

IGCSE Mathematics Extended Syllabus

Topic	Syllabus Details
Syllabus Sections NUMBER 1. Number Set Notation and language 2. 3, 5, 7,8.	Pupils should be able to:- Use natural numbers, integers, prime numbers, common factors and common multiples, rational and irrational numbers, real numbers Continue a given number sequence, recognise patterns, generalise to simple algebraic statements including expressions for the nth term. Use language notation and Venn diagrams to describe sets and represent relationships between sets. Knowledge of:- $n(A), \in, \notin, A', \emptyset, A \subset B, A \cup B, A \cap B$ etc squares, square roots and cubes and cube roots should be reviewed and included. Directed numbers, ordering, the four rules, and estimation.
9. Limits of accuracy	Give appropriate upper and lower bounds for data given to a specified accuracy, extend this to solving simple problems given data specified to a specified accuracy.
10. Ratio, Proportion, Rate	Demonstrate an understanding of ratio, direct and inverse proportion and common measures of rate. Divide a quantity in a given ratio; use scales in practical situations. Calculate average speed. Express direct and inverse variation in algebraic terms and use to find unknown quantities. Increase and decrease a quantity by a given ratio .
11. Percentages	Calculate a given percentage of a quantity; express one quantity as a percentage of another; Calculate percentage increase or decrease Carry out calculations involving reverse percentages Simple and compound interest Use vulgar and decimal fractions Recognise equivalency, interchange and order between f,d+%
13, 14. ALGEBRA 17. Graphs in practical situations	Measures and Time Use cartesian coordinates in two dimensions Construct, interpret and use, graphs in practical situations including travel graphs and conversion graphs.
Syllabus Sections 20 Algebraic representation and formula 21. Algebraic Manipulation	Use letters to express generalised numbers and express basic arithmetic processes algebraically, substitute numbers for words and letters in formulae; Transform formulae Construct equations from given situations Manipulate directed numbers; use brackets and extract common factors Expand products of algebraic expression; factorise, including difference of two squares; manipulate algebraic fractions and simplify expressions such as $\frac{x^2 - 2x}{x^2 - 5x + 6}$
24. Solutions of equations and inequalities	Solve simple linear equations in one unknown solve simultaneous linear equations in two unknowns Solve quadratic equations by factorisation and either completing the square or by use of the formula; Solve simple linear inequalities.
19. Straight line graphs	Calculate the gradient of a straight line from the coordinates of two points on it; Determine the equation of a straight line parallel to a given line. Calculate the length of a straight line segment from the coordinates of its end points; Interpret and obtain the equation of a line graph in the form $y = mx + c$ Calculate the mid-points of a line segment.

