Ministry of Education

Mathematics Prescription

Fiji Junior Certificate Course

C

Curriculum Development Unit

2003

FIJI JUNIOR CERTIFICATE EXAMINATION – 2002

FRAMEWORK FOR MATHEMATICS PRESCRIPTION

Form 3	Form 4
Term 1 Unit 1 – Directed Numbers Unit 2 – Rational Numbers Unit 3 – Measurement Unit 4 – Mathematical Shorthand 1 **Term 2** Unit 5- Coordinates 1 Unit 6 – Social Mathematics1 Unit 7 – Statistics 1 Unit 8 – Properties of Shapes 1 **Term 3** Unit 9 – Translations and Vectors Unit 10 – Reflections Unit 11 – Rotations Unit 12 – Enlargement & Similarity	Unit 1 – Relations & Functions Unit 2 – Products & Factors Unit 3 – Logarithms Unit 4 – Trigonometry (with Pythagoras) Unit 5 – Properties of Shapes 2 Unit 6 – Mathematical Shorthand 2 Unit 7 – Coordinates 2 Unit 8 – Social Mathematics 2 Unit 9 – Statistics 2 Unit 10 - Probability

Assessment	
Form 3	Form 4
♦ 3 **tests**; one on units 1 & 2, one on unit 4 and the other on unit 5. The tests should be of at least 35 minutes duration each. ♦ 2 student **tasksheets/ worksheets**; one on unit 3 and the other on units 6 & 7. ♦ **Constructions/Design** Tasks in Term 3 covering units 8 to 12. (Details on these are provided on a separate sheet) **The internal assessments will be worth 50% of the FJC mark.**	**The FJC examination will be based on form 4 work only.** **The examination will be worth 50 % of the FJC mark.**

1.0 PREAMBLE

1.1 The Fiji Junior Certificate Mathematics course provides opportunities for students to develop further a broad range of skills and encourages them to be creative and good problem solvers in their daily lives.

1.2 Teachers need to note that the understanding of mathematical concepts involves more than learning a set of rules or using a formula. It involves knowing what method to choose, how to use it and why it works in a particular situation.

1.3 The mathematical processes include problem solving, logical reasoning, analytical thinking, communication, making connections and using mathematical tools. Calculators as tools will feature prominently in the new course. These should be developed within the context of the topics and emphasised throughout the course.

1.4 Mathematics at this level lays the foundation for mathematics learning in Form 5.

2.0 AIMS AND OBJECTIVES

2.1 AIMS

The FJC Mathematics course aims to develop:

(a) in students a sound understanding of, and the ability to use mathematical concepts and processes

(b) students' mathematical skills and abilities to think and reason logically, and to communicate mathematical ideas and experiences, orally and in writing

(c) students' knowledge and skills, and the understanding required for everyday living, and for further learning in mathematics and other subjects

(d) students' creative and inventive talents in relation to problem-solving

(e) students' abilities to connect mathematics to everyday situations, to other topics within mathematics and to other subjects

(f) in students favourable attitudes towards, and continuing interest in mathematics

(g) in students the ability to recognise and appreciate the mathematics in everyday situations

(h) students' confidence and ability to do mathematics

2.2 OBJECTIVES

On completing the Fiji Junior Certificate course, pupils should have

2.2.1 developed the knowledge and understanding required to:

(a) use with increasing confidence problem-solving approaches to investigate and understand mathematical content

(b) recognise and formulate problems from situations within and outside mathematics

(c) develop and apply a variety of strategies to solve problems within and outside mathematics

(d) increase competence in estimation

(e) apply mathematical patterns and relationships to everyday situations

(f) make connections with other topics within Mathematics, with other subjects and with the outside world

(g) apply mathematics to everyday life

2.2.2 acquired the skills and understanding of the processes involved in:

(a) applying mathematical ideas, rules, techniques and strategies to solve mathematical problems

(b) devising, using and modifying problem-solving strategies to solve a variety of problems and be able to reflect on these

(c) using mathematics in everyday life

(d) using inductive and deductive reasoning and forming conjectures

(e) developing flexible thinking and logical reasoning

(f) making reasonable estimations and approximations

(g) the use of calculators and mental computations

(h) relating procedures in one representation to procedures in an equivalent representation

(i) recording information and reporting results of mathematical activities

(j) choosing and using mathematical tools and instruments

(k) investigating and using connections with other Mathematical topics and with other disciplines

(l) listening and responding to the views of others

2.2.3 developed the values and attitudes which help them to:

(a) appreciate Mathematics as an interesting, enjoyable and challenging subject

(b) develop the skills of inquiry, investigation, discovery and verification which are essential for the learning of Mathematics

(c) appreciate Mathematics as a creative, relevant and useful activity in daily living

(d) gain confidence in their ability to learn and practice self-assessment skills in mathematics

(e) show confidence in using their own language and the language of Mathematics to express mathematical ideas

(f) exercise self discipline and be resourceful in engaging in mathematical activities

(g) work co-operatively with others and participate in group discussions

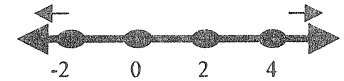
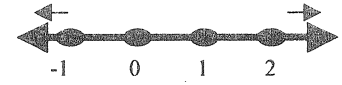
(h) appreciate that Mathematics is useful to the learning of other subjects and for job opportunities.

Key Competency Areas

1. NUMERACY SKILLS • Estimating and approximating • Recognising and using patterns and relationships • Organising information for mathematical analysis • Calculating accurately	**2. COMMUNICATING MATHEMATICAL IDEAS** • Personnel • General • Representation and interpretation • Presentation
3. PROBLEM SOLVING • Problem solving planning • Problem solving strategies • Modelling	**4. USING TOOLS AND MANAGING RESOURCES** • Instruments • Calculators • Computers • Managing time • Managing money • Managing other resources
5. LOGICAL REASONING • Categorising and interpreting • Recognising and working with patterns • Reasoning • Inferring • Proving	**6. MAKING CONNECTIONS** • Within mathematics • Other curriculum areas • Everyday life • General

