KS3 Mathematics Knowledge and Skills

Units of Work:

Unit 1	Number 1	Number
Unit 2	Number 2	Number
Unit 3	Fractions, Decimals and Percentages	Number
Unit 4	Ratio and Proportion	Number
Unit 5	Algebra	Algebra
Unit 6	Handling Data	Data
Unit 7	Probability	Data
Unit 8	Coordinates and Graphs	Algebra
Unit 9	Angles	Shape and Space
Unit 10	Measures	Shape and Space
Unit 11	Transformations	Shape and Space

In Mathematics, students gain knowledge of each individual topic, before then applying them as a skill within contextual situations. Any topics which particularly lend themselves to skill based questions are indicated with a # symbol.

Order of Work:

Year 7	Year 8	Year 9
Unit 8	Unit 1	Unit 1
Unit 1	Unit 6	Unit 9
Unit 11		
Assessment 1		
Unit 9	Unit 10	Unit 7
Unit 5	Unit 3	Unit 2
Unit 6	Unit 9	Unit 5
Assessment 2		
Unit 2	Unit 5	Unit 6
Unit 10	Unit 7	Unit 8
Unit 3	Unit 2	Unit 3
Unit 4	Unit 11	Unit 4
	Unit 4	Unit 10
Assessment 3		
Enrichment Activities		

Unit 1 - Number 1	Year 7	Year 8	Year 9

Understand place value for integers and decimals
Write numbers in words and in figures

Order numbers including negatives and decimals
Use symbols =, ≠, <, >, ≤, ≥
Find the difference between integers (inc. negative)
Mentally add and subtract two digit numbers   #
Use doubling and halving
Use tests for divisibility
Know multiplication tables up to 12 x 12
Know squares (to 15), cubes (1 to 5, 10), and associated roots
Multiply and divide numbers by 10, 100 or 1000
Mentally multiply TU x U (using partitioning)   #

Extend written methods to HTU x U, HTU x TU, U.t x U, TU x TU, HTU/U
Adding/subtracting up to 2 d.p.
Four operations with negatives
Use BIDMAS for the correct order of operations
Cancel within divisions   #

Use index notation
Indices and roots, including knowing the difference between exact and rounded answers
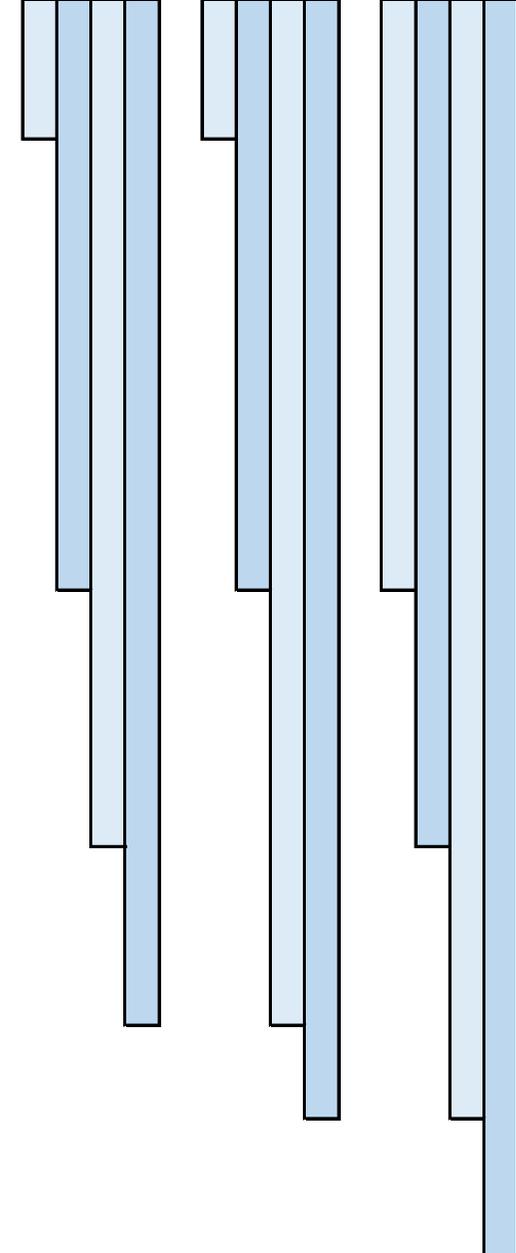Multiply decimal numbers

