MATHEMATICS

This syllabus is a modified version of the syllabus published by the Department
of Education and Culture. It is hoped that this version closes some gaps which
were apparent in the published syllabus and that it also followas fairly closely
the syllabi of some internation examinations boards notably London G.C.E.,
Cambridge Overseas School Certificate, West African Examinations Council and
International Baccalaureate of Geneva. It also combines 'Modern' and 'Traditional'
Mathematics.

When teaching the syllabus emphasis must be placed on the African and especially
South African background of the sudents and so, material and examples must reflect
this approach.

The syllabus is also more detailed that the published syllabus. This should help
the teacher in setting out a scheme of work, although the topics are not necessa-
rily set out in a particular teaching order or structural pattern.

FORM 1.

History of Counting systems; Number Base (bases 2, 3, 5, 8, 10, 12,) Place Value.
Sequences and Number Patterns (counting Numbers, Odd and Even numbers, Triangle
Numbers, Square Numbers, Fibonacci Sequence).
Multiples, Factors, prime numbers, prime factors.
Rules of Divisibility.
Idea of a set, subset; intersection of two sets.
(Notation and relations: $(\in, \subset, \notin)$
Measurement: Mass, length, time (S.I. units and also gramme, centimetre).
Currencies (£ sterling, Dollar, Kwacha, Pula, shilling), simple Arithmetical
problems involving the use of these currencies in buying and selling.
Use of symbols to represent numbers, simple algebraic expressions. Rotation about
a point (leading to angle, Degree. Bearings. Solids and their nets; Ealer's
Relations. Parallel lines; Properties of angles at a point and angles made with
paralel lines. Simple plane figures: Triangle, rectangle, squeare, parallelogram
Tesselations and Area of a rectangle, square. Collection of Data and Pictorial
Representation of Data by Bar Chart and Pie chart. Simple equations with positive
integersolutions. Coordinates and positions of points on maps.

FORM 2

Fractions, Farey Series.

Decimals. Conversions from Vulgar Fraction to decimal fraction and from decimal fraction to vulgar fraction.

Ratio and Proportion, direct and inverse proportion, proportional parts.

Percentages - including simple Interst, Profit and loss problems.

Directed Numbers (left-right, above-below, altitude, temperature scalses), The Number line. Simple Equations with integral and rational solution sets.

Arithmetical Expressions involving theuse of brackets; extension to algebraic expressions, factorisation Angle Properties of triangles, quadrilterals, polygons. Area of triangle.

The Circle (Radius, cirnumference, π , Area)

Volume of a Cube, cuboid, cylinder.

Relations (in ordinary life, arithmetic, geometry), many-many, many-one, one-many, one-one correspondences, arrow diagrams to illustrate relations, mappings or functions, inversese mapping, coordinate diagrams to illustrate relations and functions, straight line graphs, gradient.

Graphical representation of inequalities, Regions, shading regions representing inequeations, Graphical solution of simultaneous equations and inequations.

Mode, Median, Mean: Use and Abuse of statistics Union of two sets, Universal set empty or null set, Venn diagrams (as illustrations and use in simple logical problems).

FORM 3.

Indices (Positive integral, negative integral and zero indices)

Square roots (Simple calcultion and use of tables)

Standard form, significant figures, decimal places.

Use of the Slide Rule.

Transformations: Reflection; translation; rotations, centre or rotation, angle of rotation; enlargement, centre of enlargement, scale factor of enlargement.

Vectores - addition, multiplication by a scalr, application to translation.

Matrices - addition and multiplication by a scalar.

Multiplication of Matrices (Only conformable 1 x 2, 2 x 1, 2 x 2 matrices)

Velocity, acceleration; velocity-time and Distance-Time graphs.

Games of Chance, simple robability (theoretical and experimental definitions of of probability)

Formulae: substitution into formulae, change of subject of formula.

Theorem of Pythagoras (statement and simple applications to theoretical and everyday problems).

Sine, cosine and tangent of acute-angles.

Equation of a straight line in the form y = mx + c

Scales and simple map problems.

FORM 4.

Length, Area, Volume; Mensuration of the rectangle, triangle, parallelogram, trapezium, cuboid, circle, cylinder, sphere, pyramid, cone, prism. Necessary Formulae to be given in the case of the sphere, pyramid and cone.

Approximations, estmates of error, limits of accuracy, significant figure. Use of the standard form Ax10n where (integers), and

Real Number line (familiarity with tems: natural numbers, integers (+ve and zero), rational numbers, irrational numbers

Idea of ordering (use of =, $\neq$, $>$, $<$, $\geq$, $\leq$)

Indices including fractional indices.