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 3 **MEASUREMENT**	• To revise and extend the use of metric units for measurements • To discuss the accuracy of measurements • To interpret and draw scale diagrams • To measure directions by using compass bearings • To revise and extend ideas of areas and volume.	After completing this unit, students should be able to: 1. (a) identify the basic units of measurement used in the metric system. (b) state the values for commonly used metric prefixes. (c) convert from one unit to another with the relevant prefixes (d) write a given number in standard form and vice-versa. 2. (a) estimate commonly used dimension such as length, mass, area, volume, and time (b) measure objects to the nearest units required (c) write a measurement correct to the nearest unit required (d) state the smallest and largest possible measurements for an object whose recorded measurement is given; (e) write an inequality for the actual measure of an object when given a recorded measure for it. 3. (a) interpret the scale of a drawing as the ratio of length of the drawn object to the length of the actual object; (b) calculate lengths of objects from a scale drawing; (c) draw scale diagrams to a given scale; (d) measure angles of elevation and depression using a clinometer. 4. (a) use a magnetic compass to give the bearing of an object from where the student stands; (b) determine the bearings of points using a map or diagram, and a protractor; (c) draw scale diagrams where the directions of lines, or the direction from one point to another, are given as bearings. 5. (a) apply and manipulate, formulae for the area of a rectangle, square, parallelogram, triangle, rhombus and trapezium. (b) Calculate the circumference and area of a circle and relate these to the area and arc length of a sector (c) Calculate approximate areas for irregular figures by using trapezium; (d) Calculate the surface area of simple cuboids, cylinders and spheres. 6. Apply and manipulate, formulae for the volume of prisms, pyramids and spheres.	Classify the distinction between mass and weight. E.g. A mass of 50 kg has a weight of 500 N. Work on problems dealing with elevation and depression are to be dealt with as part of the work on Trigonometry.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 4 **MATHEMATICAL SHORTHAND 1**	• To introduce students to a mathematical language often called algebra. • To practise manipulating pronumeral terms, expressions and fractions, solving linear equations and inequations, and using operators.	After completing this unit, students should be able to : 1. (a) explain the difference between numerals and pronumerals; (b) name different types of algebraic expressions on the basics of the number of terms in each – monomial, binomial, trinomial only; (c) differentiate between "like" and "unlike" terms and then add and subtract polynomials; (d) multiply and divide monomials, including those with powers. 2. (a) relate numerical fractions to algebraic fractions (b) add, subtract, multiply and divide simple algebraic fractions. 3. (a) explain the concept of an operator; (b) know the meaning of the terms "inverse operator" and "self-inverse operator"; (c) solve problems involving operators, their inverses, and combination of two operators. 4. solve simple linear equations, such as $2x - 4 = 7$; $\frac{3x + 5}{4} = 2$; $x/2 - x/3 = 0$ 5. (a) use set-builder notation; (b) determine the solution set of an inequation, and graph it on an appropriate number line.	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 5 **COORDINATES 1**	• To revise and extend the work on coordinates • To draw graphs of sets of numbers and inequalities in one variable, on a number line • To draw graphs of lines parallel to the axes on a Cartesian plane.	After completing this unit, students should be able to : 1. (a) give rational number coordinates for points plotted on a number line and vice versa, e.g. $\{ 1\frac{1}{2}, 1, 3, \frac{3}{4} \}$ (b) graph inequalities on a number line, using integers or real numbers as replacement set: (i) graph all real numbers greater than 5. (ii) Graph $x < 3\frac{1}{2}$, $x \in$ real number (iii) Graph all integers where $-2 \leq x < 8$ 1. (c) describe sets of points graphed on a number line e.g. (i)  even numbers (ii)  (integers less than 3) or $x \leq 2$, x an integer (iii)  $-8 < x \leq 3\frac{1}{2}$, x a real number 2. (a) give integer coordinates for points plotted on a Cartesian plane and vice versa; (b) Determine the coordinates of points and graph the lines of the following types of equations : e.g. $x = 2$, $y = 5$, $y = -5$, $x = -3$ (c) write down the equation of a given line that is parallel to one of the axes.	All work on graphs of linear equations other than those parallel to the x or the y-axis, equations of graphs and inequalities associated with line graphs is excluded at this stage.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 6 **SOCIAL MATHEMATICS 1**	• To revise and extend students' knowledge and use of money calculations and percentages. • To introduce students to the concepts of ratio, proportion and rate and to apply these in everyday situations.	After completing this unit, students should be able to: 1. perform simple money calculations for domestic purchases; 2. (a) write a ratio to compare the corresponding measure of two objects; (b) determine the larger (or smaller) of two objects, compared in a ratio and if the measure of one of the objects is given, calculate the measure of the other object; (c) identify ratios that are equivalent; (d) simplify ratios; (e) apply ratios to increasing or decreasing of quantities, and to division into parts; 3. (a) identify when two variable quantities are proportional, and to explain why they are proportional; (b) perform simple calculations involving two variables that are proportional; 4. (a) calculate a rate or an average rate; (b) perform simple calculations involving rates or average rates; 5. (a) convert a fraction or decimal into a percentage, and vice versa; (b) express one quantity as a percentage of another; (c) calculate the percentage of a quantity; (d) increase or decrease a quantity by a given percentage; (e) perform simple calculations involving percentages, including profit and loss calculations	The use of calculators to work on percentages will greatly reduce the time required to solve problems.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 7 STATISTICS 1	In this unit, students will look at : • representing statistical data in graphical or chart form; • computing the mean, median, mode and range for a given sample • organising data from a sample into a frequency distribution and representing this by a frequency line graph or histogram.	At the end of this unit, students should be able to : 1. (a) draw charts to represent tables of statistical data using pie charts, pictograms, bar-graphs and line graphs (b) comment on the overall trends illustrated in a graph of statistical data and also read values from it; (c) decide when, and how, a chart could be used to critically analyse conclusions drawn from statistical data; 2. calculate the range, mode, median and mean for a given set of numerical data. 3. (a) organise numerical data into a frequency table, where equal width class intervals are given, and draw a frequency line graph or a histogram to illustrate it; (b) when given numerical data in the form of a frequency table or a frequency line graph or a histogram, determine the range, the mode or the modal class, and the median; (c) read off a frequency line graph or a histogram, record the data in a frequency table, and answer questions related to the graph and the table.	Calculator work on statistical functions is not necessary at this stage. Calculations of the mean will not involve using grouped data as in a frequency table.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 8 **PROPERTIES OF SHAPES 1**	• To extend students' knowledge of the angle and symmetry properties of triangles, quadrilaterals, polygons and circles. • To explore the angles formed by a transversal on two parallel lines • To construct, examine and draw two-dimensional pictures of some solid objects. • To show the application of properties of shapes in real-life situations.	After completing this unit, students should be able to:- 1. (a) classify triangles as equilateral, isosceles or scalene, and as obtuse-angled or acute-angled; (b) state and use in simple problems, the property of the sum of the interior angles of a triangle, and the property of the exterior angle of a triangle; (c) draw the lines of symmetry for equilateral, isosceles and scalene triangles and state the order of rotational symmetry for them; (d) use the symmetry of a triangle to make deductions about the sizes of its sides and angles; (e) decide whether a triangle can be drawn from the information given about its sides and angles; (f) make an accurate drawing of a given triangle. 2. (a) give correct names of polygons with 3 to 10 sides e.g. triangle, quadrilateral, pentagon, hexagon etc. (b) calculate, and use in simple problems, the sum of the interior angles of a polygon. (c) know, and use the property of the sum of the exterior angles of a polygon (d) state the number of axes of symmetry and the order of rotational symmetry of a regular polygon, and show these on diagram of the regular polygon;	This unit has been put together with units on transformations to enable students to relate more easily to properties of figures and the transformations they undergo.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 8 (cont'd)		3. (a) name from a diagram pairs of alternate, allied, corresponding, vertically opposite, adjacent, complementary and supplementary angles; (b) give the complement, and supplement of a given angle; (c) use in simple numerical problems, the properties of vertically opposite angles, the sum of the angles on straight line, and the sum of the angles around a point. (d) state, and use, the properties of alternate, allied, and corresponding angles, when lines are parallel; (e) state a definition of parallel lines; (f) identify parallel lines and non-parallel lines (g) draw a line parallel to another, and through a given point, by using a set square and straight edge. 4. (a) identify and name trapeziums, parallelograms, rectangles, rhombus, squares, kites and arrowheads (b) for the quadrilaterals in (a), indicate their symmetries and use them to deduce lengths and angles of given quadrilaterals; (c) state, and use, the basic side, angle and diagonal properties of the quadrilaterals in (a) above 5. (a) state that a circle is symmetrical about any diameter; (b) use the property that the mediator of a chord is a diameter of the circle (c) construct the centre of the circle by using a straight edge and a compass (d) define a cyclic quadrilateral; (e) recognise when a quadrilateral is cyclic; (f) recognise, and use, the following angle properties:  	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 8 (cont'd)		(g) identify the axes of symmetry in diagrams showing one or two tangents to circle; (h) use symmetry to deduce the sizes of angles and line segments in diagrams showing one or two tangents to circle; 6. (a) state the difference between pyramids and prisms; (b) identify prisms and pyramids from a collection of solids; (c) name prisms and pyramids, e.g. triangular prism, cuboid, square pyramid. (d) identify and count edges, faces, and vertices when given a prism, square, pyramid etc; (e) recognise possible nets for cubes and cuboids; (f) draw nets for simple solids such as cubes, cuboids, triangular prism, square pyramids etc. (g) construct a solid object given its net; (h) draw pictures of cubes, cuboids, figures based on cuboids, and rectangular pyramids.	

