Mathematics Curriculum Framework
Project-Based Learning Approach

Level - Zero
(Fundamentals of Mathematics)

	Arithmetic	Algebra	Geometry	Measurement	Statistics
Python Projects	Next 10 Numbers Generator Skip Counting Star Trail Number Size Comparator Number-to-Words Converter Expanded Form Decomposer Nearest Ten Rounding Machine Happy Addition Checker Multiplication Table Builder Division Splitter with Remainder Fraction Pie Drawer Which Fraction Wins? Same-Denominator Fraction Adder Decimal Add-o-Matic Move the Dot Multiplier Multiple Finder Explorer	Pattern Extender Sequence Square Drawer Next Number Predictor Expression Evaluator Apple Cost Calculator Equation Solver Equation Truth Checker Point Plotter on Grid Diagonal Line Drawer Nth Term Finder	Equilateral Triangle Drawer Cube Property Revealer Shape Identifier by Sides Symmetric Butterfly Artist Cube Net Creator Angle Drawer with Label Straight Line Angle Checker Angle Type Classifier Turtle Path Navigator Coordinate Dot Plotter	Length Converter (cm to mm) Length Comparator Rectangle Perimeter Calculator Triangle Area Solver Cuboid Volume Calculator Capacity Comparator Time Duration Finder Money Change Calculator Mass Converter (g to kg) Temperature Adjuster	Tally Chart Maker Fruit Pictogram Drawer Bar Chart Builder Average Finder Venn Diagram Dot Plotter
Conceptual Foundations	Counting forward/backward, skip counting Number comparison & ordering Odd/even recognition, number patterns Place value up to 10,000 Number forms: digits, words, expanded Rounding (10s, 100s, 1000s) 4 operations: +, −, ×, ÷ (up to 4 digits) Times tables (1–12), long division DMAS basics Real-world word problems Proper/improper fractions, mixed numbers Fraction operations & comparisons Decimals: read, write, add/subtract Convert fractions ↔ decimals Percentages & simple increase/decrease Factors, multiples, HCF, LCM, primes	Number patterns and arithmetic sequences Rule-based and recursive sequence generation Variables as placeholders in expressions Evaluate expressions like 2n + 1 Translate word problems into algebra Solve basic linear equations (x + 4 = 7, 2x = 10) Apply inverse operations Plot points on coordinate grid (first quadrant) Draw and interpret linear graphs (e.g., y = 2x) Graph reading: distance-time, cost-time nth-term formulas (e.g., nth = 2n + 1) Straight-line graphs from tables Slope and intercept in real-world context	Common 2D shapes and polygon types 3D shapes with faces, edges, and vertices Line and rotational symmetry Cube and cuboid nets Types of angles (acute, obtuse, reflex, right) Protractor-based angle measurement Angle relationships (180°, 360°, opposite) Alternate, corresponding, co-interior angles Spatial language for position (left, right, above, below) Coordinates in first quadrant Simple movement and direction commands	Non-standard and metric length measurement Unit conversions: mm, cm, m, km Estimating and comparing lengths Perimeter of basic and compound shapes Area formulas for rectangles and triangles Volume of cubes and cuboids (V = l × w × h) Capacity in liters and milliliters Reading analog and digital clocks 12-hour and 24-hour time conversion Calculating time durations Calendar usage: days, weeks, months Coin and bill recognition Calculating totals, change, and solving word problems Mass in grams/kilograms; temperature in Celsius	Data collection via surveys and observation Qualitative vs. quantitative data types Tally charts and pictograms Bar charts and line graphs Data tables for organization Mean, median, mode, and range Choosing suitable measures of central tendency Basic set notation: ∪, ∩, {} Venn diagrams for unions and intersections
Learning Outcomes	Generates and extends number patterns Compares and orders whole numbers Applies place value to read and write numbers Rounds numbers to estimate and simplify Performs all four operations with multi-digit numbers Recalls and uses times tables fluently Solves real-world word problems with operations Understands and manipulates fractions Converts between fractions and decimals Calculates with decimals in everyday contexts Applies percentages for increase, decrease, and part-whole Identifies factors, multiples, HCF, and LCM Recognizes and works with prime numbers Uses inverse operations to check and solve Transfers number understanding into visual models	Identifies and extends number patterns Generates arithmetic and recursive sequences Understands variables