Understand the effect of doing multiplying and dividing with numbers between -1 and 1   #

Write numbers to and from standard form, including those such as 234 x 10^12 or 0.54 x 10^(-2)
Standard form calculations (non-calc and calc)

Unit 2 - Number 2

	Year 7	Year 8	Year 9

Solve whole number problems   #
Revise four operations using worded problems   #
Use a calculator for worded problems   #
Factors and Multiples

Highest Common Factor and Lowest Common Multiple

Prime numbers and prime factor decomposition
Round numbers to the nearest 10, 100 or 1000
Round numbers to whole numbers and to one decimal place

Use calculators for sums including fractional sums, roots, money, measures, time   #
Round numbers to any amount of decimal places

Upper and lower bounds of a rounded number

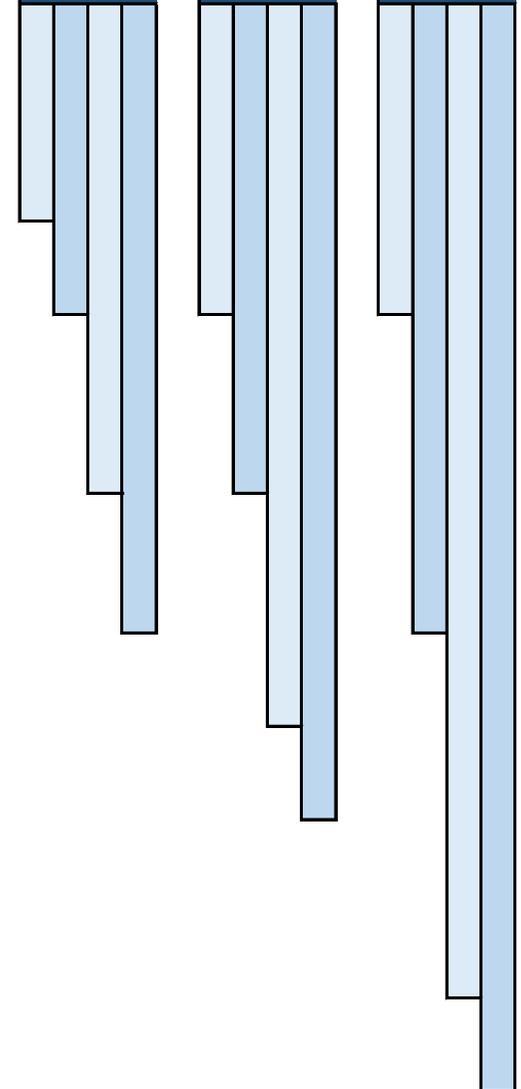Compare truncating and rounding of numbers

Use prime factor decomposition for HCF, LCM and roots   #
Round numbers to any amount of significant figures
Estimate the answer to a question by rounding all values to one significant figure   #

Calculations with bounds   #

Unit 3 - Fractions, Decimals and Percentages

	Year 7	Year 8	Year 9

Recognise when 2 simple fractions are equivalent
Use decimal notation for tenths and hundredths
Recognise proportions of a whole using fractions and percentages to describe them
Use fraction notation for parts of shapes

Change an improper fraction to a mixed number
Express one number as a fraction of another
Equivalent and simplifying fractions
Fractions of an amount

Add/subtract/multiply/divide simple fractions
Simple F.D.P. conversions and equivalents
Understand percentages, find and compare one number as a percentage of another
Percentage of an amount

More complicated fractions of an amount
Add, subtract, multiply or divide mixed numbers
Percentage increase and decrease   #
Harder F.D.P. conversions and equivalents

Use fractions to solve problems in context   #
Percentage change using multipliers
Reverse percentages   #