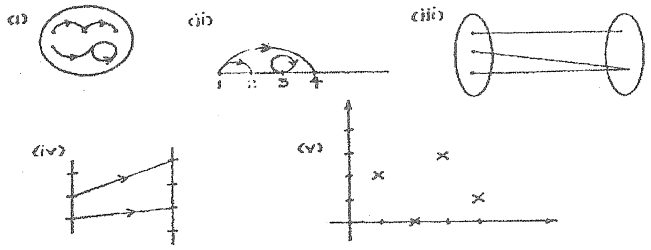
UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 9 **TRANSLATION AND VECTORS**	• To introduce simple translation properties and 2-component vectors to students. • To show the application of translation and vectors to everyday situations.	After completing this topic, students should be able to: 1. (a) identify translations used in patterns where some basic shape is repeated, in one or two dimensions (b) design their own patterns by translating some basic shape; (c) state the basic translation properties; (d) use the notation $A \rightarrow A'$, $PQ \rightarrow AB$; 2. (a) describe a translation by giving its vector in the form $\begin{pmatrix} a \\ b \end{pmatrix}$ (b) perform a translation when given the image of one point, or when given the translation vector; (c) draw an arrow vector for the column vector $\begin{pmatrix} a \\ b \end{pmatrix}$ 3. (a) combine translations by performing one translation after another (b) add two vectors algebraically, and draw their addition diagram; (c) write down the inverse of a translation vector, and give the properties of a vector and its inverse; (d) give the position vector for one object relative to another. 4. (a) perform translations when an operator symbol is used. (b) perform the translation AB where and B are operator symbols for translations.	The General Aim has been modified.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 10 **REFLECTIONS**	• To revise and extend simple reflection properties. • To show the application of reflections to everyday situations.	After completing this topic, students should be able to: 1. (a) show that the mirror line is the mediator of the line segment joining a point and its image; (b) construct the image given an object (point, line, line segment, etc.) and the mirror line, (c) construct the mirror line, and to state that this is an axis of symmetry; given an object and its image, (d) show that an object and its image are congruent and therefore length, angle and area measures are invariant; (e) show that sense or orientation is changed in reflection; (f) identify points and lines that are invariant in a reflection. 2. (a) carry out successive reflections in two parallel mirror lines, and specify the equivalent translation; (b) carry out successive reflections in two intersecting mirrors and specify the equivalent rotation; 3. use operator symbols for reflections and combinations of reflections; 4. carry out given combinations of reflections and translations.	All work on more than two combined transformations is excluded. It is expected that graph paper and to a lesser extent, coordinates will be used.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 11 ROTATIONS	• To revise and extend simple rotation properties • To show the application of rotations to everyday situations. • To show the use of rotation in obtaining the properties of some common shapes.	After completing this topic, students should be able to: 1. (a) use the convention of positive rotation (anti- clockwise) and negative rotation (clock-wise) to construct the image given an object (point, line, line segment, etc.), centre and angle of rotation, (b) find the centre of rotation and state the angle of rotation given an object and its image; (c) state that an object and its image under rotation are congruent and therefore length, angle and area measures are invariant; (d) identify the point that is invariant in a rotation and state that it is the centre of rotation. 2. (a) identify figures which have rotational symmetry and give the order of rotational symmetry; (b) identify figures which have point symmetry 3. use operator symbols for rotations and combinations of rotations; 4. (a) identify the transformation used; choosing from {translation, reflection, rotation} when given an object and its image, (b) carry out given combination of rotations, reflections and translations, and to describe the single transformation choosing from {translation, reflection, and rotation} that would map the object to its final image. (c) use operators to carry out successive transformations of translations, reflections and rotations.	Work on more than two transformations are excluded.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 12 **ENLARGEMENT AND SIMILARITY**	• To introduce students to the transformation of enlargement, and to the idea of similar figures	After completing this unit, students should be able to : 1. (a) identify when one object is related to another by an enlargement; (b) make simple enlargements of figures drawn on graph paper, given the centre of the enlargement and the scale factor , for positive scale factors; (c) identify the centre and the scale factor; when given an enlargement of figures drawn on paper, (d) use the scale factor when calculating lengths on corresponding sides in an enlargement; (e) use a symbol as an enlargement operator; (f) give the area scale factors when the length scale factor of an enlargement is given, and use these in elementary problems; 2. (a) carry out combinations of the transformations of reflections, rotations and translations with enlargement, thus obtaining similar figures; (b) identify possible transformations used in mapping from one figure to a similar figure; (c) identify corresponding vertices, angles and line segments given two similar figures (d) calculate the length scale factor and use this to calculate other lengths of given similar figures (e) identify pairs of figures as similar or not. 3. *Construct* a pantograph, given the instructions And *use* it to enlarge simple pictures.	Work on more than two consecutive ransformations are not studied.

