Royal Tutors Year 7 Mathematics Curriculum

1. Number

- **Place Value & Number Sense**: Extend understanding of the number system to include decimals, fractions, powers, and roots.

- **Arithmetic Operations**: Perform all four operations with integers, decimals, and fractions, including calculations with negative numbers.

- **Factors & Multiples**: Identify and work with factors, multiples, prime numbers, and common factors/multiples.

- **Powers & Roots**: Understand and use squares, cubes, square roots, and cube roots.

- **Order of Operations**: Apply the correct order of operations in calculations, including the use of brackets.

2. Algebra

- **Algebraic Notation**: Use and interpret algebraic notation, including coefficients, brackets, and powers.

- **Simplifying Expressions**: Simplify and manipulate algebraic expressions by collecting like terms and expanding brackets.

- **Equations**: Form and solve linear equations in one variable.

- **Sequences**: Generate terms of a sequence from a term-to-term or position-to-term rule; find the nth term of linear sequences.

- **Graphs**: Plot and interpret linear graphs; understand the relationship between algebraic equations and graphical representations.

3. Ratio, Proportion, and Rates of Change

- **Ratio**: Understand and use ratio notation; simplify ratios and divide quantities into given ratios.

- **Proportion**: Solve problems involving direct proportion; use unitary methods to solve ratio and proportion problems.

- **Percentages**: Calculate percentages of quantities; express one quantity as a percentage of another; solve problems involving percentage increase and decrease.

- **Rates of Change**: Understand and solve problems involving speed, density, and other rates.

4. Geometry and Measures

- **Properties of Shapes**: Classify and understand properties of 2D and 3D shapes, including triangles, quadrilaterals, and circles.

- **Angles**: Measure and calculate angles; understand angle properties of parallel lines and polygons.

- **Transformations**: Perform and describe translations, rotations, reflections, and enlargements of shapes.

- **Coordinates**: Plot points and draw shapes on the coordinate plane in all four quadrants.

- **Perimeter, Area, and Volume**: Calculate perimeter and area of 2D shapes; understand and calculate the volume of 3D shapes.

- **Units and Measurement**: Use standard units of measure and convert between different units; understand and use scale factors.

5. Probability

- **Basic Probability**: Understand and use the probability scale from 0 to 1; calculate probabilities of single events.

- **Experiments and Outcomes**: List all possible outcomes of a single event; conduct simple probability experiments and record outcomes.

- **Theoretical and Experimental Probability**: Compare theoretical probabilities with experimental results; understand that probabilities of all possible outcomes sum to 1.

6. Statistics

- **Data Collection and Representation**: Collect, organize, and represent data using tables, bar charts, pie charts, and line graphs.

- **Averages and Range**: Calculate and interpret mean, median, mode, and range of data sets.

- **Interpreting Data**: Analyze and compare data distributions; interpret statistical diagrams and draw conclusions.

Royal Tutors Year 8 Mathematics Curriculum

Number

- **Place value and ordering:** Understand place value for integers, decimals and measures of any size; order and compare positive and negative integers, fractions and decimals using number lines and inequality symbols.

- **Rounding and estimation:** Round numbers (including decimals) and measures to an appropriate accuracy (decimal places or significant figures) and use approximation to estimate and check answers.

- **Arithmetic with integers and decimals:** Perform the four operations (add, subtract, multiply, divide) with integers and decimals (including using formal written methods and brackets).

- **Fractions:** Convert between improper and mixed fractions, and between fractions and decimals (terminating and recurring). Add, subtract, multiply and divide fractions (including finding fractions of quantities). Simplify fractions and order fractions by common denominators or decimal conversion.

- **Percentages:** Understand percentage as "number of parts per hundred"; express one quantity as a percentage of another. Calculate percentages of amounts (including >100%) and percentage increases/decreases. Interpret percentages and percentage changes as decimals or fractions.

- **Factors and multiples:** Use vocabulary of factors, multiples, primes, common factors/multiples. Find highest common factor (HCF) and lowest common multiple (LCM) of numbers, and write numbers as prime factor products

- **Powers (indices) and roots:** Use integer powers and corresponding roots (square, cube and higher); evaluate and compare simple numerical expressions with powers. Recognise and use powers of 2, 3, 4, 5 etc., and distinguish exact roots and their decimal approximations

- **Standard form:** Interpret and compare numbers written in standard (scientific) form $A \times 10^n$ where $1 \le A < 10$ and n is an integer. Practice converting large/small numbers to and from standard form.

