TBSHS Year 8 Mathematics - Autumn Term

Progression Pathway	Content and Concepts (depth of understanding and application)	Skills Development
7 – 9	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Apply the index laws for multiplication and division of positive integer powers • Understand the effect of multiplying or dividing by any integer power of 10 • Understand the order in which to calculate expressions that contain powers and brackets in both the numerator and denominator of a fraction • Round numbers to a given number of significant figures • Use numbers of any size rounded to 1 significant figure to make standardized estimates for calculations with 1 step. • Apply the index laws for multiplication and division of small integer powers, e.g. $a^3 \times a^2$, $x^3 \div x^2$ • Know and use the general forms of the index laws for multiplication and division of positive integer powers. (e.g. $pa \times pb$, $pa \div pb$, $(pa)b$) • Construct and solve equations that involve multiplying out brackets by a negative number and collecting like terms (e.g. $4(2a – 1) = 32 – 3(2a – 2)$) • Calculate the volume and surface area of right prisms • Calculate the lengths, areas and volumes in cylinders • Calculate the lengths and areas given the volumes in right prisms • Use and apply Pythagoras' theorem to solve problems • Given the coordinates of points A and B, calculate the length of AB • Recognise graphs showing constant rates of change, average rates of change and variable rates of change • Identify misleading graphs and statistics – choosing the appropriate reasons from a wide choice of options, or writing their own reasons.	Pupils use developed knowledge with confidence and skill, combined with careful planning, to ensure accurate working with fully justified answers. They are able to confidently assess and adapt different methods to solve more challenging problems. Pupils consider the significance of errors in methods, and working out, and actively try to minimise these. They are able to confidently self-assess all work and propose solutions to solve any errors identified.
6 – 8	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Know the prime factorisation of numbers up to 30, giving answers as powers • Use prime factor decomposition to find the HCF or LCM of 2 numbers • Show that any number to the power of zero is 1 • Know the prefixes associated with 109, 106, 103 (giga, mega and kilo) • Simplify simple expressions involving index notation, i.e. $x^2 + 2x^2$, $p \times p^2$, $r5 \div r^2$ • Know and understand the meaning of an identity and use the identity sign • Simplify expressions involving brackets and powers e.g. $x(x2 + x + 4)$, $3(a + 2b) – 2(a + b)$ • Use the distributive law to take out single term algebraic factors, e.g. $x^3 + x^2 + x = x(x^2 + x + 1)$ • Substitute positive and negative integers into linear expressions and expressions involving powers • Analyse 3D shapes informally and through cross-sections, plans and elevations • Use the formulae to find area of a circle, given the radius or diameter • Use the formulae for the area of a circle, given area, to calculate the radius or diameter • Know the formula for Pythagoras' theorem and how to substitute in values from a diagram • Recognise graphs that show direct proportion • Solve problems involving direct proportion with a graph • Discuss and interpret real-life graphs • Draw and use graphs to solve distance-time problems • Identify misleading graphs and statistics – choosing the appropriate reasons from a small choice of options	Pupils use developed knowledge with confidence and skill, combined with careful planning, to ensure accurate working with fully justified answers. They are able to confidently assess and adapt different methods to solve more challenging problems. When solving problems pupils consider the significance of errors in their methods, and working out, and actively try to minimise these. They are able to confidently self-assess all work and propose solutions to solve any errors identified.
5 – 7	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Find the prime factor decomposition of a number • Establish index laws for positive powers where the answer is a positive power • Understand that each of the headings in the place value system, to the right of the tens column, can be written as a power of ten • Simplify simple expressions involving powers, but not brackets, by collecting like terms • Establish index laws for positive powers of variables where the answer is a positive power • Multiply a single term over a bracket e.g. $x(x + 4)$, $3x(2x – 3)$ • Begin to use plans and elevations • Visualise and use a wide range of 2D representations of 3D objects • Convert between larger volume measures to smaller ones (e.g. m^3 to cm^3) • Use the formula for the circumference of a circle • Know the names of parts of a circle • Be able to correctly identify the hypotenuse	Pupils are able to work independently on topics involving multi-step approaches. They can confidently identify errors in their own work, and that of peers, and suggest a possible solution to improve. They are able to link some steps in methods to wider theories.

