add, subtract, multiply and divide using commutative, associative and distributive laws	
understand and use inverse operations	
use brackets and the hierarchy of operations	
solve problems set in words; for example, formulae given in words.	
round to a given number of significant figures	
round to a suitable degree of accuracy.	
use a calculator for calculations involving four rules	
use a calculator for checking answers	
enter complex calculations and use function keys for reciprocals, squares, cubes and other powers	
enter a range of calculations including those involving money, time and other measures	
understand and use functions including $+$, $-$, $\times$, $\div$, x^2, x^3, x^n, $\sqrt{x}$, $\sqrt[3]{x}$, memory, brackets and trigonometrical functions	
use a calculator to input numbers in standard form	
use a calculator to explore exponential growth and decay using a multiplier and the power key	
understand the calculator display, knowing how to interpret the display, when the display has been rounded by the calculator and not to round during the intermediate steps of calculation	
interpret the display, for example for money interpret 3.6 as £3.60 or for time interpret 2.5 as 2 hours 30 minutes	
understand how to use a calculator to simplify fractions and to convert between decimals and fractions and vice versa.	
identify equivalent fractions	
write a fraction in its simplest form	
convert between mixed numbers and improper fractions	
compare fractions in geometry questions.	
interpret percentage as the operator 'so many hundredths of'	
use percentages in real-life situations	
work out percentage of shape that is shaded	

shade a given percentage of a shape.	
interpret a fraction, decimal or percentage as a multiplier when solving problems	
use fractions, decimals or percentages to compare proportions of shapes that are shaded	
use fractions, decimals or percentages to compare lengths, areas or volumes	
recognise that questions may be linked to the assessment of scale factor	
calculate a fraction of a quantity	
calculate a percentage of a quantity	
use decimals to find quantities	
use fractions, decimals or percentages to calculate proportions of shapes that are shaded	
use fractions, decimals or percentages to calculate lengths, areas or volumes.	
use ratios in the context of geometrical problems, for example similar shapes, scale drawings and problem solving involving scales and measures	
understand that a line divided in the ratio 1 : 3 means that the smaller part is one-quarter of the whole.	
use ratio and proportion to solve word problems using informal strategies or using the unitary method of solution	
solve best buy problems using informal strategies or using the unitary method of solution	
use direct proportion to solve geometrical problems	
use ratios to solve geometrical problems	
calculate an unknown quantity from quantities that vary in direct proportion or inverse proportion	
set up and use equations to solve word and other problems involving direct proportion or inverse proportion	
relate algebraic solutions to graphical representation of the equations.	
use notations and symbols correctly	
understand that letter symbols represent definite unknown numbers in equations, defined quantities or variables in formulae, and in functions they define new expressions or quantities by referring to known quantities.	
recognise that, for example, $5x + 1 = 16$ is an equation	
recognise that, for example V = IR is a formula	

recognise that $x + 3$ is an expression	
understand the identity symbol	
recognise that $(x+1)^2 \equiv x^2 + 2x + 1$ is an identity that is true for all x	
understand the meaning of the word 'term', for example know that $x2 = 2x = 1$ has three terms	
write an expression.	
understand that the transformation of algebraic expressions obeys and generalises the rules of generalised arithmetic	
manipulate an expression by collecting like terms	
multiply a single term over a bracket, e.g. $a(b + c) = ab + ac$	
write expressions to solve problems	
write expressions using squares and cubes	
factorise algebraic expressions by taking out common factors	
know the meaning of 'simplify', e.g. Simplify $3x - 2 + 4(x + 5)$	
know the meaning of and be able to factorise, e.g. Factorise $3x2y - 9y$ Factorise $4x2 + 6xy$	
expand the product of two linear expressions, e.g. $(2x + 3)(3x – 4)$.	
set up simple linear equations	
rearrange simple equations	
solve simple linear equations by using inverse operations or by transforming both sides in the same way	
solve simple linear equations with integer coefficients where the unknown appears on one or both sides of the equation, or with brackets.	
solve quadratic equations using the quadratic formula	
solve geometrical problems that lead to a quadratic equation that can be solved by factorisation	
solve geometrical problems that lead to a quadratic equation that can be solved by using the quadratic formula.	
use formulae from mathematics and other subjects expressed initially in words and then using letters and symbols; for example formula for area of a triangle, area of a parallelogram, area of a circle, wage earned = hours worked x hourly rate plus bonus, volume of a prism, conversions between measures	