FORM IV

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 1 **RELATIONS AND FUNCTIONS**	• To formalise the concept of a relation as pairing of elements of one set, or of elements of one set with elements of another.. • To introduce functions as special types of relations.	After completing this unit, students should be able to: 1. (a) draw a graph of a relation given in word form or given as a set of ordered pairs of elements. Suitable types of graphs are given below.  (b) list the ordered pairs of a relation given as a graph or as a rule, with domain; (c) generate ordered pairs of a relation given in the form $x \rightarrow 3x$ or $\{(x, 3x)\}$ or $y = 3x$, each with its domain; (d) list the domain and range of a relation; (e) draw the graph of the inverse of the relation, given its graph; (f) list the ordered pairs of the inverse relation, given a relation as a set of ordered pairs of elements. 2. (a) recognise that for a function, each element in the domain of the relation is mapped to only one element of the range; (b) differentiate between a function and a non-function (c) calculate the values of a function using notations such as: if $f : x \rightarrow 2x$, evaluate $f : 7$; and if $n(a) = a^2 + 3$, find the value of $n(-5)$.	• Work on combining functions is excluded.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 2 **PRODUCTS AND FACTORS**	• To apply the distributive property to the product of two polynomial expressions and the corresponding factorisation. • To introduce the use of factors in solving polynomial equations and in simplifying rational algebraic expressions	After completing this topic, students should be able to: 1. express a given monomial expression in terms of factors and vice versa, Example: $3ab = 3 \times ab = 3a \times b = 3 \times a \times b$ 2. use the distributive law to write products of factors as sums of terms $3(x+7) = 3x + 21$; $(m-5)^2 = m^2 - 10m + 25$ etc 3. factorise algebraic expressions, Examples: $3x + 3y = 3(x+y)$; $x^2 - 49 = (x+7)(x-7)$ 4. simplify rational algebraic expressions such as: $\frac{(x+a)(x+c)}{(x+a)}$, $\frac{3a+3b}{3}$, $\frac{ax+bx}{a+b}$, $\frac{a^2-16}{a+4}$ by using common factors.	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 3 **LOGARITHMS**	• To begin the study of logarithms, especially those using base 2 and base 10.	After completing this topic, students should be able to: 1. (a) write numbers in base-index form and vice-versa (b) simplify index expressions for positive, zero, and negative indices, e.g $2^4 \times 2^3 = 2^7$, $3^7 \div 3^5 = 3^2$, $(a^4)^3 = a^{12}$, $4^0 = 1$ 2 (a) use the exponential graphs $y = 2^x$ and $y = 10^x$, $x \in R$, to write numbers as powers of 2 or 10, and vice versa; (b) use the graphs of $y = 2^x$ and $y = 10^x$ as appropriate to express numbers as powers; (c) express the base-index form of a number in logarithm form and vice-versa eg. given $32 = 2^5$, then $\log_2 32 = 5$ and given $\log_{10} 49 = 1.98$, then $49 = 10^{1.98}$ 3 (a) use calculators to find logarithms of numbers (b) use calculators to find a number, given its logarithm.	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 4 **TRIGONOMETRY**	• To use calculators to find squares and square roots. • To introduce and apply the theorem of Pythagoras. • To introduce the basic sine, cosine and tangent functions.	After completing this topic, students should be able to: 1. Use calculators to find squares and square roots of numbers correct to either one or two decimal places. 2. (a) state the formula for the Pythagoras' Theorem for any given right-angled triangle; (b) calculate the length of a side of a right-angled triangle when the lengths of the other two sides are given as natural numbers; and the square of the side to be calculated is not greater than 100; (c) state whether a triangle is right-angled or not, by using the concept of pythagorean triads (restricted to natural numbers). 3. Identify the lengths of the sides of right-angled triangle in terms of r Cosθ and r Sinθ given the hypotenuse (r) and angle θ 4. Identify the side whose length is x tan θ, for numerical values of x and θ; given a side x (which is not the hypotenuse) and an angle θ of a right angled triangle, 5. For a given right angled triangle, select the appropriate function (sine, cosine or tangent) and use it to solve the size of the required angle or side 6. Use calculators to determine the sine, cosine and tangent values for given angles 7. Sketch the graphs of sine, cosine and tangent for angles from 0° to 360° 8. Identify the sine, cosine and tangent graphs for angles from 0° to 360° from a selection of graphs 9. Use a clinometer to measure angles of elevation and depression and make subsequent calculations for heights.	Work on Pythagoras Theorem is part of the unit Trigonometry For specific objective 5, the pupil does not have to be able to solve the hypotenuse length using the trigonometric functions. The use of calculators will greatly ease work on trigonometry functions.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 5 **PROPERTIES OF SHAPES 2**	• To study compass and ruler constructions, simple loci, centres of a triangle, and intersecting chords of a circle.	After completing this topic, students should be able to: 1. (a) construct, the bisector of an angle, mid-point of a line segment, the mediator of a line segment and angles of 90°, 60°, 45°, 30° at a point on a given line, using ruler and compass. (a) construct the centroid, orthocentre, circumcentre and circumcircle, incentre and incircle of a triangle and identify these in given diagrams; 2. construct, or identify on a given diagram, sets of points based on the following loci: ⇨ the locus of points equidistant from a fixed point, or two fixed points; ⇨ the locus of points equidistant from a given line, or from two given lines; 3. state and use in problems, the property of the angle subtended at the centre of a circle being twice the size of the angle subtended at the circumference by the same arc; 4. state and use in simple numerical calculations, the property of chords intersecting inside or outside a circle, and the special case of the tangents	The locus of points making given angle subtended by a given segment is excluded.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 6 **MATHEMATICAL SHORTHAND 2**	• To practise manipulation of algebraic expressions and formulae, and solve algebraic equations.	After completing this topic, students should be able to: 1. (a) substitute values into algebraic expressions; (b) add and subtract polynomials examples: (i) $(1 - 2x - 3x^2) + (2 + 4x + 5x^2)$ (ii) $(3 + 2a) - 4(7 - 6a)$ (c) perform the four basic operations (+,-,x,÷) with arithmetic and algebraic fractions, examples : (i) $1\frac{1}{2} + 1\frac{1}{4} - \frac{3}{4}$ (ii) $\frac{2x^3}{3} \times \frac{3a}{4a}$ 2. Find solutions of the following types of equations: (i) $2x + 1 = 5x - 8$ (ii) $\frac{x-1}{2} - \frac{x}{3}$ (iii) $x^2 = 4$; $(x+1)^2 = 9$, $(x = 0$ 3) = 0 (iv) $(x-1)(x+2)(x-5) = 0$ 3. (a) substitute values into a given formula and give the answer in the simplest form; (b) change the subject of a given formula. example: Make v the subject of the formula $d=m/v$; (c) solve problems by translating from verbal or written statement into mathematical equations or formula	This topic has to be given greater emphasis because of the need to reinforce students' algebraic skills – a problem encountered by students in their latter school years. It is anticipated that ideas introduced at Form 3 level will be reinforced. The emphasis on solving real life problems necessitates work on forming equations and finding solutions to equations so formed.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 7 **COORDINATES 2**	• To draw graphs of simple linear equations and inequations in two variables on a cartesian plane, and introduce the ideas of intercepts and slopes.	After completing this topic, students should be able to: 1. (a) state the intercepts on the axes and the gradient or slope of a given line on the cartesian plane, or of a line whose equation is given. (b) write the equation of a given straight line in the general form: 2. draw graphs on a cartesian plane to show points that satisfy given inequations such as:. $y = mx + c$ (i) $x \geq 4$ (ii) $y < -2$ (iii) $-3 \leq x < 4$ (iv) $y \geq 0$ and $x < 1$, and vice versa	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 8 **SOCIAL MATHEMATICS 2**	• To look at Savings Bank Accounts, Hire Purchase or Credit Accounts, and Tax Returns as examples of social uses of elementary mathematics.	.After completing this topic, students should be able to: 1. (a) verify entries made in savings bank accounts; (b) calculate the total amount to be paid, and the savings or losses incurred, when goods are bought on hire-purchase, credit terms, or lay-buy (c) complete a tax return, given the relevant information;	Concepts in this topic are also dealt with in Accounting and Economics
	• To apply percentages in problems such as interest earned on lending and investing money, and compound growth of a town's population	2 (a) increase or decrease quantities by a given percentage; (b) calculate the amount of interest receivable and payable annually, given the principal and the rate of interest; when money is loaned, interested or borrowed at simple interest (c) state the difference between simple and compound interest; (d) calculate the amount and the interest earned, or paid when the principal, rate and period of time is given when money is loaned, invested or borrowed at compound interest (e) use tables that give simple and compound interest on $1 for given interest rates and number of years; (f) apply the compound growth model to other practical examples such as populations, and depreciation of values.	