Use percentages and fractions to calculate repeated proportional changes   #
Simple interest, compound interest and VAT   #
Write recurring decimals as fractions
Recognise and use reciprocals

| Unit 4 - Ratio and Proportion	Year 7	Year 8	Year 9
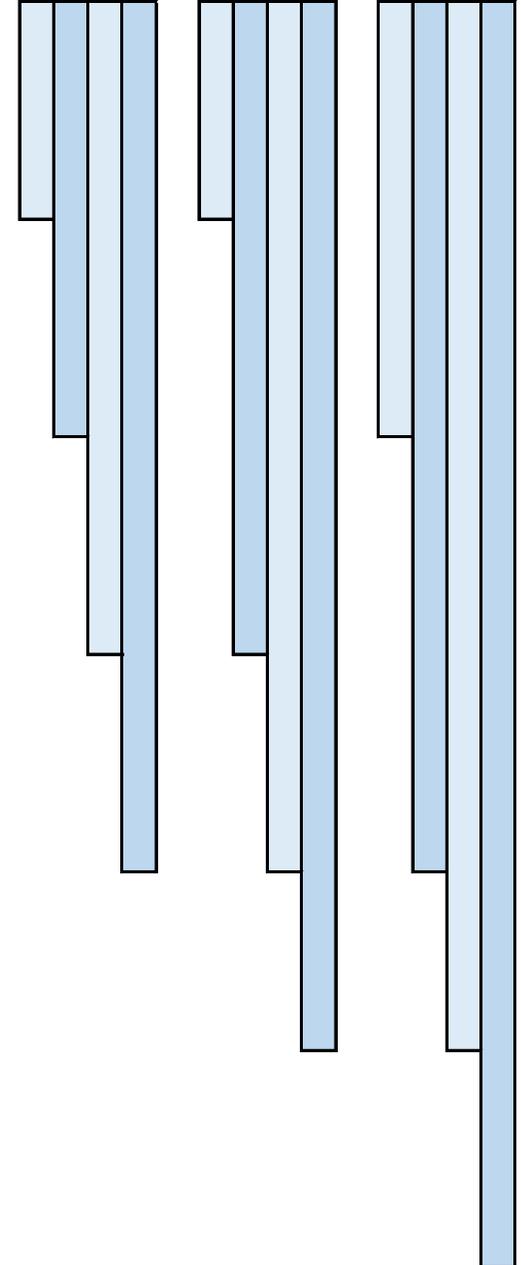
Understand the difference between ratio and proportion   #
Write the ratio of parts of a given shape or diagram

Simplify basic ratios
Find equivalent ratios

Solve basic proportion problems (i.e. if 4 pens cost £2.40 how much will 7 cost)   #
Use basic scale diagrams   #

Find missing amounts from a pair of ratios
Share in a given ratio
Use more complicated scale diagrams and map scales   #

Ratio problems, such as find the ratio of A:B:C given the ratios of A:B and B:C
Solve worded problems for both direct and inverse proportion   #

Solve ratio problems where a difference in the total amount for each person etc. is known   #

Solve proportion problems algebraically, including inverse and square proportion   #
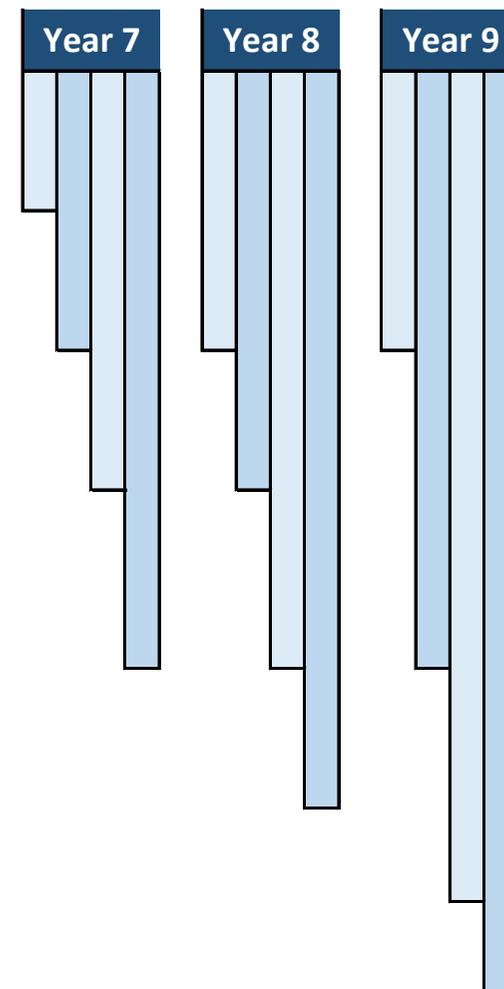
Unit 5 - Algebra (and Number Patterns in Year 8 only)

	Year 7	Year 8	Year 9

Understand and use the equals sign
Simple function machines
Write in words how one number has been changed to get to another   #
Understand basic algebraic operations and notational meanings (i.e. ab means a x b)
Use letters to represent unknown amounts

