

Understand and use ratios in appropriate contexts including dividing a quantity in a given ratio.

Calculate an unknown quantity from quantities that vary in direct proportion.

Use percentages to compare proportion; solve percentage problems involving increase and decrease including using a multiplier.

Use and understand the terms reciprocal, highest common factor, lowest common multiple, prime number; find the prime number decomposition of positive integers.

Generate points and plot graphs of quadratic functions; find approximate solutions to a quadratic equation from the graph of the corresponding quadratic function.

Form and solve simple linear inequalities in one variable and represent the solution set on a number line.

Use trial and improvement to find approximate solutions of equations.

Generate common integer sequences; use and justify linear expressions to describe the n th term of an arithmetic sequence.

Solve problems involving the surface area and volume of prisms, including cylinders; convert between area measures and volume measures.

Understand and use 3-D coordinates; find the coordinates of the midpoint of a line segment AB given points A and B in 2-D.

Apply loci to spatial problems involving shapes and paths; use straight edge and compasses to produce standard constructions including the midpoint and perpendicular bisector of a line segment, the perpendicular from a point to a line, and the bisector of an angle.

Understand and use rates and compound measures, including speed and density.

Interpret scatter graphs for discrete and continuous variables, including using lines of best fit; understand the vocabulary of correlation, including positive, negative and zero correlation.

Solve efficiently problems involving percentage increase and decrease; calculate the original amount when given the transformed amount after a percentage change.

Solve problems involving repeated proportional or percentage changes, including compound interest; represent repeated proportional change using a multiplier raised to a power.

Use standard index form expressed in conventional notation and on a calculator display; convert between ordinary and standard index form representations; calculate with standard index form; check solutions by converting to standard index form.

Perform calculations on fractions including the multiplication and division of mixed numbers.

Use and generate formulae; change the subject of a formula, including simple cases where the subject appears twice or where a power of the subject appears.

Multiply expressions of the form $(x + 3)(x - 7)$ and simplify the resulting expression; solve quadratic equations of the form $x^2 \pm \dots$ by factorisation, including the difference of two squares.

Solve harder linear equations including those with fractional coefficients.

Find the exact solution of two simultaneous equations in two unknowns by eliminating a variable, and interpret the equations as lines and their common solution as the point of intersection.

Plot graphs of simple cubic functions and the reciprocal function $y = 1/x$ with $x \neq 0$; recognise the characteristic shapes of these functions.

Understand the difference between the formulae for perimeter, area and volume by considering dimensions.

Transform triangles and other 2-D shapes by combinations of reflection, rotation (of any angle about any point) and translation, including the use of vector notation; construct enlargements using any scale factors; identify scale factors.

Understand, recall and use trigonometrical relationships in right-angled triangles and use these to solve problems, including those involving bearings.

Use tree diagrams to represent outcomes of combined events, recognising when events are independent; find probabilities.

Draw and interpret cumulative frequency tables and diagrams and box plots for grouped data; find the median, quartiles, percentiles and interquartile range.

Compare distributions and make inferences, using the shapes of the distributions and measures of average and spread, including median and quartiles.

Extension

Solve linear inequalities in one variable; solve several linear inequalities in two variables and find the solution set.

Find the gradient of straight lines given by equations of the form $y = mx + c$: understand that $y = mx + c$ represents a straight line, interpret the values of m and c ; know when lines are parallel.

Understand similarity of triangles and other plane figures and use this to make geometrical inferences.

Calculate an appropriate moving average.

Use a calculator effectively and efficiently, including using the memory and bracket keys, and function keys for reciprocals, squares and powers; enter a range of measures including 'time'; interpret the display; round off a final answer to a reasonable degree of accuracy.

Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion.

Solve problems involving the four operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.

Use the four operations with fractions; order fractions using a common denominator. Perform calculations using the hierarchy of operations.

Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out single term common factors.

Solve linear equations with integer coefficients in which the unknown appears on both sides of the equation, or with brackets.

Use index notation for simple positive integer powers; substitute positive and negative numbers into expressions such as $4x - 2$, $3x^2 + 4$ and $2x^3$.

Plot graphs of linear functions in which y is given explicitly or implicitly in terms of x . Draw and interpret graphs modelling real situations.

Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.

Recall the meaning of circle, chord, tangent, arc, sector, segment; find circumferences and areas enclosed by circles, recalling relevant formulae.

Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles; construct inscribed regular polygons; construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.

Recall and use the formula for the area of a parallelogram and a triangle; use the formula for the area of a trapezium; calculate perimeters and areas of shapes made from triangles and rectangles; find the surface area of simple shapes using the area formulae for triangles and rectangles.

Calculate volumes of shapes made from cubes and cuboids. Analyse 3-D shapes through 2-D projections and cross-sections, including plans and elevations.

Recognise, visualise and construct enlargements of objects using positive integer and fractional scale factors; identify the centre and the scale factor of enlargement; understand the implications of enlargement for perimeter.

Transform triangles and other 2-D shapes by rotation or reflection or translation using vectors; recognise and visualise rotations, reflections and translations including reflection symmetry of 3-D shapes; understand the properties preserved by these transformations; understand congruence in the context of transformations.

Identify different mutually-exclusive outcomes and know that the sum of the probabilities of all these outcomes is one.

Draw and interpret scatter graphs including using lines of best fit; have a basic understanding of correlation, identifying 'correlation' or 'no correlation'.

Use and interpret diagrams for discrete and continuous data, including frequency polygons and stem and leaf diagrams; identify the modal class; calculate the mean of grouped discrete data compare distributions and make inferences, using the shapes of the distributions and measures of average and range.

Extension

Use and understand terminating and recurring decimals including exact fraction equivalents; solve problems involving multiplication and division by decimals with up to two decimal places

Use the terms cube root, negative square root; recall the squares to 15^2 and the corresponding square roots; recall the cubes of 2, 3, 4, 5, and 10; use index laws with numerical and algebraic expressions involving multiplication and division of positive integer powers.

Check solutions to calculations using various methods including approximating, using inverse operations and recognising the effect of multiplying and dividing by numbers less than one and greater than one; estimate answers using appropriate techniques. Understand and use ratios in appropriate contexts including dividing a quantity in a given ratio.

Calculate an unknown quantity from quantities that vary in direct proportion. Use and generate formulae in context; substitute positive and negative numbers into a formula.

Form and solve equations. Form and solve simple linear inequalities in one variable and represent the solution set on a number line.

Generate common integer sequences; use and justify linear expressions to describe the n th term of an arithmetic sequence.

Know that measurements using real numbers depend on the choice of unit; recognise that a measurement given to the nearest whole unit may be inaccurate by up to one half in either direction.

Solve angle problems involving intersecting and parallel lines, and polygons; understand that the tangent at any point on a circle is perpendicular to the radius at that point.

Understand, recall and use Pythagoras' theorem. Solve problems involving area and circumference of circles; use π in exact calculations.

Solve problems involving the surface area and volume of prisms, including cylinders; convert between area measures and volume measures.

Solve probability problems involving theoretical models or relative frequency. Calculate the mean from grouped continuous data.

Round numbers to the nearest integer, to a given power of ten, to one significant figure and to one or two decimal places; estimate answers to one-stage calculations including problems involving money and measurement. Use the term cube; recall the cubes of 2, 3, 4, 5, and 10; use index notation for simple integer powers.

Understand equivalent fractions, simplifying a fraction (including mixed numbers) by cancelling all common factors; multiply a fraction by an integer or a unit fraction.

Use the equivalence between fractions, decimals and percentages in context; solve simple percentage problems including increase and decrease.

Express one quantity as a fraction or percentage of another. Use the four operations with positive and negative integers.

Solve problems involving substitution of positive numbers into simple algebraic formulas.

Solve simple linear equations in which the unknown appears on either side of the equation.

Manipulate algebraic expressions by collecting like terms. Use tables to plot graphs of linear functions given explicitly.

Construct triangles using a ruler and protractor only given information about their sides and angles; use a straight edge and compasses to construct triangles with given sides including equilateral triangles.

Use and interpret maps and scale drawings, including four-figure grid references and estimating distances and areas; use bearings to specify direction.

Classify quadrilaterals by their geometric properties.

Explore the geometry of cuboids (including cubes) and shapes made from cuboids; find the volumes of cuboids, recalling the formula; draw and interpret the net of a cuboid.

Understand that rotations are specified by a centre and an angle; complete the rotation symmetry of 2-D shapes; measure the angle of rotation using right angles and simple fractions of a turn.