substitute numbers into a formula.	
use a calculator to identify integer values immediately above and below the solution, progressing to identifying values to 1 d.p. above and immediately above and below the solution.	
plot points in all four quadrants	
find coordinates of points identified by geometrical information, for example the fourth vertex of a rectangle given the other three vertices	
find coordinates of a midpoint, for example on the diagonal of a rhombus	
calculate the length of a line segment.	
use axes and coordinates to specify points in 3D	
find the coordinates of points identified by geometrical information in 3D.	
Draw the graph of a linear function of the form $y = mx + c$ on a grid to intersect the given graph of a quadratic function	
Read off the solutions to the common roots of the two functions to the appropriate degree of accuracy	
Appreciate that the points of intersection of the graphs of $y = x2 + 3x - 10$ and $y = 2x + 1$ are the solutions to the equation $x2 + 3x - 10 = 2x + 1$.	
Draw, sketch and recognise graphs of the form $y = \frac{k}{x}$ where k is a positive integer	
Draw, sketch and recognise graphs of the form $y = kx$ for integer values of x and simple positive values of x	
Draw, sketch and recognise graphs of the form $y = x3 + k$ where k is an integer	
Know the shapes of the graphs of functions $y = \sin x$ and $y = \cos x$.	
Transform the graph of any function $f(x)$ including: $f(x) + k$, $f(ax)$, $f(-x) + b$, $f(x + c)$ where a, b, c, and k are integers.	
Recognise transformations of functions and be able to write down the function of a transformation given the original function.	
Transformations of the graphs of trigonometric functions based on $y= \sin x$ and $y = \cos x$ for $0 < x < 360$ will also be assessed.	
Recognise, sketch and draw the graphs of functions defined by spatial conditions	
Understand and use terms such as locus, parallel and equidistant in this context.	
calculate values for a quadratic and draw the graph	
recognise a quadratic graph	
sketch a quadratic graph	

sketch an appropriately shaped graph (partly or entirely non-linear) to represent a real-life situation	
choose a correct sketch graph from a selection of alternatives.	
interpret linear graphs from real-life situations; for example conversion graphs	
interpret linear graphs showing real-life situations in geometry, such as the depth of water in containers as they are filled at a steady rate	
interpret non-linear graphs showing real-life situations, such as the height of a ball plotted against time.	
find an approximate value of *y* for a given value of *x* or the approximate values of *x* for a given value of *y.*	
work out the size of missing angles at a point	
work out the size of missing angles at a point on a straight line	
know that vertically opposite angles are equal	
distinguish between acute, obtuse, reflex and right angles	
name angles	
estimate the size of an angle in degrees	
justify an answer with explanations such as ‘angles on a straight line’, etc.	
use one lower case letter or three upper case letters to represent an angle, for example *x* or *ABC*	
understand that two lines that are perpendicular are at 90o to each other	
draw a perpendicular line in a diagram	
identify lines that are perpendicular	
use geometrical language	
use letters to identify points, lines and angles.	
understand and use the angle properties of parallel lines	
recall and use the terms, alternate angles, and corresponding angles	
work out missing angles using properties of alternate angles and corresponding angles	
understand the consequent properties of parallelograms	

understand the proof that the angle sum of a triangle is 180o	
understand the proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices	
use angle properties of equilateral, isosceles and right-angled triangles	
use the angle sum of a quadrilateral is 360o.	
calculate and use the sums of interior angles of polygons	
recognise and name regular polygons; pentagons, hexagons, octagons and decagons	
use the angle sum of irregular polygons	
calculate and use the angles of regular polygons	
use the sum of the interior angles of an n-sided polygon	
use the sum of the exterior angles of any polygon is 360o	
use interior angle + exterior angle = 180o	
use tessellations of regular and irregular shapes	
explain why some shapes tessellate and why other shapes do not tessellate.	
recall the properties and definitions of special types of quadrilateral	
name a given shape	
identify a shape given its properties	
list the properties of a given shape	
draw a sketch of a named shape	
identify quadrilaterals that have common properties	
classify quadrilaterals using common geometric properties.	
recall the definition of a circle	
identify and name these parts of a circle	
draw these parts of a circle	

understand related terms of a circle	
draw a circle given the radius or diameter.	
understand that the tangent at any point on a circle is perpendicular to the radius at that point	
understand and use the fact that tangents from an external point are equal in length	
explain why the perpendicular from the centre to a chord bisects the chord	
understand that inscribed regular polygons can be constructed by equal division of a circle	
prove and use the fact that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference	
prove and use the fact that the angle subtended at the circumference by a semicircle is a right angle	
prove and use the fact that angles in the same segment are equal	
prove and use the fact that opposite angles of a cyclic quadrilateral sum to 180 degrees	
prove and use the alternate segment theorem.	
recognise reflection symmetry of 2D shapes	
identify lines of symmetry on a shape or diagram	
draw lines of symmetry on a shape or diagram	
understand line symmetry	
draw or complete a diagram with a given number of lines of symmetry	
recognise rotational symmetry of 2D shapes	
identify the order of rotational symmetry on a shape or diagram	
draw or complete a diagram with rotational symmetry	
understand line symmetry	
identify and draw lines of symmetry on a Cartesian grid	
identify the order of rotational symmetry of shapes on a Cartesian grid	
draw or complete a diagram with rotational symmetry on a Cartesian grid.	