Simplify by collecting like terms
Expand a single bracket

Substitute into or derive simple formulae, including those in words as well as algebraic ones
Solve simple linear equations

Substitute into expressions containing powers
Construct and solve linear equations (including the unknown on both sides, brackets, fractions)   #
Linear factorisation

Know the meaning of: term, expression, equation, formula, identity, function

Derive a formula   #
Change the subject of a formula
Expand the product of two linear expressions and simplify the resulting quadratic expression
Square a linear expression

Algebraic methods for simultaneous equations   #
Solve linear inequalities and represent the solution set on a number line

Change the subject of more complex formulae
Quadratic factorisation to two pairs of brackets
Difference of two squares

Recognise and continue number sequences, including those with negative numbers
Continue sequences from patterns and shapes ("real-life" sequences)   #
Describe simple sequences in words

Generate sequences from term-to-term and position-to-term rules

Use nth terms to create sequences, and find the nth term of a linear sequence   #

Use and find nth terms for simple quadratic sequences (e.g. n^2+2, $2n^2$)
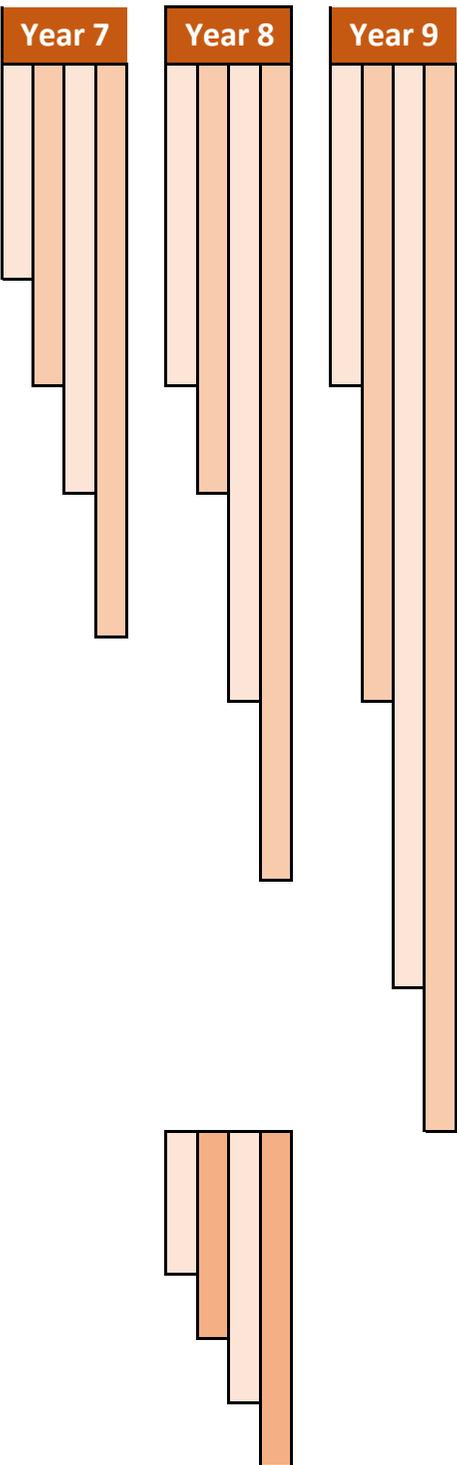
Unit 6 - Handling Data	Year 7	Year 8	Year 9
Collect, sort and classify data # Collect and record data, grouping where suitable Undertand discrete and continuous data	▮		
Extract information from tables and diagrams #		▮	▮
Find the mean, median, mode and range of a data set	▮		▮
Plan a statistical enquiry and how to collect the data # Construct bar chart, pictograms, frequency diagrams and line graphs		▮	
Use averages and/or range to compare two data sets #	▮		▮
Construct pie charts and scatter graphs, and understand correlation		▮	
Finding the missing value given the mean, and similar problems #	▮		
Use lines of best fit to provide estimates # Estimated mean, modal group and group the median lies in for grouped data		▮	
Estimate the median, quartiles and IQR from a cumulative frequency diagram Find the quartiles and IQR of a set of discrete data Draw and compare distributions using box plots #			▮
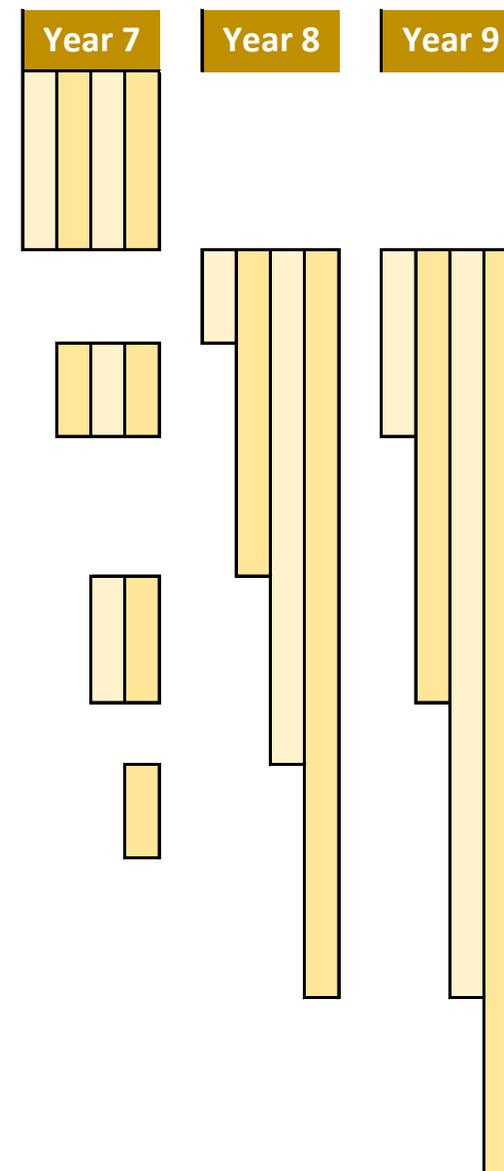
Unit 7 - Probability (this unit is not studied in Year 7)