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 9 **STATISTICS 2**	• In this unit of work students will look further at computing statistics such as mean, median, upper and lower quartiles and inter-quartile range.	After completing this topic, students should be able to : 1. (a) calculate the arithmetic mean from a frequency table, by using the mid-values of the class intervals (where necessary) (b) solve simple problems related to the mean value 2. determine the median, the upper and lower quartiles, and the inter-quartile range for a list of scores, and for scores in a frequency table (without class intervals). 3. apply the statistical concepts learnt in this topic to real-life situations.	• The statistical functions on the calculator need not be taught at this level. • Work on frequency polygons and cumulative frequency is excluded.

UNIT TITLE	GENERAL AIMS	SPECIFIC OBJECTIVES	COMMENTS
Unit 10 **PROBABILITY**	• To introduce elementary ideas of probability.	After completing this topic, students should be able to : 1. (a) perform simple statistical experiments, and from these determine the relative frequency of a particular outcome examples : tossing a coin, rolling a dice, drawing a card; (b) (i) recognise that as the number of times the experiment performed increases, the relative frequencies approach a particular value (limit). (ii) estimate this particular value (limit); and (iii) use this limit as a probability, eg in tossing a coin. 2. (a) explain the meaning of the terms such as "random event", "equally like outcomes", "fair", "biased" (b) determine the probability of each outcome of an experiment, where the outcomes are equally likely to occur, or where the outcomes can be easily related to equally likely outcomes, eg. in drawing coloured balls from a box; (c) explain why the sum of the probabilities of an experiment is one, and that the probability of an event is between zero and one, inclusive; (d) calculate the probability of an event; 3. determine the expected number of occurrences of an event given its probability, and the number of trials to be carried out.. 4. apply the probability concepts to real-life situations.	

