

Year 9 Ways of Doing- Mathematics

	Number	Algebra	Geometry & Measures	Statistics & Probability
Exceeding	<ul style="list-style-type: none"> -Explore financial problems involving percentages e.g. taxation, interest, savings and earnings -Explore surds -Make estimates for the square roots of surds by recalling square numbers 	<ul style="list-style-type: none"> -Find the gradient of a perpendicular line -Find the equation of a line that is a perpendicular bisector to another line, using coordinates -Investigate the effect that changing the numbers in the equation have on what the graph looks like and make connections to previous conclusions about linear functions -Solve simultaneous equations where one equation is non-linear -Identify the solutions to a pair of simultaneous equations, represented graphically, where one is non-linear -Factorise quadratics by completing the square 	<ul style="list-style-type: none"> -Apply Pythagoras' Theorem in order to solve trigonometry problems 	<ul style="list-style-type: none"> -Estimate the median from a histogram -Consider the most efficient method for finding a probability -Solve <i>given that</i> probability problems
Expected	<ul style="list-style-type: none"> -Convert numbers in context from standard form to normal numbers and vice versa -Writing numbers in standard form by making sure the digit before the decimal point is between 1 and 9 -Add and subtract with numbers written in standard form -Find the percentage change using a calculator -Solve compound interest and depreciation problems -Solve original value problems with or without a calculator by finding reverse percentages -Use the unitary method to solve inverse proportion questions -Use proportion to draw or interpret scale drawings -Use an algebraic method to solve proportion problems in formulae with more than 1 operation -Investigate graphical representations to explain how variables may or may not be proportional -Apply laws of indices to evaluate expressions -Evaluate expressions when the indices are fractional and/or negative 	<ul style="list-style-type: none"> -Find the equations of straight lines with fractional gradients -Find the gradient of a line between two points -Use Pythagoras' Theorem to find the length of a line segment -Find the midpoint of a line segment -Plot graphs of $y=1/x$ (reciprocal) -Set up and solve pairs of simultaneous equations (all types) -Set up equations in order to plot them and solve graphically -Find a region of the graph that satisfies inequalities (involving implicit functions) -Draw the lines from equations in order to identify a region that satisfies given inequalities (implicit functions) -Simplify algebraic fractions where the numerator and/or denominator needs to be factorised into double brackets -Factorise quadratic expressions into double brackets (coefficient of $x^2 > 1$) 	<ul style="list-style-type: none"> -Justify decisions with mathematical evidence (scale factors and angle facts) for matching similar triangles -By considering bounds, find the answer to a calculation to an appropriate degree of accuracy and justify your answer -Solve s/d/t problems where you have to convert units -Convert units of measurement when required -Solve contextual problems involving speed, density or pressure -Use angle facts and reasoning to solve problems involving bearings (without measuring) -Apply Pythagoras' Theorem to coordinate or bearings** problems -Apply Pythagoras' Theorem in 3D shapes -Determine whether a triangle is right-angled by seeing if it obeys Pythagoras' Theorem (converse) 	<ul style="list-style-type: none"> -Find the sample size of a specific data category from the population using a stratified sampling method -Find the gradient of the line of best fit -State a practical interpretation of the gradient (i.e. what is the gradient telling you) -Find the IQR from a CF curve -Using the curve to solve problems e.g. less than, more than, percentiles -Compare and contrast (the distributions) two box and whisker plots by making reference to average and spread -Complete a frequency density table from a histogram -Find the frequency from a histogram -Interpret data from a histogram -Estimate the median from a frequency table (grouped data) -Solve a problem involving two (or more) dependent or independent events using a tree diagram

Developing

- Convert ordinary small numbers into standard form
- Write small numbers written in standard form as ordinary numbers
- Apply index laws to multiply or divide numbers written in standard form
- Use a single multiplier to efficiently solve percentage decrease problems
- Find the percentage change for simple non-calculator examples (was \$100, now \$150)
- Use the unitary method to solve proportion problems
- Explain what inverse proportion means and what a graph would look like
- Use an algebraic method to solve simple inverse proportion problems
- Find the cube root of a number
- Use a calculator to find squares, cubes and roots
- Square and square root decimal numbers (place value adjustment)

- Find the equation of the line for positive gradients and negative gradients
- Find the equation of vertical and horizontal lines
- Find the equation of a line from 2 coordinates
- Justify, giving mathematical evidence, whether 3 points are collinear (lie on the same straight line)
- Plot graphs of $y=x^3$ (cubic)
- Solve pairs of linear simultaneous equations by elimination - multiplying one or both equations to find LCM and then adding or subtracting
- Set up and solve pairs of simultaneous equations from a word problem (no LCM multiplication required to solve)
- Recall what an implicit function looks like
- Plot lines from the equations (including implicit functions) to solve graphically
- Represent two inequalities on a number line
- Find a region of the graph that -satisfies inequalities (vertical and horizontal lines)
- Draw the lines from equations in order to identify a region that satisfies given inequalities (vertical and horizontal lines)
- Add or subtract algebraic fractions when the denominators are not the same
- Simplify algebraic fractions by factorising into single brackets (removing the HCF)
- Factorise quadratic expressions into double brackets (negatives)
- Factorise using the difference of two squares

