



Mathematics	Working towards expected outcomes	Working at expected outcomes	Working beyond expected outcomes
Autumn Term	<p>Students working towards expected outcomes in Y8 can:</p> <ul style="list-style-type: none">Recall and use Pythagoras' theorem in right-angled triangles, mostly with success and generally identifying the hypotenuse correctlyHas limited success with application questions and does not always appreciate the use of exact values in multi-step problemsBegins to find the distance between two coordinates, perhaps with a diagrammatic approachHave some success writing numbers in standard form but may not always appreciate that small numbers require negative powersConvert a basic decimal time e.g. 12.5 hours, into hours and minutesRead information off timetables	<p>Students working at expected in Y8 can:</p> <ul style="list-style-type: none">Recall and use Pythagoras' theorem in right-angled triangles; apply theorem in basic settings and multi-step problemsUnderstand how to use Pythagoras' theorem to check if a given triangle is right-angledUnderstand the difference between a rounded and an exact solution, working well with the latter in multi-step problemsRecall and spot Pythagoras triplesRecalls and uses the formula for finding the distance between two pointsConvert large and small numbers between ordinary numbers and standard form; accurately inputs numbers in standard form in to the calculator, interpreting the display after calculationsAppreciate that time is not decimal: converts time measuresAnalyse and calculate time information, including timetables	<p>Students working beyond expected in Y8 can:</p> <p>In addition to the skills listed under Working At for this topic, students working beyond expected outcomes can:</p> <ul style="list-style-type: none">Apply Pythagoras theorem accurately in a range of contexts, including the use of triples and exact values; plans the steps for an unfamiliar application with many stepsWork with coordinate geometry problems involving distancesWorks with numbers expressed in varying forms, appreciating their standard form notation; uses the calculator confidently to work with standard form in a variety of real-life settingsWork with time calculations in a range of unfamiliar settings



- Solve equations with positive terms and those requiring bracket expansion
- Expand a double bracket with positive terms
- Factorise by removal of a simple common factor or into double brackets with small numbers; may not always select the correct method
- Uses basic decimal multipliers, including repeated multipliers, in simple percentage of, increase and decrease calculations
- Substitute positive values into formulae, evaluating but not always give due consideration of BIDMAS
- Rearrange formulae with basic layers using the four operations
- Recall and use both $C = \pi d$ and $A = \pi r^2$ in simple cases

- Solve a range of equations with precision, including those with negative algebraic terms and those requiring cross-multiplication
- Expand double brackets with precision, including a repeated bracket
- Factorise by fully removing common factors and/or into double brackets for quadratics of the form $x^2 + bx + c$
- Begin to have success with “Show that”
- Use decimal multipliers for percentage of, increase & decrease questions
- Use index notation for repeated percentage change
- Substitute and evaluate complex formulae, giving due regard to BIDMAS and working with negatives
- Rearrange a variety of formulae, including those involving roots, powers and fractional terms
- Understand the concept of perimeter and recall/use $C = \pi d$ for shapes involving circles
- Find the area of a circle or shapes involving circle parts using $A = \pi r^2$
- Work in reverse problems, such as finding a radius when an area is given

- Adopt the most efficient strategy for solving equations, including those with a single negative algebra term and with fractions
- Expand/simplify a range of expressions involving brackets, including those with multiple double brackets and negatives and those which require an appreciation of BIDMAS
- Can reason/argue well with algebraic skills, including fluency in “show that”
- Consistently works with complex percentage change and repeated percentage change using multipliers
- Work confidently and accurately with a range of formulae, evaluating the formula with decimals, negatives and fractions
- Rearrange a variety of formulae with ease and selecting the most efficient process
- Have success with a large range of circle applications that involve perimeter and/or area, using other methods such as Pythagoras’ theorem as required



Spring Term

Students working **towards** expected outcomes in Y8 can:

- Plot explicit diagonal lines
- Read the values of gradient and y-axis intercept of a line in $y = mx + c$ form, but may confuse these two values
- Begins to find gradient by counting squares but may form the fraction incorrectly or forget negative slope
- Find an expected frequency in simple cases and a relative frequency from simple experimental data
- Form a two circle Venn
- Begins to work with set notation, understanding $A \cap B$
- Finds the exterior angle of a regular polygon
- Have some success with interior angles but cannot recall the formula consistently
- Use basic bearings and scale

Students working **at** expected in Y8 can:

- Plot diagonal lines in both implicit and explicit form
- Determine the gradient and y-axis intercept of a line in $y = mx + c$ form
- State parallel lines have equal gradient
- Find gradient both by counting squares and by formula recall
- Work with simple coordinate geometry problems
- Understand relative frequency in probability and find expected frequencies of an event from data
- Appreciate when bias has come in to play and that relative frequency is more accurate if trials are high
- Can create Venn diagrams with two or three groupings
- Finds simple number and probability information using set notation
- Find both interior and exterior angles of a regular polygon
- Begin to apply angle knowledge in polygon problems
- Find a bearing and, in certain cases, a reverse bearing
- Work accurately with scale

Students working **beyond** expected in Y8 can:
In addition to the skills listed under Working At for this topic, students working beyond expected outcomes can:

