Year 8 Ways of Doing- Mathematics

	Number	Algebra	Geometry & Measures	Statistics & Probability
Exceeding	-Use the lattice method (and proportional adjustment) to efficiently multiply 2 decimals together -Add and subtract algebraic fractions -Increase or decrease by a fraction of an amount -Round decimals to certain significant figures (e.g. 0.00035 to 1sf) -Explore surds -Make estimates for the square roots of surds by recalling square numbers -Use proportion to solve similar shape problems -Increase or decrease by a fraction of an amount -Find the percentage of an amount with a calculator -Solving compound interest and depreciation problems -Solve original value problems with or without a calculator	-Solve inequations -Solve linear equations involving adding and subtraction algebraic fractions	-Find missing angles that require forming, simplifying and solving algebraic equations -Find missing angles in parallel lines that require forming, simplifying and solving algebraic equations -Justify whether two lines are parallel -Enlarge shapes from a centre of enlargement with a negative scale factor -Find areas of sectors using proportional reasoning -Form algebraic expressions for surface area of cuboids -Find the surface area of spheres and cones -Form algebraic expressions for volumes of cuboids -Solve problems involving volumes of spheres, cones and frustums -Explore how units of measurement and dimensions are related and can be proven algebraically	-Explore how to avoid bias when asking a sample of the population -Use a sample space diagram to solve probability problems -Find the probability of an outcome of two dependent events using fractions or decimals -Explain why theoretical probability is not always what we see in reality -Consider the most efficient method for finding a probability
Expected	-Use the column method for subtraction (borrowing) -Choose an appropriate multiplication method to solve worded problems -Use short division to divide numbers by a decimal (using proportional adjustment) -Choose an appropriate division method to solve worded problems -Use long/short division methods for dividing decimals by a decimal -Evaluate negative indices with base 10 -Multiply and divide numbers with negative powers of ten (0.1, 0.01, 0.001 etc.) -Add and subtract mixed numbers -Multiply and Divide two fractions including mixed numbers -Calculate with powers of negatives e.g. $(-3)^3$ -Perform calculations accurately and fluently with negative numbers in different contexts	-Solve linear equations with unknowns on both sides -Expand and simplify expressions with double brackets (coefficient of x2>1) -Factorise 3 term expressions -Apply or evaluate laws when the indices are fractional and negative -Rearrange formulae to change the subject by factorising (splits) -Recall the difference between expression, equation, formula and IDENTITY	-Find missing angles by applying your knowledge of geometric notation -Explain why, using angle facts, their answer is correct (angle reasoning) -Find missing angles which require combining alternate, corresponding and vertically opposite angles -Explain why, using angle facts, their answer is correct (angle reasoning) -Find how many sides a shape has when given the sum of interior angles -Find interior or exterior angles in problems involving multiple polygons -Reflect shapes in horizontal, vertical and diagonal lines e.g. x=3, y=-2, y=x, y=-x etc. -Enlarge shapes from a centre of enlargement with a fractional scale factor -Draw combined transformations	-Construct two-way tables from worded (disguised) problems -Interpret data from two-way tables -Explain why representing data in a two-way table is useful -Construct an ordered back to back stem and leaf diagram -Compare two sets of data in a back to back stem and leaf by referring to averages and spread and give reasons for differences -Find the mean and median from a frequency table -Interpret averages (e.g. why you might choose to use the mode instead of the median for this data set) -Interpret whether averages represent the data well (outliers)

Green section

Column 1

- Apply accurately the correct order of operations to complex calculations including those involving fractions
- Round whole numbers to certain significant figures
- Round decimals which require carrying over tenths, hundredths etc. (e.g. 0.598 rounded to 2 dp)
- Estimate the value of calculations by rounding each number to 1 significant figure first
- Find the cube root of a number
- Use a calculator to find squares, cubes and roots
- Square and square root decimal numbers
- Evaluate expressions when the indices are fractional and/or negative
- Apply laws of indices to evaluate numerical expressions
- Use the products of prime factors to find the LCM and HCF of two or more numbers
- Apply proportional reasoning to solve problems
- Relate ratios to fractions and percentages
- Use the unitary method to solve inverse proportion questions
- Use proportion to draw or interpret scale drawings
- Find any fraction of an amount
- Find percentages of amounts involving decimals (e.g. 2.5%) without a calculator
- Find the percentage change using a calculator

