WAEC SYLLABUS FOR MATHEMATICS

1. NUMBER AND NUMERATION

(a) Number bases

- (i) conversion of numbers from one base to another
- (ii) Basic operations on a number of bases

(b) Modular Arithmetic

- (i) Concept of Modulo Arithmetic.
- (ii) Addition, subtraction, and multiplication operations in modulo arithmetic.
- (iii) Application to daily life

(c) Fractions, Decimals, and Approximations

- (i) Basic operations on fractions and decimals.
- (ii) Approximations and <u>significant</u> figures.

(d) Indices

- (i) Laws of indices
- (ii) Numbers in standard form (scientific notation)

(e) Logarithms

(i) Relationship between indices and logarithms e.g. y = 10k implies log10y = k. (ii) Basic rules of logarithms e.g. log10(pq) = log10p + log10q log10(p/q) = log10p - log10q log10pn = nlog10p. (iii) Use of tables of logarithms and antilogarithms.

Calculations involving multiplication, division, powers, and roots.

(f) Sequence and Series

(i) Patterns of sequences.

(ii) – Arithmetic progression (A.P.)

– Geometric Progression (G.P.)

Determine any term of a given sequence. The notation Un = the nth term of a sequence may be used.

Simple cases only, including word problems. (Include sum for A.P. and exclude sum for G.P).

(g) Sets

(i) Idea of sets, universal sets, finite and infinite sets, subsets, empty sets and disjoint sets. The idea of and notation for union, intersection and complement of sets.

(ii) Solution of practical problems involving classification using Venn diagrams. Notations: { }, , P'(the compliment of P).

(h) Logical Reasoning

Simple statements. True and false statements. Negation of statements, implications. Use of symbols: use of Venn diagrams.

(i) Positive and negative integers, rational numbers

The four basic operations on rational numbers. Match rational numbers with points on the number line.

Notation: Natural numbers (N), Integers (Z), Rational numbers (Q).

(j) Surds (Radicals)

Simplification and rationalization of simple surds. Surds of the form, a and a where a is a rational number and b is a positive integer. Basic operations on surds (exclude surd of the form).

\cdot^{\star} (k) Matrices and Determinants

(i) Identification of order, notation, and types of matrices.

- (ii) Addition, subtraction, scalar multiplication, and multiplication of matrices.
- (iii) Determinant of a matrix

(I) Ratio, Proportions, and Rates

The ratio between two similar quantities. The proportion between two or more similar quantities. Financial partnerships, rates of work, costs, taxes, foreign exchange, density (e.g. population), mass, distance, time, and speed.

(m) Percentages

Simple interest, commission, discount, depreciation, profit, and loss, compound interest, hire purchase and percentage error.

*(n) Financial Arithmetic

- (i) Depreciation/ Amortization.
- (ii) Annuities
- (iii) Capital Market Instruments

(o) Variation

Direct, inverse, partial, and joint variations. Application to simple practical problems.

2. ALGEBRAIC PROCESSES

(a) Algebraic expressions

- (i) Formulating algebraic expressions from given situations
- (ii) Evaluation of algebraic expressions

(b) Simple operations on algebraic expressions

- (i) Expansion
- (ii) Factorization

(c) Solution of Linear Equations

- (i) Linear equations in one variable
- (ii) Simultaneous linear equations in two variables.

(d) Change of Subject of a Formula/Relation

- (i) Change of subject of a formula/relation
- (ii) Substitution.
- (e) Quadratic Equations

- (i) Solution of quadratic equations
- (ii) Forming a quadratic equation with given roots.
- (iii) Application of solution of quadratic equation in practical problems.

(f) Graphs of Linear and Quadratic functions.

(i) Interpretation of graphs, coordinate of points, table of values, drawing quadratic graphs, and obtaining roots from graphs.

(ii) Graphical solution of a pair of equations of the form: $y = ax^2 + bx + c$ and y = mx + k

(iii) Drawing tangents to curves to determine the gradient at a given point.

(g) Linear Inequalities

(i) Solution of linear inequalities in one variable and representation on the number line.

- *(ii) Graphical solution of linear inequalities in two variables.
- *(iii) Graphical solution of simultaneous linear inequalities in two variables.

(h) Algebraic Fractions

Operations on algebraic fractions with:

- (i) Monomial denominators
- (ii) Binomial denominators

Simple cases only e.g. + = (x0, y 0).

(i) Functions and Relations

Types of Functions One-to-one, one-to-many, many-to-one, many-to-many. Functions as a mapping, determination of the rule of a given mapping/function.

3. MENSURATION

(a) Lengths and Perimeters

(i) Use of Pythagoras theorem, *§^asine, and cosine rules to determine lengths and distances.
(ii) Lengths of arcs of circles, perimeters of sectors and segments.

(iii) Longitudes and Latitudes.

(b) Areas

(i) Triangles and special quadrilaterals - rectangles, parallelograms, and trapeziums

(ii) Circles, sectors, and segments of circles.

(iii) Surface areas of cubes, cuboids, cylinders, pyramids, right triangular prisms, cones, and spheres.