List all outcomes for single events, and for two successive events, in a systematic way; find probabilities. Use the fact that the probability of not happening is $1 - \text{probability of happening}$.

Use and interpret the statistical measures mode, median, mean and range for discrete and continuous data, including comparing distributions.

Construct and interpret pie charts.

Extension

Use a calculator effectively and efficiently, including using the memory and bracket keys, and function keys for reciprocals, squares and powers; enter a range of measures including 'time'; interpret the display; round off a final answer to a reasonable degree of accuracy.

Use ratio notation, including reduction to its simplest form; solve word problems involving ratio and proportion.

Solve problems involving the four operations on decimals without the use of a calculator; convert a simple fraction to a decimal using division.

Use the four operations with fractions; order fractions using a common denominator.

Perform calculations using the hierarchy of operations.

Manipulate algebraic expressions by multiplying a single term over a bracket and by taking out single term common factors.

Solve linear equations with integer coefficients in which the unknown appears on both sides of the equation, or with brackets.

Use index notation for simple positive integer powers; substitute positive and negative numbers into expressions such as $4x - 2$, $3x^2 + 4$ and $2x^3$.

Plot graphs of linear functions in which y is given explicitly or implicitly in terms of x .

Use parallel lines, alternate angles and corresponding angles; calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; calculate and use the angles of regular polygons; understand simple proofs involving triangles and quadrilaterals.

Recall the meaning of circle, chord, tangent, arc, sector, segment; find circumferences and areas enclosed by circles, recalling relevant formulae.

Construct triangles and other 2-D shapes using a ruler and a protractor, given information about their sides and angles; construct inscribed regular polygons; construct nets of cubes, regular tetrahedra, square-based pyramids and other 3-D shapes.

Recall and use the formula for the area of a parallelogram and a triangle; use the formula for the area of a trapezium; calculate perimeters and areas of shapes made from triangles and rectangles; find the surface area of simple shapes using the area formulae for triangles and rectangles.

Identify different mutually-exclusive outcomes and know that the sum of the probabilities of all these outcomes is one.

Draw and interpret scatter graphs including using lines of best fit; have a basic understanding of correlation, identifying 'correlation' or 'no correlation'.

Use written methods to multiply up a 3 figure by a 2 figure number and divide by a number up to 12.

Add and subtract decimals up to 2 decimal places and use knowledge to solve worded/functional questions including questions involving money.

Use a calculator to solve single operation problems. (Practical/functional problems).

Understand common factors, multiples, primes and square numbers.

Calculate unitary fractions of an amount.

Understand the rules and notation of algebra.

Begin to use simple formulae expressed in words.

Solve single operation equations by using inverse operations. i.e. ($x - 5 = 7$)

Substitute into simple expressions.

Use and interpret co-ordinates in 4 quadrants. Draw and describe horizontal and vertical lines of the form $x = 2$ and $y = -3$

Simplify expressions by collecting like terms (only positive).

Continue the sequence and describe the pattern of a linear sequence.

Convert miles to kilometres and pounds to kilograms. Answer functional problems using the conversions.

Measure and draw angles using a protractor. Draw circles using a pair of compasses given the radius or diameter. Draw basic scale drawings of room plans. i.e. (ground floor room or house plan)

Reflect shapes and describe the reflections in horizontal and vertical lines

Understand the terms the terms edges, faces and vertices.

Calculate the area of a triangle.

Use mode and range to compare 2 distributions of data.

Design a grouped tally chart to collect discrete data .i.e. (Marks scored in a test)

Draw and interpret dual bar charts.

Use basic Venn diagrams.

Interpret 2 way tables and complete pre drawn 2 way tables.

Calculate basic probabilities written as a fraction.

Extension

Round numbers to the nearest integer, to a given power of ten, to one significant figure and to one or two decimal places; estimate answers to one- stage calculations including problems involving money and measurement.

Use the term cube; recall the cubes of 2, 3, 4, 5, and 10; use index notation for simple integer powers.

Manipulate algebraic expressions by collecting like terms.

Classify quadrilaterals by their geometric properties.

Explore the geometry of cuboids (including cubes) and shapes made from cuboids; find the volumes of cuboids, recalling the formula; draw and interpret the net of a cuboid.

List all outcomes for single events, and for two successive events, in a systematic way; find probabilities. Use the fact that the probability of not happening is $1 - \text{probability of happening}$.