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Syllabus Sections 22. Functions	Pupils should be able to:- Use function notation e.g $f(x) = 3x - 5$, $f : x \mapsto 3x - 5$ to describe simple functions, and the notation $f^{-1}(x)$ to describe their inverses; Form composite functions as defined by $gf(x) = g(f(x))$
18. Graphs of functions	Construct tables of values for functions of the form $ax + b$, $\pm x^2 + ax + b$ $\frac{a}{x}$ ($x \neq 0$) $a, b \in \mathbb{Z}$ draw and interpret such graphs; find the gradient of a straight line graph; solve linear and quadratic equations approximately by graphical methods construct tables of values and draw graphs of the form ax^n where a is a rational constant and n a simple integral value, functions of the form a^x where $a \in \mathbb{Z}^+$ estimate gradients of curves by drawing tangents; solve associated equations approximately by graphical methods.
23. Indices	Use and interpret positive, zero and negative indices Use and interpret fractional indices.
SHAPE AND SPACE 30. Locus 27,	Use the following loci and the method of intersecting loci for sets of points in two dimensions: A given distance from a given point, given distance from a straight line, equidistant from two given points, equidistant from two given intersecting straight lines This is a good time to review ruler and compass work Geometrical constructions
26. Geometric terms and relationships	Use and interpret the terms: point, line, parallel, bearing, right angle, acute, obtuse and reflex angles, perpendicular, similarity, congruence. Use and interpret vocabulary of triangles, quadrilaterals, circles, polygons and simple solid figures including nets Use the relationship between areas of similar figures and extension to volumes and surface areas of similar solids
29. Angle properties	Calculate unknown angles using the following geometrical properties : Angles at a point, angles formed within parallel lines angle properties of :- triangles and quadrilaterals, regular polygons, angle in a semi circle, angle between tangent and radius of a circle angle properties of irregular polygons, angle at the centre of a circle is twice the angle at the circumference, angles in the same segment are equal, angles in opposite segments are supplementary, cyclic quadrilaterals
Syllabus Sections 32. Trigonometry	Interpret and use three-figure bearings measured clockwise from the north (0-360°) apply Pythagoras' theorem and the sine, cosine, and tangent ratios for acute angles to the calculation of a side or of an angle of a right angled triangle (angles to 1 decimal place) [Most of this is revision of form 2 and 3 work] Solve trigonometrical problems in two dimensions involving angles of elevation depression, extend sine and cosine functions to angles between 90° and 360°, Solve problems using sine and cosine rules for any triangle. Use the formula area of a triangle = $\frac{1}{2}ab \sin C$ Solve simple trig problems in three dimensions including angle between a line and a plane
31. Measurement	Carry out calculations involving the perimeter and area of a rectangle and triangle, the circumference of a circle and area of a circle, the area of a parallelogram and a trapezium, the volume of a cuboid, prism and cylinder and the surface area of a cuboid and a cylinder [mostly revision from form 2 and 3] Solve problems using arc length and sector area as fractions of the circumference area of a circle, the surface area and volume of a sphere. Pyramid and cone. [It is not necessary to memorise the formulae for sphere, pyramid and cone]

Topic	Syllabus Details
Syllabus Sections 33. Statistics	Pupils should be able to:- Collect, classify and tabulate statistical data; Read. Interpret and draw simple inferences from tables and statistical diagrams Construct and use bar charts, pie charts, pictograms, simple frequency distributions and histograms with equal intervals Calculate the mean, median and mode for individual and discrete data and distinguish between the purposes for which they are used [Revision from forms 2 and 3] Construct and read histograms with equal and unequal intervals (areas proportional to frequencies and vertical axis labelled 'frequency density') Construct and use cumulative frequency diagrams Estimate the median, percentiles, quartiles and inter-quartile range Calculate an estimate of the mean for grouped and continuous data Identify the modal class from a grouped frequency distribution
Syllabus Sections 35. Vectors (2-D)	Describe a translation by using a vector represented by (\quad) , \overrightarrow{AB} , \mathbf{a} Add vectors and multiply by scalars. Calculate the magnitude of a vector as $\sqrt{x^2 + y^2}$ Understand and use notation $ \overrightarrow{AB} $ or $ a $ Represent vectors by directed line segments; use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors; use position vectors
36 Matrices	Display information in the form of a matrix of any order; calculate the sum and product of two matrices where appropriate; calculate the product of a matrix and a scalar quantity; use the algebra of 2×2 matrices including the zero and the identity 2×2 matrices calculate the determinant and inverse \mathbf{A}^{-1} of a non-singular matrix \mathbf{A}
28. Symmetry	Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions and properties of triangles, quadrilaterals and circles directly related to their symmetries recognise symmetry properties of the prism including cylinder) and the pyramid (including cone) use the following symmetry properties of circles:- equal chords are equidistant from the centre. The perpendicular bisector of a chord passes through the centre Tangents from an external point are equal in length
37. Transformations	Reflect simple plane figures in horizontal or vertical lines Rotate simple plane figures about the origin, vertices or mid points of edges of the figures, through multiples of 90° Construct given translations and enlargements of simple plane figures Recognise and describe reflections, rotations, translations and enlargements Use the following transformations of the plane: Reflection (M); rotation(R); translation (T) ; enlargement (E); shear (H); stretching (S) and their combinations Use the notation $RM(a) = c$ if $M(a) = b$ and $R(b) = c$ Identify and give precise descriptions of transformations connecting given figures Describe transformations using coordinates and matrices
34. Probability	Calculate the probability of a single event as either a fraction or a decimal (not a ratio) Calculate the probability of simple combined events, using possibility diagrams and tree diagrams