RECOMMENDED TIME SCHEDULE

	FORM 3 UNITS	NUMBER OF WEEKS		FORM 4 UNITS	NUMBER OF WEEKS
1.	Directed Nos.	3	1.	Relations and Functions	3
2.	Rational Nos.	3	2.	Products and Factors	3
3.	Measurement	2½	3.	Logarithms	2
4.	Mathematical Shorthand 1	4	4.	Trigonometry (with Pythagoras)	4
5.	Coordinates 1	2	5.	Properties of Shapes 2	3
6.	Social Mathematics 1	3½	6.	Mathematical Shorthand 2	3
7.	Statistics 1	2½	7.	Coordinates 2	3
8.	Properties of Shapes 1	3½	8.	Social Mathematics 2	4
9.	Translations and Vectors	2	9.	Statistics 2	2 ½
10.	Reflections	2½	10.	Probability	2 ½
11.	Rotations	2½			
12.	Enlargement & Similarity	3			
		34 weeks			**30 weeks**

FORM 3 MATHEMATICS

CONTINUOUS ASSESSMENT SUMMARY

TASK TESTS	DURATION	COMPLETION DATE	TASK DESCRIPTION	TASK WEIGHTING
1	35 minutes	End of Unit 2 (Week 7 of Term 1)	Paper and Pen test covering objectives from units 1 and 2	4
2	35 minutes	End of Unit 4 (Week 14 of Term 1)	Paper and Pen test covering objectives from unit 4	4
3	35 minutes	End of Unit 5 (week 3 of Term 2)	Paper and Pen test covering objectives from unit 5	4
Tasksheets/ Worksheets	Extra time for these tasks could be provided so that students could complete part of the tasks after school or during weekends.			
1	No more than 3 periods	End of Unit 3 (Week 9 of Term 1)	All students will be required to follow a task similar to the sample provided. Students will have to submit the completed task-sheet. The marking criteria should be discussed with the students in advance.	8
2	No more than 5 periods	End of Unit 7 (Week 9 of Term 2)	Refer to the sample (Teachers are reminded not to use the same task year after year)	12
CONSTRUCTIONS/ DESIGNS	Activity 1: 2 periods Activity 2: 2 -3 weeks Activity 3: 2 periods	Activity 1:Wk 1 of Term 3 Activities 2 & 3: Wk 10 of Term 3	These activities will be designed to assess objectives covering units 8 to 12. Refer to the samples provided.	18 (6% for each activity)
				50

Sample Assessment Tasks

Note that all these activities should lead to the assessment of an individual's competence in the competency areas listed earlier; i.e. Numeracy Skills, Problem Solving, Logical Reasoning, Communicating Mathematical Ideas, Using Tools and Managing Resources, and Making Connections.

Teachers are advised to work on all the tasks and activities well in advance so that they are aware of the kind of results expected as well as any problems that may arise. .

❖ Tests

Each test should be of 35 minutes duration. The multiple-choice questions should concentrate on knowledge and comprehension levels and simple calculation type problems. The long answer questions should concentrate on application type questions requiring greater understanding, analysis, synthesis and perhaps evaluation, and involving comparatively more difficult calculations.

The test format is given below:

Item Type	No. of Questions	Marks
Multiple Choice or Definitions	4	4
Short Answer	4	8
Long Answer requiring detailed working	3	12

The total marks should eventually be converted to out of 4.

❖ A Practical Task for the Topic Measurement.(Unit 3) 8%

Key Competencies:
Numeracy Skills, Using Tools, Communicating Mathematical Ideas, Making Connections.

Detailed descriptions:
Estimation, Measurement, Drawing scale drawings, Interpretation of scale drawings, Use of a compass.

Materials required:
Measuring tape, Compass, Measurement Tasksheet, Protractor

Detailed Task Description:

Students could either work individually or in pairs. They are given specific instructions to follow.

The task involves students moving out of the classroom, using basic measuring instruments, recording results and using these in calculations. They are also given the opportunity to make estimations of measurements. They return to their classrooms to draw a scaled drawing of their measurements and present this together with their worksheet for assessment.

The tasksheet is presented on the following page.

Tasksheet 1 on Unit 3 (Measurement) 8%

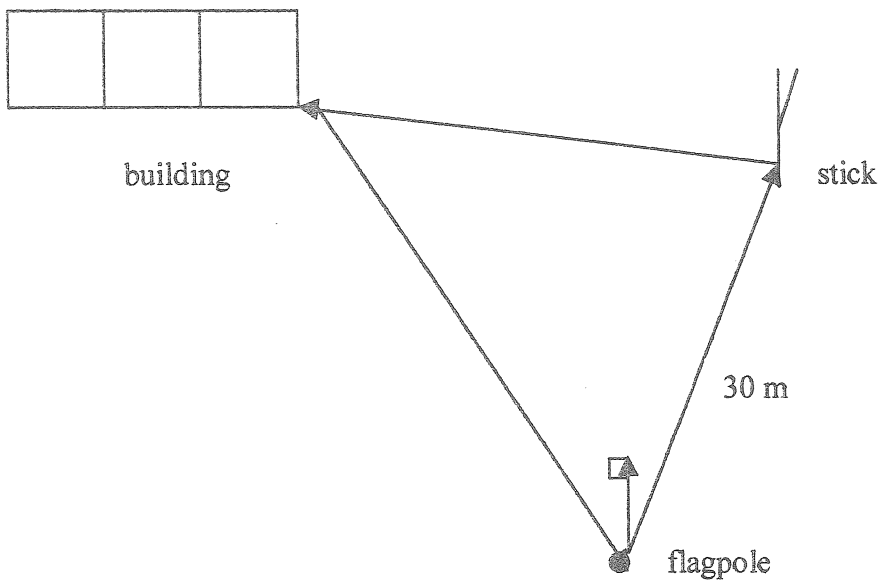
1. Take the flagpole as the starting point.
2. Move 30.0 metres at a bearing of N20E.
3. Place a stick in the ground.
4. From this point estimate the distance to the edge of the building/palm.
5. Record this estimate (E1) Estimate = _____
6. Determine the bearing of the edge of the building/coconut palm from this point.
7. Record this bearing (B1) Bearing = _____
8. Measure this length to the nearest centimetre using a measuring tape.
9. Record this distance (D1). Distance =_____
10. Estimate the distance from the edge of the building/coconut palm to the flagpole.

