

Stage 8

N Number

Ni Integers, powers and roots

- **8Ni1** Add, subtract, multiply and divide integers
- **8Ni2** Identify and use multiples, factors, common factors, highest common factors, lowest common multiples and primes; write a number in terms of its prime factors, e.g. $500 = 2^2 \times 5^3$
- **8Ni3** Calculate squares, positive and negative square roots, cubes and cube roots; use the notation $\sqrt{49}$ and $\sqrt[3]{64}$ and index notation for positive integer powers

Np Place value, ordering and rounding

- **8Np1** Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01
- **8Np2** Order decimals, including measurements, making use of the =, \neq , > and < signs
- **8Np3** Round whole numbers to a positive integer power of 10, e.g. 10, 100, 1000 or decimals to the nearest whole number or one or two decimal places

Nf Fractions, decimals, percentages, ratio and proportion

- **8Nf1** Find equivalent fractions, decimals and percentages by converting between them
- **8Nf2** Convert a fraction to a decimal using division; know that a recurring decimal is a fraction
- **8Nf3** Order fractions by writing with common denominators or dividing and converting to decimals
- **8Nf4** Add and subtract fractions and mixed numbers; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction
- **8Nf5** Calculate and solve problems involving percentages of quantities and percentage increases or decreases; express one given number as a fraction or percentage of another
- **8Nf6** Use equivalent fractions, decimals and percentages to compare different quantities
- **8Nf7** Simplify ratios, including those expressed in different units; divide a quantity into more than two parts in a given ratio
- **8Nf8** Use the unitary method to solve simple problems involving ratio and direct proportion

Nc Calculation

Mental strategies

- **8Nc1** Use known facts to derive new facts, e.g. given $20 \times 38 = 760$, work out 21×38
- **8Nc2** Recall squares to 20×20 , cubes to $5 \times 5 \times 5$, and corresponding roots
- **8Nc3** Recall simple equivalent fractions, decimals and percentages
- **8Nc4** Use known facts and place value to multiply and divide simple fractions
- **8Nc5** Use known facts and place value to multiply and divide simple decimals, e.g. 0.07×9 , $2.4 \div 3$
- **8Nc6** Use known facts and place value to calculate simple fractions and percentages of quantities
- **8Nc7** Recall relationships between units of measurement
- **8Nc8** Solve simple word problems including direct proportion problems
- **8Nc9** Use the laws of arithmetic and inverse operations to simplify calculations with integers and fractions
- **8Nc10** Use the order of operations, including brackets, with more complex calculations

Addition and subtraction

- **8Nc11** Consolidate adding and subtracting integers and decimals, including numbers with differing numbers of decimal places

Multiplication and division

- **8Nc12** Divide integers and decimals by a single-digit number, continuing the division to a specified number of decimal places, e.g. $68 \div 7$
- **8Nc13** Multiply and divide integers and decimals by decimals such as 0.6 or 0.06, understanding where to place the decimal point by considering equivalent calculations, e.g. $4.37 \times 0.3 = (4.37 \times 3) \div 10$, $92.4 \div 0.06 = (92.4 \times 100) \div 6$

A Algebra

Ae Expressions, equations and formulae

- **8Ae1** Know that letters play different roles in equations, formulae and functions; know the meanings of *formula* and *function*
- **8Ae2** Know that algebraic operations, including brackets, follow the same order as arithmetic operations; use index notation for small positive integer powers
- **8Ae3** Construct linear expressions
- **8Ae4** Simplify or transform linear expressions with integer coefficients; collect like terms; multiply a single term over a bracket
- **8Ae5** Derive and use simple formulae, e.g. to convert degrees Celsius ($^{\circ}\text{C}$) to degrees Fahrenheit ($^{\circ}\text{F}$)
- **8Ae6** Substitute positive and negative integers into formulae, linear expressions and expressions involving small powers, e.g. $3x^2 + 4$ or $2x^3$, including examples that lead to an equation to solve
- **8Ae7** Construct and solve linear equations with integer coefficients (unknown on either or both sides, without or with brackets)

As Sequences, functions and graphs

- **8As1** Generate terms of a linear sequence using term-to-term and position-to-term rules; find term-to-term and position-to-term rules of sequences, including spatial patterns
- **8As2** Use a linear expression to describe the n th term of a simple arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated
- **8As3** Express simple functions algebraically and represent them in mappings
- **8As4** Construct tables of values and use all four quadrants to plot the graphs of linear functions, where y is given explicitly in terms of x ; recognise that equations of the form $y = mx + c$ correspond to straight-line graphs