in algebraic expressions Evaluates expressions using substitution Converts word problems into algebraic form Solves simple linear equations Applies inverse operations to find unknowns Plots points in the first quadrant Draws and interprets straight-line graphs Reads and explains real-world graphs Uses nth-term rules to describe sequences Constructs graphs from tables of values Interprets slope and intercept in context	Recognizes 2D shapes and polygons Identifies 3D shape properties Detects line and rotational symmetry Understands cube/cuboid nets Classifies and measures angle types Uses protractor for angle drawing Applies angle sum relationships Identifies angles on parallel lines Describes position using spatial terms Plots coordinates in first quadrant Follows direction/movement instructions	Measures length (non-standard & metric) Converts units of length (mm–km) Estimates and compares lengths Calculates perimeter (2D & compound shapes) Applies area formulas (rectangle, triangle) Computes volume (cubes, cuboids) Measures liquid capacity (liters, ml) Reads analog and digital clocks Converts between 12-hour and 24-hour time Calculates elapsed time durations Uses calendars (days, weeks, months) Recognizes coins and bills Solves money totals and change problems Measures mass and reads temperatures	Collects data via survey/observation Distinguishes data types (qualitative vs. quantitative) Creates tally charts and pictograms Interprets bar and line graphs Organizes data using tables Calculates mean, median, mode, range Selects appropriate central tendency measures Understands basic set notation (∪, ∩, {}) Uses Venn diagrams for set operations

Mathematics Curriculum Framework
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Level 1
(Mastering IGCSE, GCSE and O Levels)

	Numbers	Algebra	Geometry	Trignometry	Probability & Statistics
Python Projects	Number Set Classifier Real Number Explorer BODMAS Smart Solver Step-by-Step Arithmetic Engine Fraction Operation Toolkit Decimal↔Fraction Converter Smart Percentage Solver Compound Interest Simulator Ratio Divider Machine Index Rule Visualizer Standard Form Converter Surd Simplifier Pro HCF & LCM Calculator with Steps Venn Diagram Visualizer	Expression Simplifier Pro Bracket Buster (Expand Single & Double) Quick Quadratic Factorizer Linear Equation Cracker Simultaneous Equation Visual Solver All-in-One Quadratic Solver (Factor, Formula, Complete Square) Straight-Line Graph Plotter (y = mx + c) nth-Term Finder & Pattern Visualizer	Triangle Properties Explorer Angle Relationship Checker Circle Area & Circumference Calculator 2D Shape Area & Perimeter App 3D Volume & Surface Area Calculator Transformation Animator (Translate, Rotate, Reflect, Enlarge) Perpendicular Bisector & Angle Bisector Drawer	SOHCAHTOA Right Triangle Solver Missing Side/Angle Calculator Height/Distance Estimator (Real-World Scenarios) Pythagorean Triplet Checker Hypotenuse Finder 3-Figure Bearing Plotter	Graph Generator: Bar Chart, Histogram, Pie Chart, Box Plot Cumulative Frequency Grapher Scatter Plot with Line of Best Fit Mean, Median, Mode & Midrange Calculator Range & IQR Calculator Probability Spinner Simulator Tree Diagram Builder Venn Diagram Probability Solver Vector Addition/Subtraction Visualizer
Conceptual Foundations	Number systems: natural, integers, rational, real Arithmetic operations: +, −, ×, ÷ Order of operations (BODMAS) Fraction and decimal operations Fraction ↔ decimal conversions Recurring decimals to fractions Percentages: basic, increase/decrease, reverse Compound interest & depreciation Ratios: simplify, divide, real-life use Proportion: direct and inverse Indices: laws, negative/fractional/zero Standard form: conversions, calculations Surds: simplify, rationalize denominator Factors, multiples, HCF, LCM Divisibility rules Set theory: notation, union, intersection, complement Venn diagrams and universal sets	Simplify algebraic expressions Expand brackets (single & double) Factorize expressions and quadratics Solve linear equations (simple to complex) Rearrange formulas and expressions Solve simultaneous equations (elimination, substitution) Model and solve word problems algebraically Solve and represent inequalities Interpret compound inequalities (intro) Recognize and extend sequences Work with arithmetic/geometric sequences and nth term Use recursive patterns (basic level) Plot linear graphs from tables Understand gradient and intercept (y = mx + c) Interpret real-life graphs (distance-time, conversion) Solve quadratic equations (factor, complete square, formula)	Triangle types and angle properties Quadrilateral classification and features Polygon identification (regular/irregular) Types and classification of angles Angle rules on lines and around points Alternate, corresponding, and co-interior angles Circle parts and terminology (radius, chord, tangent) Circle measurements: circumference and area Arc length and sector area calculations Perimeter and area of 2D shapes Surface area and volume of 3D solids Unit conversions in measurement problems Performing and describing geometric transformations Understanding line and rotational symmetry Locus definitions and applications Classical constructions using compass and ruler	Identify triangle sides: opposite, adjacent, hypotenuse Apply SOHCAHTOA to find missing sides Use SOHCAHTOA to calculate missing angles Solve height and distance word problems Use Pythagoras' Theorem for side length calculation Apply converse of Pythagoras for triangle checks Solve real-world problems using Pythagorean concepts Interpret and draw 3-figure bearings Solve problems using bearings with trigonometry Apply bearings in practical and scaled diagrams	Data types: qualitative, quantitative, discrete, continuous Survey and questionnaire design Random, systematic, and stratified sampling Bar, pie, stem-leaf, histogram, and boxplot construction Scatter plots and best-fit line interpretation Central tendency: mean, median, mode, midrange Dispersion measures: range, IQR, spread analysis Probability basics and number line scale (0–1) Sample space and event analysis Venn diagrams and set-based probabilities Tree diagram and dependent/independent events Relative frequency estimation Vector notation and representation in 2D Vector addition, subtraction, and scalar multiplication Vector diagrams, direction, and journey modeling
Learning Outcomes	Understands types of numbers (natural, integers, rational, irrational, real) Applies 4 operations and BIDMAS/BODMAS Operates with fractions and decimals Converts between decimals ↔ fractions, handles recurring decimals Calculates percentages, reverse %, compound growth/decay Solves ratio and proportion problems Applies laws of indices (including negative/fractional/zero) Works with standard form (conversion & calculation) Simplifies and rationalizes surds Identifies primes, HCF, LCM, applies divisibility rules Uses basic set notation and Venn diagrams	Expression simplification & manipulation Bracket expansion & factorization skills Linear and quadratic equation solving Formula rearrangement fluency Inequality representation & interpretation Sequential pattern recognition nth-term formula construction Coordinate plotting and graph interpretation Understanding slope and intercept in context Problem modeling with algebraic expressions Applying methods for simultaneous equations Graphing real-world linear relationships Solving and verifying quadratics using multiple methods	Classify and compare 2D/3D geometric figures Identify triangle and quadrilateral properties Recognize and draw various angle types Apply angle rules in geometry problems Use circle terminology and formulas Calculate perimeter, area, surface area, and volume Perform and describe transformations geometrically Analyze symmetry in 2D shapes Execute ruler-and-compass constructions Solve real-world problems using loci and geometry tools	Recognize and label sides in right-angled triangles Use sine, cosine, and tangent ratios accurately Solve right-angled triangle problems step-by-step Interpret and solve practical problems involving height, distance, or angles Apply Pythagorean Theorem with numeric and word-based inputs Check triangle properties using reverse logic (converse of theorem) Understand and apply directional bearings using 3-digit format Combine trigonometry and bearings in multi-step problem solving	Classify and collect different types of data Design effective surveys and apply sampling techniques Create accurate and readable data visualizations Analyze data using mean, median, mode, and range Understand and compare spread using IQR and box plots Calculate basic probabilities and use structured diagrams Apply logic with Venn and tree diagrams Perform vector operations algebraically and geometrically Interpret and solve real-life problems using vector paths

Mathematics Curriculum Framework