Algebra

- **Algebraic notation:** Understand and use symbols and notation (e.g. a×ba), variables and expressions. Identify terms, factors and coefficients in expressions. Write simple algebraic expressions from verbal descriptions.

- **Manipulating expressions:** Expand brackets and collect like terms to simplify linear expressions. Factorise simple algebraic expressions by taking common factors (e.g. writing 3x+6 as 3(x+2)).

- **Equations:** Solve one-step and two-step linear equations in one variable (including equations with brackets or with fractional coefficients). Form and solve equations to match word problems.

- **Inequalities:** Solve simple linear inequalities and represent the solution set on a number line (remembering to reverse the inequality sign when multiplying/dividing by a negative)

- **Graphs of functions:** Plot straight-line (linear) graphs from equations (e.g. y =mx+c) or tables. Interpret the gradient and intercept in context (often extended KS3 content). Recognise how changing a formula affects the graph (link between algebra and geometry).

- **Sequences:** Recognise and continue number sequences (arithmetic sequences), and find the *nth* term. Use the "general term" of a sequence to generate terms. Relate sequences to linear functions where appropriate.

- **Formulae and substitution:** Use given formulae (from maths and other subjects) by substituting values to calculate results. Rearrange simple formulae to make a specified variable the subject

Geometry and Measures

- **Angle properties:** Understand angle types (acute, obtuse, straight, reflex) and angle relationships. Identify and use alternate and corresponding angles made by parallel lines. Know that the sum of angles in a triangle is 180° and in a quadrilateral is 360°. Use the exterior-angle rule in triangles.

- **Properties of shapes:** Classify 2D shapes (triangles: equilateral, isosceles, right; quadrilaterals: parallelogram, trapezium, etc.) and 3D shapes (prisms, cylinders, cones, spheres). Use geometrical properties (sides, angles, symmetry) to classify shapes. Know that congruent shapes have equal corresponding sides/angles.

- **Perimeter and area:** Calculate the perimeter of 2D shapes. Use and apply formulae for area of triangles, rectangles, parallelograms, trapeziums and compound shapes. Use units of area (cm², m², etc.) correctly.

- **Volume and surface area:** Calculate volume (and surface area) of right prisms and cuboids and of spheres/cylinders/cones if introduced. Use volume formulae for cuboids and cylinders

- **Geometric reasoning:** Apply Pythagoras' theorem (often introduced at KS3) to find missing side lengths in right-angled triangles. Use congruence and similarity to reason about shapes and sizes.

- **Transformations:** Understand and perform transformations on 2D shapes: reflections (mirror lines), rotations (specify center and angle), translations (vectors) and enlargements (scale factors). Identify lines of symmetry and order of rotational symmetry of shapes. Use scale factors in enlargements (with centre of enlargement)

- **Coordinates:** Plot points on a coordinate plane and read coordinates. Find midpoints and use the distance formula (introductory level) for points in the plane. Graph linear functions (as above).

- **Units and measurement:** Convert between units of length, mass, volume, time, etc. (metric/imperial) and use appropriate units in context. Use bearings to specify direction. Understand scale in similar shapes and maps (e.g. "1 cm represents 100 m").

Ratio and Proportion

- **Ratio notation:** Interpret and use ratios in the form a:b. Divide quantities into given ratios (e.g. splitting 20 in a 3:2 ratio gives parts 12 and 8). Reduce ratios to simplest form.

- **Equivalent ratios:** Scale ratios up/down using multiplication or division. Solve direct proportion problems using ratio tables or unitary method (e.g. if 5 items cost £15, 1 item costs £3).

- **Inverse proportion:** Understand contexts of inverse proportion (e.g. if one quantity doubles, the other halves) in simple cases.

- **Similar shapes and scale factor:** Recognise similar shapes and use scale factors to find missing lengths, areas or volumes of corresponding shapes (e.g. two similar triangles with scale factor 2 have area ratio 4). Use compound units and density/speed in proportion problems if covered.

- **Percentages (extension):** Relate percentages to ratio (e.g. 25% is a 1:4 ratio). Continue to work with percentage increase/decrease and compare two quantities by percentages. (Percentages overlap with Number strand.)

- **Rates:** Solve problems involving speed, density or pricing where rate or density is constant (e.g. speed = distance/time, unit pricing as price per kilogram).