- Use tests for congruence to justify your decisions to match up triangles
- Identify missing angles or sides in congruent triangles
- Find missing lengths on similar shapes by using the scale factor
- Combine the bounds of measurements to find the upper or lower bound of a calculation (e.g. from a formula)
- Find the speed or distance travelled of an object when the time is not a whole number of hours
- Find the time taken, given the speed and the distance
- Use a calculator for s/d/t calculations by converting time into decimal hours
- Rearrange the formula to change the subject
- Rearrange formulae to change the subject to solve a speed, density or pressure problem
- Construct and measure back bearings
- Use a scale to measure a distance on a map accurately
- Recall some Pythagorean Triples
- Find the short side of a right-angle triangle using Pythagoras' Theorem
- Solve contextual worded problems using Pythagoras' Theorem

- Suggest ways of taking a systematic sample
- Use the line of best fit to interpret data from a scatter graph
- Describe the relationship between two variables
- Draw a CF curve drawing your own axes
- Find the lower and upper quartile
- Draw a box and whisker plot from given data
- Find the lower quartile (LQ), median, upper quartile (UQ), range, IQR from a box plot
- Complete a partial completed frequency density table from a partially completed histogram
- Find the class interval containing the median
- Find an estimate for the mean from continuous and grouped frequency tables
- Explain why the mean has to be an estimate
- Complete a tree diagram for two dependent events using fractions or decimals

Supported

- Convert ordinary large numbers into standard form
- Write large numbers written in standard form as ordinary numbers
- Recall the conventions for writing numbers in correct standard form
- Use a calculator to add, subtract, multiply or divide numbers written in standard form
- Calculate percentages of amounts without a calculator

- Find the intercept of a line from the graph -Find the gradient of the line for positive whole numbers
- Find the equation of the line by putting the gradient and intercept in the right place
- Determine whether a point is on the line by substituting into the equation
- Find the gradient of a line from 2 coordinates
- Recognise the graphs of quadratic, cubic and reciprocal functions
- Plot graphs of $y=x^2$ (quadratic)

- Determine if triangles are similar or congruent
- Find the scale factor for similar shapes
- Find the upper and lower bound of a measurement
- Use the correct units for speed given the units for distance and time
- Find the speed of an object when you know the distance travelled and time taken
- Find the distance travelled given the speed and the time

- Suggest ways of taking a random sample
- Explain why the location of a survey, the time and who is being asked can lead to biased results
- Read the scales on the axes accurately and plot points on the scatter graph
- Draw a line of best fit with a ruler
- Describe the correlation between two variables on a scatter graph
- Complete a CF table
- Draw a CF curve on a set of already drawn axes

- Use a single multiplier to efficiently solve percentage increase problems
- Use proportion to solve recipe style questions (double and halves)
- Recognise the symbol for proportionality \propto and k is used for the constant of proportionality
- Explain what direct proportion means and what a graph would look like
- Use an algebraic method to solve simple direct proportion problems
- Justify whether two variables are directly proportional or not
- Find the square of a number
- Find the cube of a number
- Find the square root of a number
- Use index notation

- Solve pairs of linear simultaneous equations by elimination - one step adding or subtracting
- Substitute to find the value of the second variable
- Explain what point of intersection means
- Use a graph with all the lines plotted to find a solution
- Write an inequality for one rule
- List integers that satisfies one inequality
- Represent one inequality on a number line
- Simplifying expressions involving dividing terms
- Add or subtract algebraic fractions when the denominators are the same
- Factorise quadratic expressions into double brackets (positive only)

- Substitute values into a formula to find the missing variable
- Recall the definitions of speed, density and pressure
- Recall the formulae for speed, density and pressure
- Recall the correct units of measurement for distance, time, mass, volume, force, area, pressure, density and speed
- Substitute values into a formula to find speed, density or pressure
- Recall compass points e.g. North or North East
- Recall that a bearing is measured clockwise from North and must be written in 3 digits
- Use a bearing to determine the direction e.g. 45° is North East
- Measure a bearing
- Construct a bearing
- Recall that Pythagoras' Theorem states that $c^2 = a^2 + b^2$
- Identify the hypotenuse of a right-angled triangle
- Calculate the hypotenuse of a right-angle triangle using Pythagoras' Theorem
- Round answers to an appropriate degree of accuracy

- Find the median from the curve
- Identify the features of a box and whisker plot: lowest, lower quartile (LQ), median, upper quartile (UQ), highest, range, IQR
- Draw a box and whisker plot from a CF curve
- Recall the difference between histograms and bar charts
- Recall that frequency density = frequency / class width
- Recall that the area of the bar = class width x frequency density
- Find the the class width
- Complete a frequency density table
- Draw a histogram
- Sort a list of numbers into a frequency table and grouped data by correctly applying inequalities symbols
- Find the modal class interval
- Complete a tree diagram for two independent events using fractions or decimals