the square and the general quadratic formula.	• **Practical activity:** Students in groups will investigate the nature of roots for various quadratic equations.
	2.2.4 Nature of roots	2.2.4.1 Investigate the nature of roots of a given quadratic equation: equal, real and complex roots.	• **Demonstration:** Demonstrate the skill of drawing graph from given information.
	2.2.5 Quadratic function	2.2.5.1 Draw graphs of quadratic functions.	

		2.2.5.2 Determine the relationship between the roots of a quadratic equation and the coefficients. 2.2.5.3 Investigate the maximum and minimum values of a quadratic function.	• **Discussion:** In small groups students discuss how to obtain maximum and minimum values of a quadratic function. • **Presentation:** Students present their findings to the class.
	2.2.6 Polynomials	2.2.6.1 Simplify polynomial expressions. 2.2.6.2 Solve polynomial equations by factor method and synthetic division.	**N.B: For Students:** **Demonstration:** Lecturer demonstrates how to simply and solve various polynomials.
2.3 TRIGONOMETRY	2.3.1 Circular measure	2.3.1.1 Convert from degrees to radians and vice versa.	**FOR STUDENTS:** • **Demonstration**: Lecturer demonstrates to students how to convert from degrees to radians and vice versa.
	2.3.2 Trigonometric ratios.	2.3.2.1 Calculate the arc length, 2.3.2.2 Calculate the area of a sector. 2.3.2.3 Express the sides of a right-angled triangle in terms of sine, cosine and tangent ratios. 2.3.2.4 Solve problems on trigonometric ratios including angles of elevation and depression.	• **Inquiry**: Give students round objects to measure and investigate the relationship between the arc length and area of a sector • **Think/Pair/Share:** Students generate the sine, cosine and tangent ratios individually and share their findings in pairs. Thereafter they discuss with the whole class.

	2.3.3 Compound angles	2.3.3.1 Apply the knowledge of compound angles in solving trigonometrical problems.	• **Problem solving:** Give students practical activities involving use of trigonometric ratios. • **Mathematical Investigation** Give students a task to find the angle of elevation of a point on the ground, from the top of the flag pole. • **Think/Pair/Share**: Working individually and later in pairs students are given many different functions of cosine, sine and tangent and tables of values to complete. In pairs they sketch the respective graphs. • **Demonstration:** Illustrate simple proofs of trigonometric identities.
	2.3.4 Trigonometric functions	2.3.4.1 Derive the five basic trigonometric ratios (0°, 30°, 45°, 60° and 90°). 2.3.4.2 Sketch graphs of sine, cosine and tangent.	
	2.3.5 Identities	2.3.5.1 Prove simple trigonometric identities.	
2.4 STATISTICS	2.4.1 Methods of Data collection. 2.4.2 Data presentations.	2.4.1.1 Describe different methods of collecting data. 2.4.2.1 Present data in different forms: Bar chart, Histogram, pie chart, frequency polygons. 2.4.2.2 Interpret graphs of given data.	• **Group work:** In groups learners discuss and record various ways of collecting data. This is followed by a class discussion led by the teacher. • The teacher asks learners to say their shoe sizes allowed. Then learners continue in their groups to present this data graphically in as many forms as they could. • **Discussion:** In a plenary session learners present their graphs to the rest of the class resulting into a whole class discussion. Use the data collected earlier to determine, with the learners, the most frequent shoe size, the middle shoe size. This leads to the development of concept of measures of central tendency.
	2.4.3 Measures of central tendency.	2.4.3.1 Find the mean of grouped and ungrouped data. 2.4.3.2 Calculate measures of central tendency.	

	2.4.4 Application	2.4.4.1 Apply statistical concepts to solve real life problems.	• **Problem solving:** Give several real life problems to learners involving application of statistical concepts. **FOR STUDENTS:**
	2.4.5 Measures of dispersion.	2.4.5.1 Describe different measures of dispersion: range, variance, standard deviation.	• Ask students to record their shoe sizes. Use the recorded data to determine, with students, the difference between the largest and the smallest shoe size, the mean and how the shoe sizes are scattered around the mean. This leads to the development of the concept of measures of dispersion.
		2.4.5.2 Calculate measures of dispersion.	• **Problem solving:** Give students challenging and non-routine problems to solve.
		2.4.5.3 Interpret graphical presentations on measures of dispersion (variability).	• **Guided discovery:** Give students different graphs on measures of dispersion and ask them to work in groups to interpret them.
	2.4.6 Application	2.4.6.1 Apply measures of dispersion to solve real life problems.	• **Problem solving:** Give several real life problems to students involving application of measures of dispersion.
2.5 DIFFERENTIAL CALCULUS	2.5.1 Curve sketching 2.5.2 Derivatives of exponential and logarithmic functions	2.5.1.1 Sketch the curves of given functions. 2.5.2.1 Determine the derivatives of exponential and logarithmic functions. 2.5.3.1 Determine the derivatives of the six basic trigonometric functions.	**FOR STUDENTS:** • **Demonstration:** Illustrate the procedures for curve sketching and give students functions to practice and consolidate the skill.