Column 3

- Describe reflections fully
- Describe enlargements fully
- Find the area of shapes by forming, simplifying and solving algebraic equations
- Calculate exactly with multiples of π
- Find the surface area of prisms
- Find the surface area of shapes in contextual problems
- Find volumes of prisms, including those with cross-sections that are compound shapes
- Find missing lengths, given the volume
- Convert metric units of volume e.g. cm^3 to m^3
- Convert between metric units including area and volume

Column 4

- Explain the difference between discrete and continuous data
- Identify the words used in a question that makes it leading
- Ask a variety of open, closed, option questions
- Construct a sample space diagram to show all outcomes
- Calculate missing probabilities in a table involving algebra
- Calculate the number of times an outcome would occur using the theoretical probability
- Find the probability of and outcome of two independent events using fractions or decimals
- Solve a problem involving two (or more) dependent or independent events using a tree diagram

Orange section

Column 1

- Use the column method for addition
- Use the column method for subtraction (no borrowing)
- Use the column or grid methods to multiply numbers with more than 2 digits together
- Use long division for dividing numbers with remainders
- Use short division to leave answer as a decimal or mixed number
- Divide numbers by factors when the divisor is not a 2-digit multiple of 10
- Use the chunking method to divide numbers with more than 3 digits
- Multiply and divide numbers by 0.1, 0.01 etc.

Column 2

- Solve linear equations with two steps, including ones with brackets
- Expand and simplify expressions with double brackets (negatives)
- Factorise an expression by taking out more than one common factor
- Apply the three laws of indices with numbers as well as algebraic expressions
- Rearrange formulae to change the subject with >2 operations
- Use correct algebraic notation for operations
- Recall the difference between expression, equation, formula and IDENTITY

Column 3

- Find missing angles by combining two or more angle facts
- Recognise the common conventions for geometric notation
- Find missing angles in parallel lines using alternate and corresponding angles
- Calculate one interior angle of any given polygon
- Reflect shapes in diagonal lines
- Reflect shapes on a grid in the axes
- Enlarge shapes from a centre of enlargement in x,y plane
- Describe translations using vector notation
- Describe rotations fully, using tracing paper to find the centre of rotation

Column 4

- Construct two way tables
- Find and simplify probabilities from two-way tables
- Identify when it is appropriate to use two-way table
- Find the mode, modal group, median and range from a stem and leaf diagram
- Find the mode from a frequency table
- Find numbers in a set when given the averages
- Compare the consistency of results by making reference to the spread (range)
- Explain the difference between primary and secondary data

-Use the lattice method to multiply decimals by first removing the decimal point
-Order decimals
-Multiply and divide decimals with positive powers of ten
-Add and subtract fractions with different denominators
-Multiply and dividing fractions with whole numbers
-Add and subtract with negative numbers
-Apply accurately the correct order of operations with calculations involving indices
-Insert brackets into a calculation to change the answer
-Round decimals to a certain amount of decimal places (2dp, 3dp etc)
-Use approximation to check the magnitude of a calculation before or after the proper calculation
-Find the cube of a number
-Find the square root of a number
-Express a number as a product of its prime factors using index notation
-Recall that a proportion is described as a fraction
-Divide an amount into a given ratio
-Use the unitary method to solve proportion problems
-Find any fraction of an amount where the numerator is 1
-Use 1%, 10%, 25% and 50% to find 20%, 30%, 5% etc. of amounts
-Find the single multiplier for decrease and increase problems
-Find the percentage change for simple non-calculator examples (was $100, now $150)
		-Find the area of a parallelogram, trapezium and compound shapes
		-Solve problems involving missing lengths when given the area
		-Solve more complex problems involving:
		  -Parts of circles e.g. semi-circle
		  -Word questions
		  -Finding the radius or diameter given the area
		-Find the surface area of a cuboid from its dimensions
		-Find missing lengths of a cuboid from information about its surface area
		-Use the appropriate unit for the size of the volume you are finding
		-Use the length, width and height to find the volume of cuboids
		-Find missing lengths, given the volume
		-Convert between metric units for capacity and metric units for mass units e.g. ml to l, or kg to g etc.
			-Determine whether questions give a qualitative or quantitative response
			-Create questions with qualitative and quantitative responses
			-Improve a question and/or the response boxes
			-List all the outcomes of 2 events
			-Complete a partially filled in sample space diagram for two events
			- Recall the definition for mutually exclusive events
			-Use P(outcome) and P'(outcome) notation
			-Find the probability of an outcome NOT happening (P'=1-P)
			-Calculate missing probabilities in a table
			-Complete a tree diagram for two dependent events using fractions or decimals