- Determine the gradient and y-axis intercept of a line with equation $ax + by + c = 0$
- Confidently find all axes intersections and use these in e.g. area problems
- Work with a range of coordinate geometry problems, using their knowledge of gradient, distances and axes intersections
- Fully understands relative frequency and its limit in theoretical probability
- Work comfortably with complex information and Venn diagrams
- Use set notation in all cases
- Confidently use bearings, reverse bearings and scale in a variety of settings
- Discuss when (regular) polygons will/not tessellate



- Find a basic “proportion of” expressed as a fraction
- Have some success with ratio problems
- Works with Best value, but does not always consider the meaning of units being used
- Have some success in proportional reasoning e.g. simple recipes

- Find speed using proportional reasoning in basic settings e.g. 40km in half an hour is equivalent to 80km/hr
- Interpret basic distance-time graphs, including an appreciation that a line with zero gradient represents a stationary particle
- Begin to evaluate quadratic and cubic expressions but not always accurately for negative values

- Work competently in “proportion of” problems
- Work well with ratio in a range of settings
- Find a ratio within a ratio
- Find the solution to a best value problem with clear reference to units
- Work with proportional reasoning in problems such as recipes

- Find speed using a proportional method (not formula) in a variety of cases
- Draw or interpret a Distance-time graph for journeys, including those involving stationary particles, faster/slower movements and returning to a starting point
- Plots the curves $y = x^2$ and $y = x^3$, including drawing one’s own set of axes
- Appreciate when a curve is a parabola or a cubic and plot simple cases of both

- Use a range of methods in “proportion of” questions, adapting to the setting of the question
- Work with complex proportional reasoning

- Interpret the most complicated distance-time graphs and form such graphs of their own for complicated journeys
- Plot a wide range of quadratic and cubic graphs, working eloquently with BIDMAS and with negative values, moving to cases with the dominant term being negative

**Summer Term**

Students working **towards** expected outcomes in Y8 can:

- Begin to work with isometric paper to represent basic solids
- Determine the solid portrayed by a series of plans/elevations
- Find basic surface areas and begin to have success with cylinders when the formula is presented
- Find the volume of a cylinder when the formula is presented

- Continue the terms of a basic sequence and key known sequences e.g. square numbers
- Find the nth term formula for increasing arithmetic sequences
- Understand that a constant second difference represents a quadratic sequence

- Reflect in horizontal or vertical lines
- Rotate about the origin

Students working **at** expected in Y8 can:

- Represent solids using nets, isometric drawing and plans/elevations
- Determine the solid represented by the above forms
- Find the surface area of a range of solid, including both open and closed cylinders, recalling this formula
- Find the volume of all prisms, including cylinders [and recalling this formula]
- Convert between units of area or volume

- Generate a variety of sequences with written term-to-term formulae and algebraic position-to-term formulae
- Recognise terms of key formulae: square, cube, triangular, Fibonacci, Powers of 2, prime, arithmetic
- Find the nth term formula for arithmetic sequences and simple quadratic sequences
- Establish if a given term is in a sequence for which the nth term formula is known

- Carry out reflections, rotations, enlargements (positive or fractional scale factors) and translations

Students working **beyond** expected in Y8 can:

In addition to the skills listed under Working At for this topic, students working beyond expected outcomes can:

- Work with two-dimensional representations of all solids
- Work in reverse or algebraic problems with both surface area and volume, including cylinders

- Find the nth term formula for more complex sequences, including “shifted” sequences e.g. $T(n) = (n + 1)^2$ or fractional sequences e.g. $T(n) = \frac{2n-1}{n^2+2}$
- Understand the structure of a sequence problem and generate nth term formulae by consideration of this structure e.g. the number of edge, middle or corner pieces in a square jigsaw

- Successfully and accurately carry out and describe a combination of transformations, one after another



- Translate through positive column vectors
- Enlarge with simple positive scale factors

- Work or create basic stem and leaf diagrams
- Make simple observations/comparisons of data sets using the average
- Plot and discuss a scatter diagram, using the term correlation when present

- Find compound measures of speed, density and pressure when the formula is provided and units are compatible
- Convert the well-known metric-to-metric units, such as cm into km
- Begin to convert between imperial and metric units when the conversion is provided
- Read values of given conversion graphs

- Describe above transformations with clear language and all required information

- Interpret or create a [back-to-back] stem and leaf diagram
- Compare and contrast distributions given in stem and leaf form, referring to both a suitable average and the range
- Plot or interpret a scatter diagram for bivariate data, inserting a line of best fit when present and discussing the correlation observed
- Begin to discuss outliers, anomalies, interpolation and extrapolation

- Find compound measures including speed, density and pressure and recall the formulae for these measures
- Convert between all metric-to-metric units and begin to recall and convert between imperial and metric units
- Work with unfamiliar units and their conversions e.g. currency conversions or conversions presented in graphical form

- Choose the correct diagram and most effective average to visualise and analyse a given set of data
- Understand that correlation does not imply causation

- Work with a range of compound measures, recalling the formula, and in applied settings
- Convert all metric-to-metric forms and all imperial to metric forms, using given conversions in the latter
- Undertake complex comparisons, such as money conversions and petrol consumption in one problem