Simple Algebraic Fractions, Factors (expressions of the form ax+bx, ax+bx +kayxkby, $a^2 - b^2$, $a^2 + 2ab + b^2$, $ax + bx + c$)

Solution of simple linear equations, pairs of simultaneous equations, quadratic equations (by factorisation and eitheruse of formula or by completing the square)

Graphs of y=Axn, n = -2, -1, 1, 2, 3 and simple sums of these,

Angle properties of polygons.

symmetries of regular polygons; symmetry properties of the triangle (isosceles, Equilateral), quadrilateral (trapezium, kite, parallelogram, rhombus, rectangle, square), prism (including cylinder), pyramid (including cone).

Symmetry properties of the circle — (i) equal chords equidistant from centre,

    (ii) perpendicular bisector of chord passes through the centre of circle,

    (iii) tangent is pe pendicular to the radius at point of contact,

    (iv) tangents from an external point are equal in length.

Angle at centre is twice angle at circumference,

Angle in a semicircle is a right angle,

Angle in the same segment are equal and in opposite segements are supplementary

Locus as a set of points in two or three dimensions.

Simple constru tions of plane figure.

Two dimensional vectors (Representations:

Modulus of a rector $\binom{x}{y}$ as $\sqrt{x^2 + y^2}$ (Notation ($\overline{AB}$) $\binom{2}{1}$)

Position vectors.

Use of the results (a) $\underline{a} = \underline{b} \Rightarrow |\underline{a}| = |\underline{b}|$ and $\underline{a}$

is parallel to $\underline{b}$ (b) $k\underline{a} = k\underline{b} \Rightarrow \underline{a}$ parallel to $\underline{b}$ OR $k = 0$

and $k = 0$. is proving properies of

equvalence, paralelism and incidence in rectilinear figures.

Matrices of any shape (addition and multiplication)

Algebra of 2 x 2 matrices including zero and identity matrices, determinant of
a matrix and inverse of a non-singular matrix.

Transformations of the plane: reflection(M), rotation(R) traslation(T), enlargement
(E), shear (H) and stretch (S) and their matrices.

Sets: Subsets, Universal set; intersention, Union of two or three sets;
complement of a set; Disjoint sets; Zero(Null)set; Venn diagrams.

FORM 5.

Extension of the sine and cosine ratios to angles between 90 and 360 degrees.

Graphs of sine, cosine, tangent.

Use of sine and cosine formulae for any triangle.

Area of triangle = $\frac{1}{2}$ab sin C.

Applications to problems using true bearings (bearings measured clockwise from north
i.e. 000° - 360°).

The Earth as a sphere: latitude, longitude; distances in nautical miles along
parallels of latitude and along meridians, speeds in knots.

Solution of simultaneous linear equations and inequations by graphical methods
and their use in linear programming.

Approximate solution of equations by graphical methods.

Estimation of gradients of grphs by drawing tangents, and of areas under graphs
by counting squares or by the trapezium rule.

Idea of a rate of change; gradient at a point on a curve; dy/dx. Newton and leibniz.

Maxima and Minima.

Application to kinematics.

Function, composition of functions, Inverse functions.

Graphical representation of numerical data by bar chart, frequency polygon, piechart, diagrams.

Mean (including use of assumed mean), mode median.

Estimation of median and quartiles; interquartile range, Modal Class.

Simple Probability (Including applications to sums and product laws, tree diagrams)

Similarity and 3congruency.

Relationships between areas of similar triangles, with corresponding results for
similar figures and extension to volumes of similar solids.

Closure, Associatrivity, Commutativity, Neutral (Identiry) element, Inverse
element.

Groups

FORM 6

ALGEBRA

1. Sets

   Sets and subsets, Universal set, Complement of a set; Finite and Infinite sets; Equivalent sets; continuous and discrete sets; Closed and Open sets; Closed and Open Regions.

2. OPERATIONS WITH SETS:

   Intersection of sets, Union of sets;

   Disjoin sets;

   Commutative, Associative and distributive laws;

   De Morgan's Laws.

   Principles of Duality.

   Venn Diagrams.

3. RELATIONS AND FUNCTIONS:

   Relations; Functions; Domain and range of functions,

   One-to-one Functions, Inverse of a Function.

   Composition of Functions.

   Equavalence relations.

   Cardinal Numbers; Countably infinite sets,

   Non-denumerable sets.

4. GROUPS:

   Definitions and Examples; Groups of matrices.

   Isomorphisms of Groups.

REAL ANALYSIS

1. The Natural Numbers.

   The integers.

   The Rational Numbers.

   Real Numbers.

2. SEQUENCES: Arithmatic and Geometric Sequences and Series; Limits of sequences; Sums, Differences, Products and Quotients of Sequences.

3. Limits of Functions.

4. Continuity: Continuity at a point, continuity of Functions

5. DIFFERENTIATION: Of sums, Products, Quotients of Functions.

6. INTEGRATION: Area unde a curve: Intergration as inverse of differentiation.

7. Theory of Quadratic Functions.

8. Polynomial Functions, Remainder Theorem

9. Exponential Function and Logarithms.