    Estimate (E2) = _____
11. Measure this distance to the nearest centimetre.
12. Record this distance (D2). Distance=_____
13.. Determine the bearing(B2) of the flagpole from the coconut palm.
14. Record this bearing (B2) Bearing = _____
15. Calculate the perimeter of the triangle formed to the nearest centimetre.

_____
_____
_____
_____

16. Return to the classroom and on a piece of A4 size paper draw a scaled drawing (Scale 1: 5 or any suitable scale) of the dimensions. Do not forget to mention the scale used.
17. Submit this tasksheet together with the scaled drawing for assessment.

Note that the actual task should be completed in no more than 2 periods. The total time required for a task similar to this should not take more than two weeks even after allowing for any absenteeism and re-doing.



❖ *Marking Criteria*

It is wise to initially make a list of all the competencies that you would like to assess and then decide on the weightings. Remember that it would not be manageable and right to assess all the competencies in any one task only.
Decide on whether you are going to assess on the product, on the process or a combination of the two. Obviously, a combination of the two would be desirable but bear in mind that any assessment based on observations etc should be as objective as possible. It is wise then to initially assign few marks only for such criteria and then gradually build up when you as the teacher and the also the students become more comfortable.

It is best to use a rating scale so that student performances and responses could be rated according to the level of mastery. Hence student marks could range from anywhere between 0 and 2 perhaps in intervals of ½ or 1 indicating differences in levels of achievements. Decide on an achievement level (remember we are looking now at criterion - referenced measurement) which every student should aim to reach. Students who are not able to meet this level may be given the opportunity to re - do tasks to reach adequate mastery levels.

All students marks for individual tasks should initially be recorded correct to 2 decimal places. Only when marks are added at the end , should marks be rounded off to the nearest whole number.

Record all students' marks and ask students to keep materials as evidence of tasks completed in their portfolios for future reference.

An example of a marking scheme is presented here for reference.

Sample Marking Criteria for Tasksheet 1 (8%)

School:_____ Subject Teacher:_____

Name: _____ Form : _____

Marks Scored: ____/12 x 2/3 = Weighting ____/8%

Estimates (E1 and E2)

Both within a very close range (within 0 -10% of actual value)	2
1 within 0-10% and the other between 10 – 20%	1 ½
1 within 10% and the other too far OR both within 10-20%	1
1 within 10 - 20% and the other too far	½
Both too far wide	0

Distance measurements (D1 and D2)

Both within a very close range (within 0 -1%)	2
1 within 0-1% and another between 1 – 2%	1 ½
1 within 1% and the other too far OR both within 1-2%	1
1 within 1-2% and the other too far	½
Both too far wide	0

Bearings (B1 and B2)

Both within a very close range (within 2 degrees)	2
1 within 2 degrees and another between 2 and 4 degrees	1 ½
1 within 2 degrees and the other too far OR both within 4 degrees	1
1 within 2-4 degrees and the other too far	½
Both too far wide	0

Correct steps to calculate perimeter

All working shown and easy to follow	1
Vague idea	½
No idea at all	0

Correct perimeter

Correct value and correct units	1
Either the correct units or the correct value only	½
Wrong	0

Correct Scale drawing

All measurements drawn correct to scale	2
Only one or two measurements correct	1
No idea at all about scale diagrams	0

Efficient use of time

Both practical and written work on time	1
An average worker	½
Too slow (careless attitude)	0

Ability to work independently/cooperatively

Displays responsibility & commitment	1
Lacks strong commitment	½
Over reliance	0

Activity 2 (Poster Design)

This activity could be spread over 2 to 3 weeks.

- Students work in groups of three or four students. Group members should change where possible.
- They design a poster (*tapa / rangoli* design etc.) using a basic shape and the various transformations that they have learnt. A3 size paper would be good enough.
- They are then asked to explain the properties of the basic shape and explain the transformations that the shape has undergone. The presentation should take just around 5 minutes.

Due Date: *Week 10 of Term 3*

Assessment Criteria for Activity 2 (6%)

Name: _____ Form: _____

Teacher: _____

Marks: ____/8 x ¾ = Weighting ____/6%

- **Planning and Organisation**

Group exhibits problem solving planning skills and uses appropriate strategies and modelling	1	
Planning skills and strategies used but not very effective	½	
No evidence of any constructive planning etc	0	

- **Product quality**

Exhibits originality, attractive, evidence of lot of effort	2	
Above average	1 ½	
Product of average quality in terms of originality and effort	1	
A meagre effort	½	
No product	0	

- **Design complexity**

Use of a variety (at least 3) of transformations	1	
Only 2 different transformations	½	
Very simple design	0	

- **Presentation**

Displays a very good understanding of the concepts	2	
Good understanding of concepts	1	
Too vague/ No understanding	0	

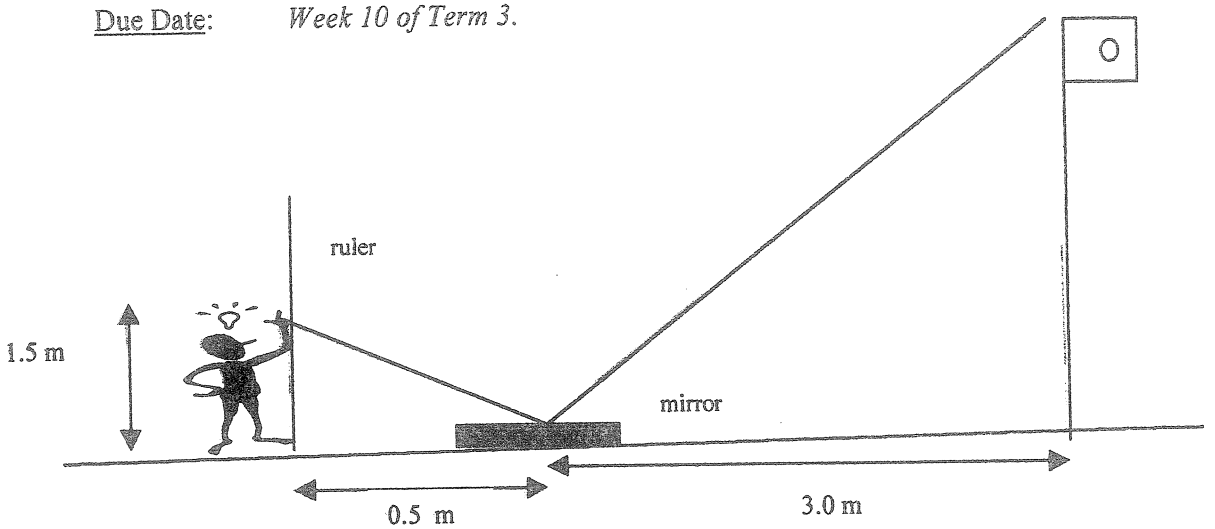
- **Group Participation/Contribution** (check with group members)