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Level 2
(Mastering A Level Mathematics)

	Pure Mathematics	Differential & Integral Calculus	Probability	Statistics	Mechanics
Python Projects	Composite Function Visualizer Inverse Function Grapher Function Transformation Simulator Arithmetic Sequence Generator Geometric Sequence Generator Sigma Summation Calculator Infinite Series Convergence Checker Sequence Pattern Visualizer Trig Identity Verifier Trig Graph Generator (sin, cos, tan) Radian–Degree Converter Trig Equation Solver with Graph Output Circle Equation Plotter Line–Circle Intersection Visualizer	Derivative Plotter Tangent/Normal Line Drawer Turning Point Analyzer Maxima/Minima Finder with Graph Area Under Curve Simulator Definite Integral Visual Tool Integration by Substitution App Volume of Revolution Visualizer	Descriptive Summary Generator Boxplot and Histogram Builder Scatter Plot with Regression Line Tool Probability Tree Diagram Simulator Conditional Probability Solver Venn Diagram Calculator Binomial Distribution Simulator Normal Distribution Grapher Z-Score Calculator Hypothesis Test Simulator (1-tail and 2-tail)	Correlation Coefficient Grapher Regression Line Calculator with Scatter Plot Residual Plot Generator SUVAT Motion Simulator Projectile Motion Visualizer SHM Energy Oscillator 1D Collision Simulator Force Equilibrium Explorer Motion Path Tracer	SUVAT Equation Solver Projectile Motion Simulator Force Component Analyzer Equilibrium Condition Visualizer Work-Energy-Power Calculator Momentum & Collision Simulator Centripetal Force Demonstrator SHM Motion Visualizer
Conceptual Foundations	Polynomial factorization and root solving Function transformations and domain analysis Inverse and composite function operations Arithmetic and geometric sequence rules Sigma notation and series summation Convergence of infinite geometric series Exponent and logarithm laws Logarithmic and exponential equation solving Coordinate geometry of lines and circles Parametric equations of conic sections Vector operations in 2D and 3D Dot product and angle between vectors Vector line and plane equations Complex number arithmetic and i notation Polar and exponential form of complex numbers De Moivre's Theorem and complex powers Matrix algebra and multiplication Determinants and inverse matrices Trigonometric function graphs and transformations Trigonometric identities and equation solving	Analytical limit evaluation Continuity and types of discontinuities Power, product, quotient, and chain rules Implicit and parametric differentiation Tangents, normals, and slopes of curves Stationary points and curve sketching Maxima, minima, and optimization Rate of change and related rates Indefinite and definite integration Area under and between curves Substitution and integration by parts Partial fraction integration Volume of revolution techniques First- and second-order differential equations Numerical methods: trapezium rule, Newton-Raphson	Sample space and event definitions Addition rule for probability Multiplication rule for independent events Complementary and mutually exclusive events Conditional probability concepts Tree diagram structures and interpretation Venn diagrams for event visualization Bayes' theorem for conditional updates Discrete probability distributions Binomial distribution properties and usage Poisson distribution fundamentals Geometric distribution basics Continuous distributions overview Standard normal distribution and Z-scores Normal approximation to binomial	Measures of central tendency: mean, median, mode Measures of spread: range, IQR, variance, standard deviation Interpretation of skewness in data sets Histogram and boxplot construction and analysis Cumulative frequency and percentile reading Scatter plot interpretation and data trend analysis Random, stratified, and systematic sampling Understanding sampling distributions Central Limit Theorem application Formulating null and alternative hypotheses Setting significance levels and defining critical regions Performing one- and two-tailed hypothesis tests Applying t-tests and chi-square tests Pearson correlation and strength of association Simple linear regression and residual analysis	Displacement, velocity, and acceleration definitions SUVAT equations for constant acceleration Graphical interpretation of motion Horizontal and vertical components in projectile motion Newton's laws of motion and applications Resultant force and equilibrium conditions Frictional force modeling (limiting/static/kinetic) Vector resolution of forces Work-energy principle and calculations Kinetic and potential energy relationships Power as work done per unit time Momentum conservation in collisions Impulse and change in momentum Centripetal force and angular velocity in circular motion SHM definitions and the differential equation