	2.5.3 Derivatives of the six basic trigonometric functions	2.5.3.2 Differentiation of a function (chain), implicit functions, and parametric functions.	• **Discussion:** In groups students discuss derivatives of the six basic trigonometric functions. • **Inquiry:** Give students tasks to explore how to differentiate functions using different methods. This should be followed by presentations to the whole class.
2.6 MATRICES	2.6.1 Introduction to Matrices. 2.6.2 Order of matrices. 2.6.3 Operations on matrices. 2.6.4 Properties of matrix. Multiplication. 2.6.5 Determinants of matrices of order two and three. 2.6.6 Inverse of a 2 x 2 and a 3 x 3 matrix. 2.6.7 Applications to systems of equations (Cramer's rule). 2.6.8 Applications	2.6.1.1 Present data from real life in matrix form 2.6.2.1 Determine order of a matrix. 2.6.3.1 Apply operations on matrices: addition, subtraction, scalar and product of two matrices. 2.6.4.1 Apply the properties of matrix multiplication: associative and distributive. 2.6.5.1 Calculate the determinants of matrices of order two and three. 2.6.6.1 Determine the inverse of a 2 x 2 and a 3 x 3 matrix. 2.6.7.1 Apply matrices to systems of Equations (Cramer's rule). 2.6.8.1 Apply matrices in real life situations.	• **Fieldwork:** Gather data from everyday activities and present it in matrix form. • **Demonstration:** using the data students presented in matrix form illustrate how to find the order of a given matrix. • **Problem solving:** Workings in groups solve problems by carrying out the operations on matrices. **FOR STUDENTS :** • **Exploration:** In groups students explore the properties of matrix multiplication: associative and distributive. • **Guided inquiry:** Guide students on how to find the determinants and inverse of matrices of order two and three. • **Demonstration:** Illustrate the approach used to solve systems of equations by Cramer's rule.

			• **Problem solving:** Give problems involving matrices on real life situations.

YEAR TWO		
METHODOLOGY		
TOPIC	**SUB-TOPIC**	**SPECIFIC OUTCOME**
2.1 TEACHING/LEARNING METHODS	2.1.1 Learner-centred methods • discovery • discussion • field trip • project	2.2.1.1 Choose an appropriate teaching method in order to teach a topic in mathematics.
	2.1.2 Teacher-centred methods: • Lecture method	2.2.1.2 Distinguish between teacher exposition and learner centered method.
2.2 PLANNING FOR INSTRUCTION	2.2.1 Curriculum 2.2.2 Syllabus 2.2.3 Schemes of work 2.2.4 Lesson plans 2.2.5 Records of work 2.2.6 Sequencing instruction	2.2.1.1 Identify the components of the curriculum. 2.2.2.1 Interpret the content of the syllabus. 2.2.3.1 Develop schemes of work from the syllabus 2.2.4.1 Prepare an effective lesson plan 2.2.5.1 Write the records of work. 2.2.6.1 Arrange topics in an appropriate learning hierarchy.
2.3 LEARNING AND TEACHING RESOURCES	2.3.1 Audio and Audio-visual aids	2.3.1.1 Differentiate between audio and audio visual aids 2.3.1.2 Use of teaching aids in teaching mathematics
	2.3.2 Textbooks	2.3.1.3 Use of textbooks
PEER TEACHING		
2.4 ASSESSMENT OF LEARNING	2.4.1 Types of assessment 2.4.2 Assessment instruments	2.5.1.1 Identify different types of assessment. 2.5.1.2 Construct tests, assignments,

	2.4.3 Item analysis	2.5.1.3 Use item analysis to analyse difficulty of an item.
TEACHING PRACTICE		

YEAR THREE

CONTENT

TOPIC	SUB TOPIC	SPECIFIC OUTCOME	SUGGESTED INSTRUCTIONAL PEDAGOGY FOR SCHOOL
3.1 STATISTICS	3.1.1 Z-scores 3.1.2 Normal and Binomial Distribution 3.1.3 Correlation and Linear regression	3.1.1.1 Determine the Z-scores. 3.1.2.1 Apply the Normal distribution to determine values. 3.1.2.2 Sketch the Normal distribution curves. 3.1.2.3 Apply the binomial distribution to determine values.	**FOR STUDENTS:** • **Exploration:** Give students tasks to explore Z-scores, Binomial and Normal distribution. • **Demonstration:** Illustrate the procedure for sketching Normal curve. • **Problem solving:** Give students tasks to determine correlation coefficient of two variables and lines of regression.