-Use partitioning and a number line to add two numbers together -Subtract by counting on using a number line -Use the column method to multiply 2 digit numbers together -Use the grid method to multiply 2 digits together -Use long division to divide numbers with no remainders -Use the bus stop method (short division) to divide	-Use function machines to find the input from the output -Solve linear equations (one step) using inverse operations -Expand and simplify expressions with double brackets (positive only) -Find HCF of numbers and expressions -Accurately apply the three laws of indices to simplify algebraic expressions	-Identify acute, obtuse and reflex angles -Identify vertically opposite angles -Identify types of angles by estimating their size -Find one missing angle in triangles, straight lines, quadrilaterals and around a point -Identify and label vertically opposite angles -Identify and label alternate and corresponding angles on a parallel line	-Complete partially filled two-way tables -Find values from two-way tables -Construct an ordered stem and leaf diagram with a key -Find averages (mode, median and mean) and from a list of numbers -Compare simple averages (e.g. mean of goals scored by boys vs mean of goals scored by girls)

numbers with no remainders
-Find factors of numbers
-Divide numbers by factors when the divisor is a 2-digit multiple of 10
-Use the chunking method to divide up to a 3 digit number
-Add and subtract decimals using the column method
-Multiply and divide numbers by 10, 100 and 1000 etc.
-Read, write and say numbers in figures and in words
-Identify the place value of a digit in a number
-Multiply and divide whole numbers with positive powers of ten
-Identify the missing operation between whole numbers using powers of ten (10, 100, 1000 etc.)
-Convert between improper and mixed numbers
-Simplify fractions
-Add and subtract fractions with the same denominator
-Convert between improper and mixed numbers
-Find equivalent fractions
-Simplify fractions
-Find fractions of amounts
-Multiply and divide with negative numbers
-Simplifying expressions by collecting (adding and subtracting) terms
-Apply accurately the correct order of operations with no indices
-Round to nearest unit, 10, 100 and 100
-Check the accuracy of a calculation by using inverse operations
-Express a number as a product of its prime factors
-Find the square of a number
-Use index notation
-Write ratios in the correct order
-Simplify and find equivalent ratios
-Use proportion to solve recipe style questions (double and halves)
-Find halves and quarters of an amount
-Find 50%, 25% of an amount by halving or quartering
-Find 10% or 1% by dividing by 10 or 100
-Increase and decrease amounts by 1%, 10%, 25% and 50% to find 20%, 30%, 5% etc. without a calculator

-Identify the subject of a formula
-Use function machines to get the operations in the right order
-Rearrange formulae with one operation
-Recall the difference between expression, equation, formula and IDENTITY

-Find missing angles using vertically opposite angles
-Identify exterior and interior angles
-Calculate the sum of interior angles of any given polygon using the formula
-Find the exterior angle of a given polygon
-Translate shapes using vector notation
-Rotate shapes using tracing paper
-Reflect shapes using a vertical or horizontal mirror line
-Enlarge shapes using a scale factor
-Recall what happens with each transformation (e.g. slide, flip, turn, bigger or smaller)
-Recall what vector instructions mean
-Find the area of a rectangle or triangle
-Find the missing lengths of rectangles and triangles when given the area
-Identify parts of a circle
-Find the area of a circle when given the radius
-Find the surface area of a 3D shape from its net
-Find the surface area of a cuboid
-Find the volume of solid shapes by counting cubes and thinking about layers
-Use the correct units for volume
-Multiply and divide by 10, 100, 1000 etc. to convert metric units.
-Use appropriate metric units based on the size of what you are measuring
-Convert between metric length units e.g. mm to m

-Recall that response boxes should be exhaustive and non-overlapping
-Recall that timescales should be specified in the question
-Give reasons why questions and/or response boxes are wrong in a questionnaire