G Geometry

Gs Shapes and geometric reasoning

- **8Gs1** Know that if two 2D shapes are congruent, corresponding sides and angles are equal
- **8Gs2** Classify quadrilaterals according to their properties, including diagonal properties
- **8Gs3** Know that the longest side of a right-angled triangle is called the hypotenuse
- **8Gs4** Identify alternate angles and corresponding angles
- **8Gs5** Understand a proof that:
 - the angle sum of a triangle is 180° and that of a quadrilateral is 360°
 - the exterior angle of a triangle is equal to the sum of the two interior opposite angles
- **8Gs6** Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and special quadrilaterals, explaining reasoning with diagrams and text
- **8Gs7** Draw simple nets of solids, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism
- **8Gs8** Identify all the symmetries of 2D shapes
- **8Gs9** Use a straight edge and compasses to construct:
 - the midpoint and perpendicular bisector of a line segment
 - the bisector of an angle
- **8Gs10** Use a ruler and compasses to construct:
 - circles and arcs
 - a triangle, given three sides (SSS)
 - a triangle, given a right angle, hypotenuse and one side (RHS)

Gp Position and movement

- **8Gp1** Find the midpoint of the line segment AB, given the coordinates of points A and B
- **8Gp2** Transform 2D shapes by rotation, reflection and translation, and simple combinations of these transformations
- **8Gp3** Understand and use the language and notation associated with enlargement; enlarge 2D shapes, given a centre of enlargement and a positive integer scale factor
- **8Gp4** Interpret and make simple scale drawings

G Measure

Gl Length, mass and capacity

- 8Gl1** • **8Ml1** Choose suitable units of measurement to estimate, measure, calculate and solve problems in a range of contexts, including units of mass, length, area, volume or capacity
- 8Gl2** • **8Ml2** Know that distances in the USA, the UK and some other countries are measured in miles, and that one kilometre is about $\frac{5}{8}$ of a mile

Gt Time and rates of change

- 8Gt1** • **8Mt1** Draw and interpret graphs in real life contexts involving more than one component, e.g. travel graphs with more than one person

Ga Area, perimeter and volume

- 8Ga1** • **8Ma1** Know the definition of a circle and the names of its parts; know and use formulae for the circumference and area of a circle
- 8Ga2** • **8Ma2** Derive and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound 2D shapes, and lengths, surface areas and volumes of cuboids
- 8Ga3** • **8Ma3** Use simple nets of solids to work out their surface areas

D Handling data**Dc Planning and collecting data**

- **8Dc1** Identify and collect data to answer a question; select the method of collection, sample size and degree of accuracy needed for measurements
- **8Dc2** Know the difference between discrete and continuous data
- **8Dc3** Construct and use:
 - frequency tables with given equal class intervals to gather continuous data
 - two-way tables to record discrete data

Dp Processing and presenting data

- **8Dp1** Calculate statistics for sets of discrete and continuous data; recognise when to use the range, mean, median and mode and, for grouped data, the modal class
- **8Dp2** Draw, and interpret:
 - frequency diagrams for discrete and continuous data
 - pie charts
 - simple line graphs for time series
 - stem-and-leaf diagrams

Di Interpreting and discussing results

- **8Di1** Interpret tables, graphs and diagrams for discrete and continuous data, and draw conclusions, relating statistics and findings to the original question
- **8Di2** Compare two distributions, using the range and one or more of the mode, median and mean
- **8Di3** Compare proportions in two pie charts that represent different totals

Db Probability

- **8Db1** Know that if the probability of an event occurring is p , then the probability of it not occurring is $1 - p$
- **8Db2** Find probabilities based on equally likely outcomes in practical contexts
- **8Db3** Find and list systematically all possible mutually exclusive outcomes for single events and for two successive events
- **8Db4** Compare estimated experimental probabilities with theoretical probabilities, recognising that:
 - when experiments are repeated different outcomes may result
 - increasing the number of times an experiment is repeated generally leads to better estimates of probability

Problem solving

Using techniques and skills in solving mathematical problems

- **8Pt1** Calculate accurately, choosing operations and mental or written methods appropriate to the numbers and context
- **8Pt2** Use the order of operations, including brackets, with more complex calculations
- **8Pt3** Manipulate numbers, algebraic expressions and equations, and apply routine algorithms
- **8Pt4** Understand everyday measurement systems, using them to estimate, measure and calculate
- **8Pt5** Recognise and use spatial relationships in two and three dimensions
- **8Pt6** Draw accurate mathematical diagrams, graphs and constructions
- **8Pt7** Estimate, approximate and check working
- **8Pt8** Solve word problems involving calculations with whole numbers, fractions, percentages, decimals, money or measures, including multi-step problems

Using understanding and strategies in solving problems

- **8Ps1** Identify the mathematical features of a context or problem; try out and compare mathematical representations using accurate notation
- **8Ps2** Conjecture and generalise, identifying exceptional cases or counter-examples
- **8Ps3** Use logical argument to interpret the mathematics in a context or to establish the truth of a statement
- **8Ps4** Give accurate solutions appropriate to the context or problem
- **8Ps5** Record and compare reasoning, solutions and conclusions
- **8Ps6** Refine approaches and findings on the basis of discussions with others