Areas of similar figures. Include the area of triangle = $\frac{1}{2}$ base x-height and $\frac{1}{2}$ absinC. Areas of compound shapes.

Relationship between the sector of a circle and the surface area of a cone.

(c) Volumes

(i) Volumes of cubes, cuboids, cylinders, cones, right pyramids, and spheres.

(ii) Volumes of similar solids

Include volumes of compound shapes.

4. PLANE GEOMETRY

(a) Angles

(i) Angles at a point add up to 360 degrees.

(ii) Adjacent angles on a straight line are supplementary.

(iii) Vertically opposite angles are equal.

(b) Angles and intercepts on parallel lines.

(i) Alternate angles are equal.

- (ii)Corresponding angles are equal.
- (iii)Interior opposite angles are supplementary

**a(iv) Intercept theorem.

(c) Triangles and Polygons.

(i) The sum of the angles of a triangle is 2 right angles.

(ii) The exterior angle of a triangle equals the sum of the two interior opposite angles.

(iii) Congruent triangles.

(iv) Properties of special triangles - Isosceles, equilateral, right-angled, etc

(v) Properties of special quadrilaterals – parallelogram, rhombus, square, rectangle, trapezium.

(vi)Properties of similar triangles.

(vii) The sum of the angles of a polygon

(viii) Property of exterior angles of a polygon.

(ix) Parallelograms on the same base and between the same parallels are equal in area.

(d) Circles

(i) Chords.

(ii) The angle which an arc of a circle subtends at the centre of the circle is twice that which it subtends at any point on the remaining part of the circumference.

(iii) Any angle subtended at the circumference by a diameter is a right angle.

(iv) Angles in the same segment are equal.

(v) Angles in opposite segments are supplementary.

(vi)Perpendicularity of tangent and radius.

(vii)If a tangent is drawn to a circle and from the point of contact a chord is drawn, each angle which this chord makes with the tangent is equal to the angle in the alternate segment.

Angles subtended by chords in a circle and at the center. Perpendicular bisectors of chords.

(e) Construction

(i) Bisectors of angles and line segments

(ii) Line parallel or perpendicular to a given line.

(iii) Angles e.g. 900, 600, 450, 300, and an angle equal to a given angle.

(iv) Triangles and quadrilaterals from sufficient data.

(f) Loci

Knowledge of the loci listed below and their intersections in 2 dimensions.

(i) Points at a given distance from a given point.

(ii) Points equidistant from two given points.

(iii)Points equidistant from two given straight lines.

(iv)Points at a given distance from a given straight line.

E. COORDINATE GEOMETRY OF STRAIGHT LINES

(i) Concept of the x-y plane.

(ii) Coordinates of points on the x-y plane.

F. TRIGONOMETRY

(a) Sine, Cosine, and Tangent of an angle.

- (i) Sine, Cosine, and Tangent of acute angles.
- (ii) Use of tables of trigonometric ratios.
- (iii) Trigonometric ratios of 30o, 45o, and 60o.
- (iv) Sine, cosine, and tangent of angles from 0o to 360o.
- (v)Graphs of sine and cosine.

(vi)Graphs of trigonometric ratios.

(b) Angles of elevation and depression

- (i) Calculating angles of elevation and depression.
- (ii) Application to heights and distances.

(c) Bearings

- (i) Bearing of one point from another.
- (ii) Calculation of distances and angles

5. INTRODUCTORY CALCULUS

- (i) Differentiation of algebraic functions.
- (ii) Integration of simple Algebraic functions.

Concept/meaning of differentiation/derived function, the relationship between the gradient of a curve at a point, and the differential coefficient of the equation of the curve at that point. Standard derivatives of some basic function e.g. if $y = x^2$, = 2x. If $s = 2t^3 + 4$, $= v = 6t^2$, where s = distance, t = time and v = velocity. Application to real-life situations such as maximum and minimum values, rates of change, etc.

Meaning/ concept of integration, evaluation of simple definite algebraic equations.

6. STATISTICS AND PROBABILITY

(a) Statistics

- (i) Frequency distribution
- (ii) Pie charts, bar charts, histograms, and frequency polygons
- (iii) Mean, median, and mode for both discrete and grouped data.
- (iv) Cumulative frequency curve (Ogive).

(v) Measures of Dispersion: range, semi inter-quartile/interquartile range, variance, mean deviation, and standard deviation.

(b) Probability

- (i) Experimental and theoretical probability.
- (ii) Addition of probabilities for mutually exclusive and independent events.
- (iii) Multiplication of probabilities for independent events.

7. VECTORS AND TRANSFORMATION

Vectors in a Plane

Vectors as a directed line segment.

Cartesian components of a vector

The magnitude of a vector, equal vectors, addition and subtraction of vectors, zero vector, parallel vectors, multiplication of a vector by a scalar.

Transformation in the Cartesian Plane

Reflection of points and shapes in the Cartesian Plane.

Rotation of points and shapes in the Cartesian Plane.

Translation of points and shapes in the Cartesian Plane