Learning Outcomes	Apply the Remainder and Factor Theorems Construct and manipulate function compositions Determine domain, range, and inverse of functions Generate terms in arithmetic and geometric sequences Use sigma notation for finite/infinite series Evaluate and rearrange exponential/logarithmic expressions Solve coordinate geometry problems using line/circle equations Work with conic sections and parametric forms Perform vector arithmetic and scalar multiplication Solve 3D geometry problems using vectors and dot product Represent and manipulate complex numbers in Cartesian/polar form Plot and interpret Argand diagrams Apply De Moivre's theorem to powers and roots Perform matrix operations and solve systems using inverses Sketch and transform graphs of trig functions Use compound, double, and half-angle identities Solve trig equations algebraically and graphically Work with reciprocal trig functions and identities Interpret inverse trig functions with proper domains Apply trig and complex numbers in modeling contexts	Evaluate limits and determine function behavior near points Identify continuity and discontinuity from expressions and graphs Apply derivative rules for complex expressions Differentiate implicit and parametric forms Compute slopes of tangents and normals Analyze turning points and classify extremum Solve real-life optimization problems using calculus Use calculus to model rates of change Perform standard and advanced integration techniques Compute area bounded by curves and axes Use substitution and parts in definite integrals Decompose expressions into partial fractions for integration Derive and solve differential equations from physical contexts Model motion, decay, and SHM with differential equations Estimate roots and areas using iterative and trapezoidal methods	Construct and analyze sample spaces Apply addition and multiplication probability rules Identify and compute complementary events Determine event independence Use conditional probability formulas Solve multi-step problems using tree diagrams Visualize and compute intersections using Venn diagrams Apply Bayes' theorem in contextual problems Calculate probabilities using binomial distribution Model rare events using Poisson distribution Analyze memoryless processes using geometric distribution Interpret probability density in continuous distributions Use Z-tables to compute normal probabilities Standardize variables using Z-scores Approximate binomial probabilities with normal curve	Calculate and compare central tendency measures Compute variance, standard deviation, and IQR Interpret skewed distributions visually and numerically Construct and analyze histograms and boxplots Plot and analyze scatter plots and identify correlation Select appropriate sampling methods and justify choice Model sampling distributions and apply CLT logic Design and conduct hypothesis tests with conclusions Use critical values and significance thresholds Differentiate between one- and two-tailed tests Apply t-tests for small sample inference Conduct chi-square tests for independence/goodness-of-fit Calculate correlation coefficients and interpret values Build linear regression equations and make predictions Analyze residuals for model fit and accuracy	Calculate displacement, velocity, and acceleration from motion data Apply SUVAT formulas to solve kinematics problems Analyze motion using velocity-time and displacement-time raphs Resolve projectile motion into perpendicular components Apply Newton's laws to dynamic and static systems Compute resultant forces and verify equilibrium Determine and apply friction forces in motion problems Resolve forces into perpendicular components Calculate work done by constant and variable forces Compute kinetic, potential energy, and total mechanical energy Solve problems involving power and energy transfer Use momentum conservation in 1D and 2D collisions Calculate impulse using force-time graphs Determine angular velocity and centripetal force Analyze SHM motion graphs and solve SHM equations