Year 7	Year 8	Year 9

Use the vocabulary of probability, such as impossible, certain, likely, fair
Use a probability scale from 0 to 1   (F.D.P.)
Find probabilities based on equally likely outcomes
Identify all mutually exclusive outcomes of a single event

Estimate a probability based on a simple experiment or survey   #
Understand that repeating an experiment can lead to different results   #

Use a table or list to show all outcomes of successive events
Compare experimental probabilities with theoretical probabilities   #
Understand that increasing the number of trials increases the reliability of the results   #

Use the probability of an event not occurring
Use the fact that the sum of the probabilities of mutually exclusive events is one
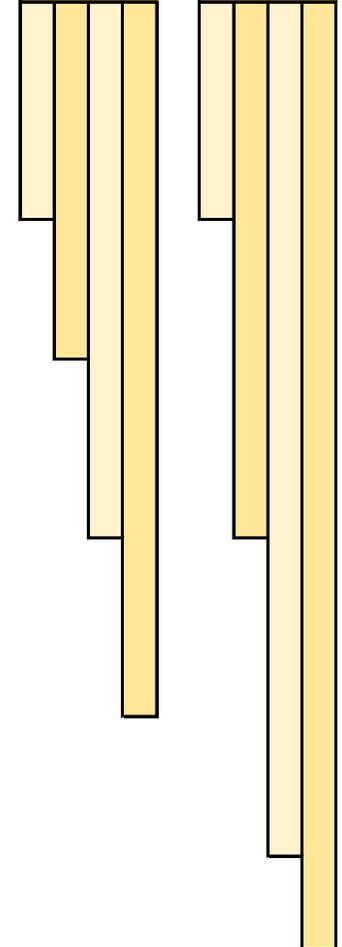Use two-way tables to find simple probabilities

Use relative frequencies of experiments to compare outcomes   #
Understand the use of Venn diagrams for simple probabilities

Use tree diagrams to find the probability of two events occurring one after the other   #

Unit 8 - Coordinates and Graphs (this unit is not studied in Year 8)	Year 7	Year 8	Year 9

Use coordinates in the first quadrant

Use coordinates in all four quadrants

State the coordinates that will complete a shape   #

Generate and plot points in all four quadrants from a linear function (i.e. y=2x+1)
Recognise that equations of the form y=mx+c correspond to straight-line graphs
Find the gradient and intercept of lines given by equations of the form y=mx+c
Gradients of parallel and perpendicular lines, be able to compare lines from their equations
Decide if a point lies on a given line