Major effort	2	
Above average contribution	1 ½	
Average contribution	1	
Little contribution	½	
No contribution	0	

Activity 3 (Application of Enlargement & Similarity Concepts)

- Students present a written report on the use of a practical measurement, which involves similar figures, for example, the method shown below, to find the height of a tall object such as a flagpole or building etc.. Note that students will actually have to do the activity to enable them to do the write-up.

Due Date: *Week 10 of Term 3.*



Assessment Criteria for Activity 3 (6%)

Name: _____ Form: _____

Teacher: _____

Marks: ____/6 = Weighting ____/6 %

Introduction		
Good discussion of concepts being studied	1	
Vague idea of concepts	½	
No idea at all	0	
Aim		
Aim stated clearly	½	
No mention of aim, or aim is not clear enough	0	
Method		
Well stated and easy to follow	2	
Just good enough	1 ½	
Needs improvement	1	
Too vague	½	
Method not given	0	
Results and Calculations		
Values obtained clearly identified and all calculations correct	2	
Correct calculations but incorrect values	1 ½	
Correct values obtained but calculations incorrect	1	
Attempt made but wrong calculations and values	½	
No attempt	0	
Conclusion		
Conclusion clearly stated	½	
Conclusion not clear/ No conclusion	0	

FORM 3 MATHEMATICS

CONTINUOUS ASSESSMENT

MARK CAPTURE SHEET

Name: _____ Form: _____
School: _____ Year: _____
Teacher: _____ Principal: _____
Moderator: _____

TASK	WEIGHTING	MARKS SCORED (Teacher's Marks)	MODERATED MARKS
Test 1	4		
Test 2	4		
Test 3	4		
Tasksheet 1	8		
Tasksheet 2	12		
Constructions/ Design	Act. 1 -- 6		
	Act. 2 -- 6		
	Act. 3 -- 6		
Totals	50		

Comments:
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THE FJC EXAMINATION

1. The format of the examination paper for FJC shall remain as it is. The FJC Mathematics paper will be based on Form 4 units only.

2. The table below summarises the weighting of the units in the examination paper.

	UNITS	RECOMMENDED TEACHING TIME (WEEKS)	FORM 4 WEIGHTINGS	EXAM PAPER WEIGHTINGS
1.	Relations and Functions	3	5	10
2.	Products & Factors	3	5	10
3.	Logarithms	2	3	6
4.	Trigonometry (with Pythagoras)	4	7	14
5.	Properties of Shapes 2	3	5	10
6.	Mathematical Shorthand 2	3	5	10
7.	Coordinates 2	3	5	10
8.	Social Mathematics 2	4	7	14
9.	Statistics 2	2 ½	4	8
10.	Probability	2 ½	4	8
	TOTAL	30	50	100

3. While the examination will have a few knowledge type questions, the emphasis will be on word problems and computation and application type questions.

MATHEMATICS – FORM 3

STUDENT PROFILE

Report on: _____ Form: _____ Year: _____

Teacher: _____ Student's Mark: _____ Class Average: _____

Assessment Strategies : The following strategies were used to assess the students:

Topic Tests *Written work* *Oral presentations* *Teacher Observations*

Individual Student Task *Group Task* *Interviews* *Tasksheets Worksheets*

Numeracy Skills	1	2	3	4		Communicating Mathematical Ideas	1	2	3	4
♦ estimates/approximates proficiently						♦ able to work independently				
♦ recognises and uses patterns and relationships						♦ works cooperatively in a group				
♦ manipulates using numbers, symbols and formula correctly						♦ able to use symbols, graphs, diagrams and tables to represent mathematical ideas precisely				
♦ calculates accurately						♦ interprets results using graphical, numerical or algebraic representations correctly				
						♦ presents and discusses arguments using clear, logical and concise statements				
Problem Solving						♦ reports in formal mathematical language				
♦ plans problem solving tasks in an organised manner						♦ accepts different points of view, criticisms				
♦ uses a range of problem solving strategies						**Using Tools and Managing Resources**				
♦ uses modelling to assist in problem solving						♦ chooses and uses measuring instruments correctly				
Logical Reasoning						♦ chooses and uses drawing instruments correctly				
♦ makes simple deductions						♦ uses calculators with confidence				
♦ collects, categorises, organises, and represents data properly						♦ makes efficient use of time				
♦ interprets symbols, data, tables, diagrams, graphs correctly						♦ appreciates the need for, and practices proper management of money				
♦ able to think creatively, critically and logically						♦ chooses and uses resources including everyday objects safely, efficiently and wisely				
♦ exercises imagination, initiative and flexibility						**Making Connections**				
♦ justifies answers and procedures with reasons and supporting evidence						♦ links concepts, procedures and topics in mathematics				
♦ judges the validity of arguments						♦ uses mathematics in other subject areas with confidence				
						♦ uses mathematics in everyday life				
						♦ applies mathematical perspectives to familiar and unfamiliar situations				

Key: 1 – Experiencing difficulty, 2 – Developing, 3 – Competent, 4 - Highly Developed

General Comments:

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LIST OF RECOMMENDED TEXTBOOKS

Form 3

1. *FJC Maths Form 3* by Len Flier published by Pacific Educational Books.
2. *Mathematics for Form 3* by Umesh C. Pratap and Arun K. Pratap
3. *Mathematics Books 3A, 3B & 3C* published by the Ministry of Education, Fiji.

Form 4

1. *Mathematics for Form 4* by Umesh C. Pratap and Arun K. Pratap.
2. *FJC Maths Form 4* by Len Flier published by Pacific Educational books.
3. *Mathematics Books 4A & 4B* published by the Ministry of Education.