Statistics

- **Data collection and representation:** Collect data and represent it using appropriate charts and tables. Create and interpret frequency tables, bar charts, histograms (for grouped data), pie charts and line graphs. Choose the appropriate graphical representation for discrete vs continuous data.

- **Measures of average:** Calculate mean, median and mode for ungrouped data. For grouped data, estimate mean and mode from frequency tables. Understand the concept of an average

- **Measure of spread:** Calculate range, and if introduced, interquartile range, to describe spread of data.

- **Comparing data sets:** Compare two or more sets of data using statistical measures. Interpret and draw conclusions from comparative charts (e.g. side-by-side box plots or comparative bar charts).

- **Misleading data:** Recognise potential biases or misleading representations (e.g. truncated axes, inappropriate averaging) in graphs.

- **Statistical enquiry:** Plan simple statistical surveys, decide how to collect data, and interpret results in context. Summarise the data using chosen statistics and graphical displays

Probability

- **Basic probability:** Understand probability scale from 0 (impossible) to 1 (certain). Use vocabulary (certain, likely, even chance, unlikely, impossible).

- **Simple experiments:** Calculate theoretical probability of single events (e.g. flipping coins, rolling dice) by listing all equally likely outcomes (sample space), Express probability as a fraction, decimal or percentage.

- **Experimental probability:** Conduct simple probability experiments (e.g. coin tosses) and compare experimental (observed) probability with theoretical.

- **Compound events:** Use sample space diagrams, two-way tables or probability trees for combined events (e.g. 2-stage experiments). Use systematic lists or trees to calculate probabilities of multi-step experiments

- **Combined outcomes: Understand and calculate the probability of "and" (intersection) and "or" (union) events for simple cases.**

- **Fairness and expectation: Discuss fairness of games (e.g. is a die fair?), and use probability language to explain outcomes. (These often set the stage for Year 9 probability work.)**

Royale Tutors Year 9 Mathematics Curriculum

1. Number

- **Consolidation of Number Skills**: Reinforce understanding of integers, decimals, fractions, and percentages, applying these in varied contexts.

- **Standard Form**: Interpret and compare numbers in standard form, particularly when dealing with very large or small quantities.

- **Indices and Roots**: Work with positive, negative, and fractional indices; understand and calculate square and cube roots.

- **Surds**: Simplify expressions involving surds and perform operations with them.

2. Algebra

- **Expanding and Factorising**: Expand products of two or more binomials and factorise quadratic expressions.

- **Solving Equations**: Solve linear and quadratic equations, including those with the unknown on both sides or involving brackets.

- **Inequalities**: Solve linear inequalities and represent solutions on a number line.

- **Graphs**: Plot and interpret linear and quadratic graphs; understand gradients and intercepts.

- **Sequences**: Recognise and generate arithmetic and geometric sequences; find the nth term.

3. Ratio, Proportion, and Rates of Change

- **Direct and Inverse Proportion**: Solve problems involving proportional relationships, including graphical representations.

- **Percentages**: Calculate percentage increases, decreases, and reverse percentages; solve problems involving compound interest and depreciation.

- **Rates of Change**: Understand and calculate rates such as speed, density, and pressure.

- **Trigonometry Introduction**: Begin to explore trigonometric ratios (sine, cosine, tangent) in right-angled triangles.

4. Geometry and Measures

- **Properties of Shapes**: Explore properties of polygons and circles; understand terms like congruence and similarity.

- **Angles**: Calculate angles in various contexts, including polygons and intersecting lines.

- **Transformations**: Perform and describe translations, rotations, reflections, and enlargements on the coordinate plane.

- **Pythagoras' Theorem**: Apply the theorem to find missing sides in right-angled triangles.

- **Surface Area and Volume**: Calculate surface areas and volumes of 3D shapes like prisms, cylinders, and spheres.

5. Probability

- **Theoretical Probability**: Calculate probabilities of single and combined events using appropriate methods.

- **Experimental Probability**: Conduct experiments to estimate probabilities and compare with theoretical values.

- **Venn Diagrams and Tree Diagrams**: Use these tools to represent and solve probability problems involving multiple events.

6. Statistics

- **Data Collection and Representation**: Gather data and represent it using bar charts, histograms, pie charts, and scatter graphs.

- **Averages and Range**: Calculate mean, median, mode, and range; interpret these in context.

- **Cumulative Frequency and Box Plots**: Construct and interpret cumulative frequency graphs and box plots to analyse data distributions.

- **Correlation**: Understand and interpret correlation in scatter graphs, distinguishing between positive, negative, and no correlation.