Use a given graph to find solutions to an equation   #
Interpret graphs showing real-life situations   #
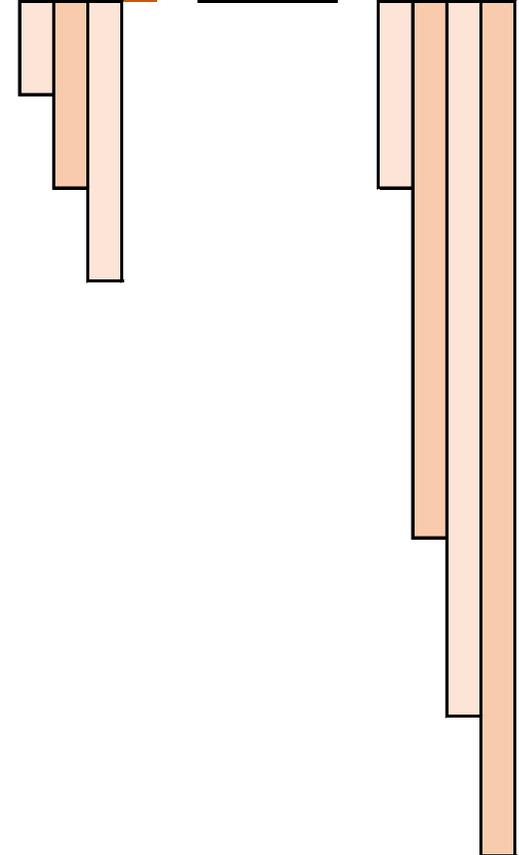Sketch graphs given a real-life situation   #

Use a given graph to solve quadratic equations   #
Plot graphs of simple quadratic and cubic functions given their explicit equation

Unit 9 - Angles	Year 7	Year 8	Year 9

Understand words such as acute, obtuse, reflex, parallel, perpendicular, vertical and horizontal
Understand the eight points of the compass
Measure and draw lines and angles

Angles on a straight line
Angles about a point
Vertically opposite angles
Construct triangles given Side-Angle-Side or Angle-Side-Angle   #

Angles in a triangle

Alternate, corresponding and allied angles

Proof of sum of angles in and triangle and quadrilateral
Proof of the exterior angle of a triangle equals the sum of the opposite two interior angles
Interior and exterior angles of polygons
Ruler/compass to construct the perpendicular bisector of a line and bisector of an angle   #

Construct the perpendicular from a point on a line, and from a point to a line   #
Know that the perpendicular from a point to a line is the shortest distance to the line   #

Pythagoras' Theorem in 2D   #
Finding the distance between two points
Understand congruence and similarity

Understand that triangles SSS, SAS, ASA, RHS are unique but that SSA and AAA are not   #
SOHCAHTOA trigonometry for right-angled triangles   #

Unit 10 - Measures	Year 7	Year 8	Year 9
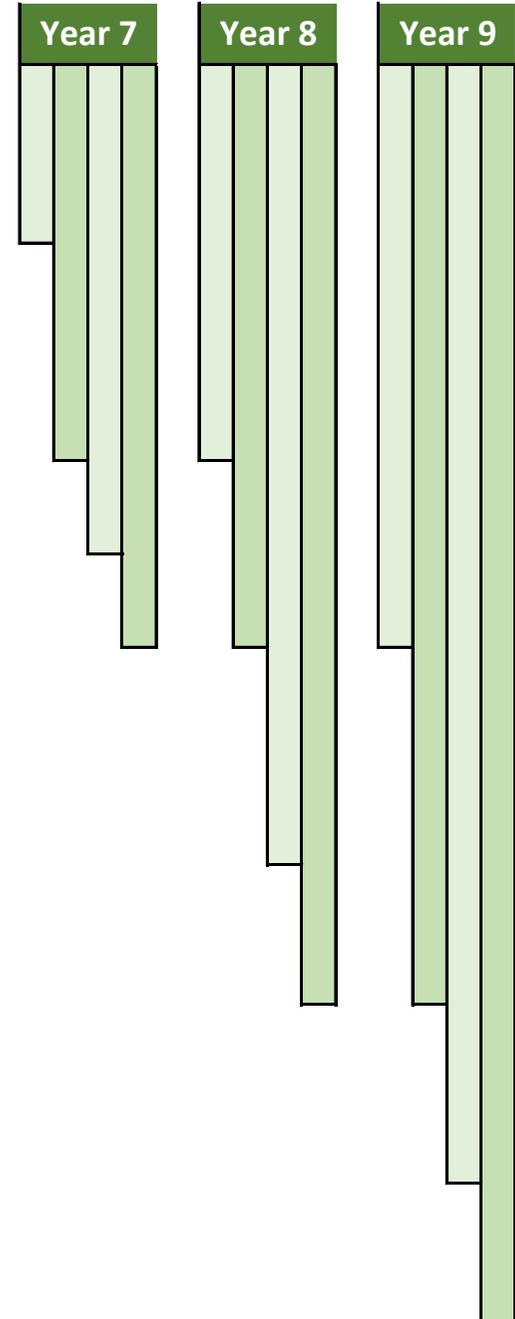
Know that when comparing measurements they must be in the same units
Suggest suitable units and equipment to estimate or measure length, mass or capacity   #
Record estimates and readings from scales to a suitable degree of accuracy   #

