Secondary Stage 7 Mathematics for Year 7

Number

Integers, powers and roots

- Recognise negative numbers as positions on a number line, and order, add and subtract positive and negative integers in context.
- Recognise multiples, factors, common factors, primes (all less than 100), making use of simple tests of divisibility; find the lowest common multiple in simple cases; use the 'sieve' for generating primes developed by Eratosthenes.
- Recognise squares of whole numbers to at least 20 × 20 and the corresponding square roots; use the notation 7^2 and $\sqrt{49}$.

Place value, ordering and rounding

- Interpret decimal notation and place value; multiply and divide whole numbers and decimals by 10, 100 or 1000.
- Order decimals including measurements, changing these to the same units.
- Round whole numbers to the nearest 10, 100 or 1000 and decimals, including measurements, to the nearest whole number or one decimal place.

Fractions, decimals, percentages, ratio and proportion

- Recognise the equivalence of simple fractions, decimals and percentages.
- Simplify fractions by cancelling common factors and identify equivalent fractions; change an improper fraction to a mixed number, and vice versa; convert terminating decimals to fractions, e.g. 0.23 = 23/100.
- Compare two fractions by using diagrams, or by using a calculator to convert the fractions to decimals, e.g. and 3/5 and 13/20.
- Add and subtract two simple fractions, e.g. 1/8 + 9/8, 11/12 – 5/6; find fractions of quantities (whole number answers); multiply a fraction by an integer.
- Understand percentage as the number of parts in every 100; use fractions and percentages to describe parts of shapes, quantities and measures.
- Calculate simple percentages of quantities (whole number answers) and express a smaller quantity as a fraction or percentage of a larger one.
- Use percentages to represent and compare different quantities.
- Use ratio notation, simplify ratios and divide a quantity into two parts in a given ratio.
- Recognise the relationship between ratio and proportion.
- Use direct proportion in context; solve simple problems involving ratio and direct proportion.

Calculation

Mental strategies

- Consolidate the rapid recall of number facts, including positive integer complements to 100, multiplication facts to 10 × 10 and associated division facts.
- Use known facts and place value to multiply and divide two-digit numbers by a single-digit number, e.g. 45 × 6, 96 ÷ 6.
- Know and apply tests of divisibility by 2, 3, 5, 6, 8, 9, 10 and 100.
- Use known facts and place value to multiply simple decimals by one-digit numbers, e.g. 0.8 × 6.
- Calculate simple fractions and percentages of quantities, e.g. one quarter of 64, 20% of 50 kg.
- Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.
- Use the order of operations, including brackets, to work out simple calculations.

Addition and subtraction

- Add and subtract integers and decimals, including numbers with different numbers of decimal places.

Multiplication and division

- Multiply and divide decimals with one and/or two places by single-digit numbers, e.g. 13.7 × 8, 4.35 ÷ 5.
- Know that in any division where the dividend is not a multiple of the divisor there will be a remainder, e.g. 157 ÷ 25 = 6 remainder 7.
- The remainder can be expressed as a fraction of the divisor, e.g. 157 ÷ 25 = 6 7/25.
- Know when to round up or down after division when the context requires a whole-number answer.

Algebra

Expressions, equations and formulae

- Use letters to represent unknown numbers or variables; know the meanings of the words *term*, *expression* and *equation*.
- Know that algebraic operations follow the same order as arithmetic operations.
- Construct simple algebraic expressions by using letters to represent numbers.
- Simplify linear expressions, e.g. collect like terms; multiply a constant over a bracket.
- Derive and use simple formulae, e.g. to change hours to minutes.
- Substitute positive integers into simple linear expressions/formulae.
- Construct and solve simple linear equations with integer coefficients (unknown on one side only), e.g. $2x = 8$, $3x + 5 = 14$, $9 - 2x = 7$.

Sequences, functions and graphs

- Generate terms of an integer sequence and find a term given its position in the sequence; find simple term-to-term rules.
- Generate sequences from spatial patterns and describe the general term in simple cases.
- Represent simple functions using words, symbols and mappings.
- Generate coordinate pairs that satisfy a linear equation, where y is given explicitly in terms of x; plot the corresponding graphs;
- recognise straight-line graphs parallel to the x- or y-axis.