	• Extend a proportion or relationship beyond known values (given proportion graphically or in words) • Interpret information from a complex real life graph, read values and discuss trends • Plot the graphs of a function derived from a real life problem • Discuss and interpret linear and non-linear graphs from a range of sources • Plot a simple straight line graph (distance-time)	
4 – 6	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Divide £.p by a two digit number to give £.p • Add and subtract integers – positive and negative numbers (with varying numbers of significant figures) • Find the HCF or LCM of 2 numbers less than 100 • Estimate square roots of non-square numbers less than 100 • Multiply and divide integers - positive and negative numbers • Calculate squares, cubes and cube roots • Add, subtract, multiply and divide integers. Extend to the distributive law a(b + c) • Find the prime factor decomposition of a number • Use the function keys for powers and fractions • Combine laws of arithmetic for brackets with mental calculations of cubes roots and square roots • Calculate surface areas of cubes and cuboids • Calculate areas of triangles, parallelograms, trapezia • Calculate areas of compound shapes • Calculate the volume of shapes made from cuboids • Solve volume problems • Convert between metric and imperial measures, and cm3 and litres. • Calculate the surface area of shapes made from cuboids • Use complex two way tables • Interpret scatter graphs, draw lines of best fit and use correlation • Find the modal class of a set of continuous data • Use stem and leaf diagrams to find mode, median, mean, range • Identify misleading graphs and statistics • Construct and solve linear equations • Substitute integers into formulae and solve for missing values one- step equations • Simplify simple expressions involving powers • Multiply a single term over a bracket • Use the distributive law to take out numerical common factors	Takes independent responsibility for working through problems. Is able to recall and explain how basic steps combine to solve problems. Still requires some support, on occasion, and can reflect to identify some of their own errors.
3 – 5	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Add and subtract integers with varying numbers of significant figures • Extend written methods to TU x TU and HTU x TU • Add and subtract negative integers from positive and negative integers • Multiply and divide negative integers by a positive number • Use ratio notation • Reduce a ratio to its simplest form • Reduce a three part ratio to its simplest form by cancelling • Find equivalent ratios • Solve simple problems using ratio expressed in words and in ratio notation • Recognise the links between ratio and fractional notation • Use direct proportion in simple contexts • Use the unitary method to solve simple word problems involving ratio • Know and use geometric properties of cuboids and shapes made from cuboids • Deduce properties of 3D shapes from 2D representations, including nets, 3D sketches and isometric drawings • Identify nets of 3D shapes – regular amd irregular polyhedra • Use a ruler and compass to construct simple nets of 3D shapes • Calculate the surface area of cubes • Use nets to calculate the surface area of simple cuboids • Find the volume of a cube and cuboid by counting cubes • Know the formulae for the volume of cube and a cuboid • Solve simple problems involving units of measurement in the context of length, area and capacity • Convert cm3 to litres • Group data, where appropriate in equal class intervals • Use experimentation to complete a data collection sheet, e.g. throwing a dice or data-logging • Use questionnaire responses to complete a data collection sheet • Interpret data from compound and comparative bar charts • Construct a frequency table for grouped discrete data and draw a graph	Pupils can solve problems as part of a group and complete multi-stage problems. They still require some scaffolding to support their understanding and application of core methods. They are able to identify some possible errors in their work and possible challenges.

	• Construct compound bar graphs • Interpret simple pie charts • Use arithmetic operations with algebra • Simplify more complex linear algebraic expressions by collecting like terms, e.g. x + 7 + 3x, 2b – 3a + 6b • Find outputs and inputs of simple functions expressed in words or symbols using inverse operations • Construct functions (completing a number machine) • Understand the difference between an expression and an equation and the meaning of the key vocabulary 'term' • Understand and identify the unknowns in an equation • Solve simple linear equations with integer coefficients, of the form ax = b or x +/– b = c, e.g. 2x = 18, x + 7 = 12 or x – 3 = 15 • Substitute solution back into equation to check it is correct • Know that expressions can be written in more than one way, e.g. 2 x 3 + 2 x 7 = 2(3 + 7) • Begin to multiply a positive integer over a bracket containing linear terms, e.g. 4(x + 3)	
2 – 4	Pupils working on this path way will have shown they are able to complete the prior skills and are expected to be able to: • Understand how to use brackets in simple calculations • Multiply by zero • Know and use names of 3D shapes • Identify 2D representations of 3D shapes • Identify and count faces, edges, vertices • Identify a prism and know it has a constant cross section • Identify nets of closed cubes and cuboids • Use distributive law with brackets, with numbers	Pupils can solve problems when the steps are clearly broken down into their core components and explained in full to them with additional scaffolding. They are able to complete simple tasks but often require support to link methods and theories to practical questions.
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