Perimeter & area of a shape by counting squares

Calculate perimeter and area of rectangles and triangles, and compound shapes of these

Deduce and use formulae for the area of a parallelogram and trapezium
Know and use the formula for the area and circumference of a circle

Convert between metric units (i.e. km to m)

Find volumes and surface areas of cuboids and compound shapes made from cuboids   #

Convert between area and volume measures (mm^2 to cm^2, cm^2 to m^2, cm^3 to m^3)   #
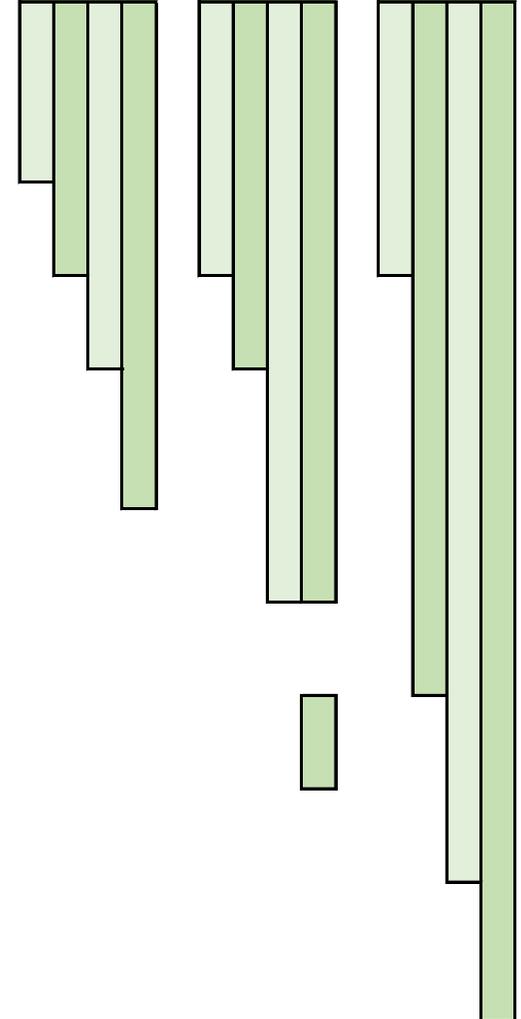
Calculate the surface area and volume of right prisms including cylinders   #

Find the area of more complicated compound shapes, including those from parts of circles   #
Distinguish between formulae for perimeter, area and volume by considering dimensions   #

Unit 11 - Transformations (this unit is not studied in Year 9)

	Year 7	Year 8	Year 9

Recognise all lines of symmetry of a 2D shape
Reflect a shape in a mirror line   #

Recognise planes of symmetry of a 3D shape
Describe the order of rotational symmetry
Rotate any shape about a given centre   #

Classify 2D and 3D shapes by their properties   #
Simple properties of triangles and quadrilaterals
Classify quadrilaterals using geometric properties   #

Describe and perform translations by a vector
Enlargement using a positive integral scale factor   #
Transform 2D shapes by combinations of rotations, reflections and translations   #

Enlargements with fractional scale factors   #
Recognise if two shapes are similar, and identify the scale factor of enlargement

Enlargements with negative scale factors   #
Describe the single transformation equivalent to a combination of given transformations   #