describe and transform 2D shapes using single rotations	
understand that rotations are specified by a centre and an (anticlockwise) angle	
find a centre of rotation	
rotate a shape about the origin or any other point	
measure the angle of rotation using right angles	
measure the angle of rotation using simple fractions of a turn or degrees	
describe and transform 2D shapes using single reflections	
understand that reflections are specified by a mirror line	
identify the equation of a line of reflection	
describe and transform 2D shapes using single transformations	
understand that translations are specified by a distance and direction (using a vector)	
translate a given shape by a vector	
describe and transform 2D shapes using enlargements by a positive scale factor	
understand that an enlargement is specified by a centre and a scale factor	
enlarge a shape on a grid (centre not specified)	
draw an enlargement	
enlarge a shape using (0, 0) as the centre of enlargement	
enlarge shapes with a centre other than (0, 0)	
find the centre of enlargement	
describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements	
distinguish properties that are preserved under particular transformations	
identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides	
understand that distances and angles are preserved under rotations, reflections and translations, so that any figure is congruent under any of these transformations	

recognise that enlargements preserve angle but not length	
identify the scale factor of an enlargement as the ratio of the length of any two corresponding line segments	
describe a translation	
use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations	
distinguish properties that are preserved under particular transformations.	
understand congruence	
identify shapes that are congruent	
understand and use conditions for congruent triangles	
recognise congruent shapes when rotated, reflected or in different orientations	
understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and compass constructions	
understand similarity	
understand similarity of triangles and of other plane figures, and use this to make geometric inferences	
use similarity	
identify shapes that are similar, including all squares, all circles or all regular polygons with equal number of sides	
recognise similar shapes when rotated, reflected or in different orientations.	
understand, recall and use Pythagoras' theorem in 2D, then 3D problems	
investigate the geometry of cuboids including cubes, and shapes made from cuboids, including the use of Pythagoras' theorem to calculate lengths in three dimensions.	
understand, recall and use trigonometry relationships in right-angled triangles	
use the trigonometry relationships in right-angled triangles to solve problems, including those involving bearings	
use these relationships in 3D contexts, including finding the angles between a line and a plane (but not the angle between two planes or between two skew lines); calculate the area of a triangle using $\frac{1}{2}ab\sin c$	
use the sine and cosine rules to solve 2D and 3D problems.	
apply mathematical reasoning, explaining and justifying inferences and deductions	

show step-by-step deduction in solving a geometrical problem	
state constraints and give starting points when making deductions.	
use 2D representations of 3D shapes	
draw nets and show how they fold to make a 3D solid	
know the terms face, edge and vertex (vertices)	
identify and name common solids, for example cube, cuboid, prism, cylinder, pyramid, sphere and cone	
analyse 3D shapes through 2D projections and cross-sections, including plan and elevation	
understand and draw front and side elevations and plans of shapes made from simple solids, for example a solid made from small cubes	
understand and use isometric drawings.	
use and interpret maps and scale drawings	
use a scale on a map to work out an actual length	
use a scale with an actual length to work out a length on a map	
construct scale drawings	
use scale to estimate a length, for example use the height of a man to estimate the height of a building where both are shown in a scale drawing	
work out a scale from a scale drawing given additional information.	
understand the effect of enlargement on perimeter	
understand the effect of enlargement on areas of shapes	
understand the effect of enlargement on volumes of shapes and solids	
compare the areas or volumes of similar shapes.	
use the effect of enlargement for perimeter, area and volume in calculations.	
interpret scales on a range of measuring instruments including those for time, temperature and mass, reading from the scale or marking a point on a scale to show a stated value	
know that measurements using real numbers depend on the choice of unit	
recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction.	