		3.1.3.1 Determine the correlation coefficient of two variables. 3.1.3.2 Draw the line of regression (Line of best fit).	
3.2 CONIC SECTIONS	3.2.1 Circle 3.2.2 Parabola 3.2.3 Ellipse 3.2.4 Hyperbola	3.2.1.1 Generate equations of conic sections. 3.2.1.2 Solve equations involving conic sections.	**FOR STUDENTS** • **Exploration:** Students explore properties of conic sections and develop techniques of writing equations of conic sections. • **Problem solving:** Students solve problems involving circles, parabola, ellipses and hyperbolas.
3.3 VECTORS	3.3.1 Vectors in two dimensions 3.3.1 Magnitude of a vector 3.3.2 Scalar multiplication 3.3.3 Ratio theorem 3.3.4 Vector multiplication	3.3.1.1 Define scalar and vector quantities. 3.3.1.2 Describe position and free vectors. 3.3.1.3 Apply operations of addition and subtraction on vectors. 3.3.2.1 Calculate the magnitude of a vector. 3.3.3.1 Multiply a vector by a scalar. 3.3.4.1 Apply the ratio theorem on vectors. 3.3.5.1 Multiply vectors.	**FOR STUDENTS:** • **Discussion**: In groups discuss various examples of scalar and vector quantities. • **Problem solving:** Give students tasks on the operations of addition and subtraction on vectors. • **Guided inquiry:** Guide students on how to determine the magnitude of a vector. • **Demonstration:** Illustrate procedures for multiplying a vector by a scalar and a vector by another vector. • **Inquiry:** In groups investigate the application of the ratio theorem on

	3.3.5 Angle between two vectors	3.3.5.1 Calculate angles between two vectors.	vectors. Present your findings to the whole class. • **Demonstration:** Illustrate procedure for calculating the angle between two vectors.
3.4 INTEGRAL CALCULUS	3.4.1 Integration as the reverse of differentiation. 3.4.2 Integration of definite and indefinite integrals. 3.4.3 Application of integration: Area under a curve, displacement, velocity and acceleration. 3.4.4 Integration of exponential and logarithmic functions. 3.4.5 Integration by substitution and by parts.	3.4.1.1 Express integration as a reverse of differentiation. 3.4.2.1 Integrate definite and indefinite integrals. 3.4.3.1 Apply integration to calculate area under a curve, displacement, velocity and acceleration. 3.4.4.1 Integrate exponential and logarithmic functions. 3.4.5.1 Use the method of substitution and by parts to integrate.	**FOR STUDENTS:** • **Discussion:** In groups discuss integration as the reverse of differentiation and definite and indefinite integrals. • **Problem solving:** Give students tasks to calculate area under a curve, displacement, velocity and acceleration. • **Guided inquiry:** Guide students on how to integrate using different methods.
3.5 PROBABILITY	3.5.1 Introduction to probability. 3.5.2 Experimental Probability. 3.5.3 Theoretical probability. 3.5.4 Laws of probability. 3.5.5 Conditional probability. 3.5.6 Binomial probability.	3.5.1.1 Describe the concept of probability. 3.5.2.1 Demonstrate experimental probability. 3.5.3.1 Demonstrate favourable and possible outcomes. 3.5.3.2 Calculate probabilities theoretically. 3.5.4.1 Apply laws of probability. 3.5.5.1 Calculate probabilities with given conditions. 3.5.6.1 Apply Binomial distribution to calculate probabilities.	• **Demonstration:** Involve learners in experiments of chance. • **Discussion:** In groups learners interpret probability values and chance **FOR STUDENTS:** • **Exploration:** Students to explore laws of probability • **Demonstration:** illustrate to students how to calculate probabilities.

YEAR THREE		
METHODOLOGY		
TOPIC	**SUB-TOPIC**	**SPECIFIC OUTCOMES**
3.1 Classroom Organization and Management	3.1.1 Classroom organization	3.1.1.1 Identify the necessary components for a conducive learning environment.
	3.1.2 Types of classroom management	3.1.2.1 Discuss different types of learners' behavior and determine appropriate responses.
TEACHING PRACTICE		
3.2 Analysis of Junior Secondary School Mathematics	3.2.1 Mathematics syllabus 3.2.2 Mathematics text book	3.2.1.1 Explore mathematics syllabus 3.2.2.1 Analyse content in mathematics textbooks.
3.3 Innovations in Education practices	3.3.1 Lesson study 3.3.2 School Based Continuing Professional Development (SBCPD).	3.3.1.1 Practice innovations in the teaching of Mathematics.