Geometry

Shapes and geometric reasoning

- Identify, describe, visualise and draw 2D shapes in different orientations.
- Use the notation and labelling conventions for points, lines, angles and shapes.
- Name and identify side, angle and symmetry properties of special quadrilaterals and triangles, and regular polygons with 5, 6 and 8 sides.
- Estimate the size of acute, obtuse and reflex angles to the nearest 10°.
- Start to recognise the angular connections between parallel lines, perpendicular lines and transversals.
- Calculate the sum of angles at a point, on a straight line and in a triangle, and prove that vertically opposite angles are equal; derive and use the property that the angle sum of a quadrilateral is 360°.
- Solve simple geometrical problems by using side and angle properties to identify equal lengths or calculate unknown angles, and explain reasoning.
- Recognise and describe common solids and some of their properties, e.g. the number of faces, edges and vertices.
- Recognise line and rotation symmetry in 2D shapes and patterns; draw lines of symmetry and complete patterns with two lines of symmetry; identify the order of rotation symmetry.
- Use a ruler, set square and protractor to:
    - measure and draw straight lines to the nearest millimetre
    - measure and draw acute, obtuse and reflex angles to the nearest degree

- draw parallel and perpendicular lines
- construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA)
- construct squares and rectangles
- construct regular polygons, given a side and the internal angle.

- Read and plot coordinates of points determined by geometric information in all four quadrants.
- Transform 2D points and shapes by:
  - reflection in a given line
  - rotation about a given point
  - translation.
- Know that shapes remain congruent after these transformations.

Measure

Length, mass and capacity

- Choose suitable units of measurement to estimate, measure, calculate and solve problems in everyday contexts.
- Know abbreviations for and relationships between metric units; convert between:
  - kilometres (km), metres (m), centimetres (cm), millimetres (mm)
  - tonnes (t), kilograms (kg) and grams (g)
  - litres (l) and millilitres (ml).
- Read the scales on a range of analogue and digital measuring instruments.

Time and rates of change

- Draw and interpret graphs in real life contexts involving more than one stage, e.g. travel graphs.
- Know the relationships between units of time; understand and use the 12-hour and 24-hour clock systems; interpret timetables; calculate time intervals.

Area, perimeter and volume

- Know the abbreviations for and relationships between square metres (m2), square centimetres (cm2), square millimetres (mm2).
- Derive and use formulae for the area and perimeter of a rectangle; calculate the perimeter and area of compound shapes made from rectangles.
- Derive and use the formula for the volume of a cuboid; calculate volumes of cuboids.
- Calculate the surface area of cubes and cuboids from their nets.

Handling data

Planning and collecting data

- Decide which data would be relevant to an enquiry and collect and organise the data.
- Design and use a data collection sheet or questionnaire for a simple survey.
- Construct and use frequency tables to gather discrete data, grouped where appropriate in equal class intervals.

Processing and presenting data

- Find the mode (or modal class for grouped data), median and range.
- Calculate the mean, including from a simple frequency table.
- Draw and interpret:
  - bar-line graphs and bar charts
  - frequency diagrams for grouped discrete data
  - simple pie charts
  - pictograms.

Interpreting and discussing results

- Draw conclusions based on the shape of graphs and simple statistics.
- Compare two simple distributions using the range and the mode, median or mean.

Probability

- Use the language of probability to describe and interpret results involving likelihood and chance.
- Understand and use the probability scale from 0 to 1.
- Find probabilities based on equally likely outcomes in simple contexts.
- Identify all the possible mutually exclusive outcomes of a single event.
- Use experimental data to estimate probabilities.
- Compare experimental and theoretical probabilities in simple contexts.

Problem solving

Using techniques and skills in solving mathematical problems

- Use the laws of arithmetic and inverse operations to simplify calculations with whole numbers and decimals.
- Manipulate numbers, algebraic expressions and equations, and apply routine algorithms.
- Understand everyday systems of measurement and use them to estimate, measure and calculate.
- Recognise and use spatial relationships in two and three dimensions.
- Draw accurate mathematical diagrams, graphs and constructions.
- Check results of calculations by using inverse operations.
- Estimate, approximate and check their working.
- Solve word problems involving whole numbers, percentages, decimals, money or measures: choose operations and mental or written methods appropriate to the numbers and context, including problems with more than one step.

Using understanding and strategies in solving problems

- Identify and represent information or unknown numbers in problems, making correct use of numbers, symbols, words, diagrams, tables and graphs.
- Recognise mathematical properties, patterns and relationships, generalising in simple cases.
- Work logically and draw simple conclusions.
- Relate results or findings to the original context and check that they are reasonable.
- Record and explain methods, results and conclusions.
- Discuss and communicate findings effectively, orally and in writing.