

## 1. Number Systems, Standard Form, and Numerical Precision

- Real numbers: rational and irrational numbers
- Powers, roots, exponent laws, and rational exponents where appropriate
- Surds and radicals: simplifying and operating at an age-appropriate level
- Standard form / scientific notation
- Approximation, rounding, significant figures, and decimal places
- Bounds, intervals, absolute value, and error checking
- Percentage error and relative error where appropriate
- Unit consistency and dimensional awareness in practical calculations
- Estimation and reasonableness in STEM contexts

## 2. Algebraic Expressions, Formulae, and Manipulation

- Algebraic notation, structure, and equivalent forms
- Expanding and factorising expressions, including quadratics
- Polynomial operations at an age-appropriate level
- Algebraic identities and equivalence
- Rational expressions: simplifying, restrictions, and invalid steps where appropriate
- Rearranging formulae and changing the subject
- Substitution into formulae from Math and Science contexts
- Algebraic fractions and simplification where appropriate
- Algebraic validity and common errors

## 3. Equations, Inequalities, and Systems

- Linear equations and multi-step equations
- Quadratic equations: factorising, completing the square, formula, or graphical methods where appropriate
- Simultaneous equations: linear systems and introductory linear-quadratic systems where appropriate
- Inequalities and compound inequalities
- Interval notation and graphical representation
- Equations and inequalities from real contexts
- Constraints in optimisation, science, and finance problems
- Extraneous solutions and solution checking
- Intersections and solutions interpreted through graphs

## 4. Functions, Graphs, Sequences, and Mathematical Modelling

- Function concept: input, output, domain, range, and notation
- Linear functions: gradient, intercepts, equations, and rate of change
- Quadratic functions: roots, vertex, axis of symmetry, transformations, and contextual interpretation
- Exponential functions: growth, decay, repeated percentage change, and modelling contexts
- Graph transformations: translations, reflections, stretches, and scale changes
- Piecewise and contextual graphs where appropriate
- Tables, graphs, equations, and verbal models

- Arithmetic and geometric sequences
- Recursive and explicit sequence rules
- Links between sequences, functions, and repeated change
- Modelling real situations and recognising assumptions and limitations

## **5. Geometry, Coordinate Geometry, and Mensuration**

- Properties of triangles, quadrilaterals, polygons, and circles
- Congruence and similarity
- Coordinate geometry: distance, midpoint, gradient, and equations of straight lines
- Parallel and perpendicular lines in coordinate contexts
- Circle geometry at an age-appropriate level
- Transformations: reflection, translation, rotation, enlargement, and combinations
- Scale factor effects on length, area, and volume
- Perimeter and area of common and composite shapes
- Surface area and volume of common solids and composite solids
- Geometric modelling and optimisation at an introductory level
- Nets, projections, and spatial visualisation where appropriate

## **6. Trigonometry, Vectors, and Measurement in Context**

- Pythagorean theorem and distance applications
- Sine, cosine, and tangent in right triangles
- Solving for sides and angles in right triangles
- Angle of elevation and depression
- Bearings and direction
- Sine rule, cosine rule, and area of triangles using trigonometry where appropriate
- Trigonometric modelling in diagrams and practical tasks
- Introductory vectors: magnitude, direction, components, addition, and scalar multiplication where appropriate
- Choosing appropriate methods for measurement and spatial problems

## **7. Data, Statistics, Probability, and Uncertainty**

- Data collection, sampling, bias, representativeness, and data quality
- Tables, frequency tables, grouped data, and spreadsheets where appropriate
- Statistical displays: bar charts, histograms, line graphs, scatter plots, box plots, cumulative displays, and comparative graphs
- Measures of centre: mean, median, and mode
- Measures of spread: range, interquartile range, and introductory standard deviation where appropriate
- Comparing distributions and interpreting outliers
- Correlation, trend, and correlation vs causation
- Probability of simple, compound, independent, and dependent events where appropriate
- Tree diagrams, Venn diagrams, two-way tables, sample spaces, and conditional probability at an introductory level where appropriate
- Experimental vs theoretical probability
- Uncertainty, reliability, error, and limitations in data-based conclusions

## **8. Financial Math, Optimisation, and STEM Modelling**

- Multi-step and unfamiliar problem solving
- Modelling with formulae, functions, graphs, statistics, diagrams, and constraints
- Approximation, bounds, sensitivity, and reasonableness checks
- Optimisation at an introductory level: cost, time, materials, efficiency, capacity, and performance
- Financial math: budgeting, unit price, profit/loss, discount, tax, mark-up, simple and compound interest, depreciation, and value comparison
- Scientific modelling with assumptions and limitations
- Decision making using quantitative evidence
- Communicating mathematical reasoning with units, assumptions, diagrams, and limitations