convert between metric measures	
recall and use conversions for metric measures for length, area, volume and capacity	
recall and use conversions between imperial units and metric units and vice versa using common approximation For example 5 miles ≈ 8 kilometres, 4.5 litres ≈ 1 gallon, 2.2 pounds ≈ 1 kilogram, 1 inch ≈ 2.5 centimetres.	
Convert between imperial units and metric units and vice versa using common approximations.	
make sensible estimates of a range of measures in everyday settings	
make sensible estimates of a range of measures in real-life situations, for example estimate the height of a man	
choose appropriate units for estimating measurements, for example a television mast would be measured in metres.	
use bearings to specify direction	
recall and use the eight points of the compass (N, NE, E, SE, S, SW, W, NW) and their equivalent three-figure bearings	
use three-figure bearings to specify direction	
mark points on a diagram given the bearing from another point	
draw a bearing between points on a map or scale drawing	
measure a bearing of a point from another given point	
work out a bearing of a point from another given point	
work out the bearing to return to a point, given the bearing to leave that point.	
understand and use compound measures including area, volume and speed.	
measure and draw lines to the nearest mm	
measure and draw angles to the nearest degree.	
make accurate drawings of triangles and other 2D shapes using a ruler and protractor	
make an accurate scale drawing from a sketch, a diagram or a description.	
use straight edge and a pair of compasses to do standard constructions	
construct a triangle	

construct an equilateral triangle with a given side	
construct a perpendicular bisector of a given line	
construct the perpendicular from a point to a line	
construct the perpendicular from a point on a line	
construct an angle bisector	
construct angles of 60°, 90°, 30° and 45°	
draw parallel lines	
draw circles or part circles given the radius or diameter	
construct a regular hexagon inside a circle	
construct diagrams of 2D shapes from given information.	
find loci, both by reasoning and by using ICT to produce shapes and paths	
construct a region, for example, bounded by a circle and an intersecting line	
construct loci, for example, given a fixed distance from a point and a fixed distance from a given line	
construct loci, for example, given equal distances from two points	
construct loci, for example, given equal distances from two line segments	
construct a region that is defined as, for example, less than a given distance or greater than a given distance from a point or line segment	
describe regions satisfying several conditions.	
work out the perimeter of a rectangle	
work out the perimeter of a triangle	
calculate the perimeter of shapes made from triangles and rectangles	
calculate the perimeter of shapes made from compound shapes made from two or more rectangles	
calculate the perimeter of shapes drawn on a grid	
calculate the perimeter of simple shapes	

recall and use the formulae for area of a rectangle, triangle and parallelogram	
work out the area of a rectangle	
work out the area of a parallelogram	
calculate the area of shapes made from triangles and rectangles	
calculate the area of shapes made from compound shapes made from two or more rectangles, for example an L shape or T shape	
calculate the area of shapes drawn on a grid	
calculate the area of simple shapes	
work out the surface area of nets made up of rectangles and triangles	
calculate the area of a trapezium.	
extend to other compound shapes, for example made from circles or part circles with other known shapes	
calculate the length of arcs of circles	
calculate the area of sectors of circles	
calculate the area of segments of circles.	
calculate the area of a triangle given the length of two sides and the included angle.	
recall and use the formula for the circumference of a circle	
work out the circumference of a circle, given the radius or diameter	
work out the radius or diameter given the circumference of a circle	
use π = 3.14 or the π button on a calculator	
work out the perimeter of semi-circles, quarter circles or other simple fractions of a circle	
recall and use the formula for the area of a circle	
work out the area of a circle, given the radius or diameter	
work out the radius or diameter given the area of a circle	
work out the area of semi-circles, quarter circles or other simple fractions of a circle.	

calculate the length of arcs of circles	
calculate the area of sectors of circles	
calculate the area of segments of circles.	
recall and use the formula for the volume of a cuboid	
recall and use the formula for the volume of a cylinder	
use the formula for the volume of a prism	
work out the volume of a cube or cuboid	
work out the volume of a prism using the given formula, for example a triangular prism	
work out the volume of a cylinder.	
work out perimeters of complex shapes	
work out the area of complex shapes made from a combination of known shapes	
work out the area of segments of circles	
work out volumes of frustums of cones	
work out volumes of frustums of pyramids	
calculate the surface area of compound solids constructed from cubes, cuboids, cones, pyramids, cylinders, spheres and hemispheres	
solve real life problems using known solid shapes.	
understand and use vector notation	
calculate, and represent graphically the sum of two vectors, the difference of two vectors and a scalar multiple of a vector	
calculate the resultant of two vectors	
understand and use the commutative and associative properties of vector addition	
solve simple geometrical problems in 2D using vector methods	
apply vector methods for simple geometric proofs	
recognise when lines are parallel using vectors	

recognise when three or more points are collinear using vectors.	