KSHS Key Stage 3 Mathematics Grade Descriptors

	Learning Path	Year 7	Year 8	Year 9
Developing Fluency, reasoning Mathematically and Problem Solving	Foundation	consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots	develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems.	select and use appropriate calculation strategies to solve increasingly complex problems
	Core	develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems. select and use appropriate calculation strategies to solve increasingly complex problems begin to model situations mathematically and express the results using a range of formal mathematical representations use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships	select and use appropriate calculation strategies to solve increasingly complex problems begin to model situations mathematically and express the results using a range of formal mathematical representations identify variables and express relations between variables algebraically and graphically substitute values in expressions, rearrange and simplify expressions, and solve equations	begin to model situations mathematically and express the results using a range of formal mathematical representations identify variables and express relations between variables algebraically and graphically substitute values in expressions, rearrange and simplify expressions, and solve equations extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically
	Proficient	substitute values in expressions, rearrange and simplify expressions, and solve equations extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically	extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]. make and test conjectures about patterns and relationships; look for proofs or counter-examples	move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]. make and test conjectures about patterns and relationships; look for proofs or counter-examples select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems
	Exceptional	move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]. make and test conjectures about patterns and relationships; look for proofs or counter-examples select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics	select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics develop algebraic and graphical fluency, including understanding linear and simple quadratic functions	use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes, probability and statistics develop algebraic and graphical fluency, including understanding linear and simple quadratic functions

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Number	Foundation	Round decimals to the nearest whole number. Multiply and divide decimals by 10, 100, 1000	Use the 4 operations applied to integers. Use standard column procedures to add and subtract decimals with up to two places	Simplify fractions by cancelling all common factors. Understand the vocabulary of prime numbers, factors, multiples, common factors, common multiples. Convert terminating decimals to fractions.
	Core	Use the 4 operations applied to integers. Use standard column procedures to add and subtract decimals with up to two places. Simplify fractions by cancelling all common factors. Understand the vocabulary of prime numbers, factors, multiples, common factors, common multiples. Convert terminating decimals to fractions. Use the 4 operations applied to decimals. Order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥. Know and use the order of operations. 4 operations applied to fractions. Recognise and use inverse operations. Use a calculator to calculate accurately. Round numbers [dp or sf]. Calculate simple percentages. Find HCF, LCM and factor trees. Use standard units of mass, length, time, money.	Simplify fractions by cancelling all common factors. Understand the vocabulary of prime numbers, factors, multiples, common factors, common multiples. Convert terminating decimals to fractions. Use the 4 operations applied to decimals. Order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥. Know and use the order of operations. 4 operations applied to fractions. Recognise and use inverse operations. Use a calculator to calculate accurately. Round numbers [dp or sf]. Calculate simple percentages. Find HCF, LCM and factor trees. Use standard units of mass, length, time, money. 4 operations for improper fractions& mixed numbers. Deal confidently with negative and positive numbers. Express 1 quantity as a percentage of another, compare 2 quantities using percentages, percentages greater than 100%	Use the 4 operations applied to decimals. Order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥. Know and use the order of operations. 4 operations applied to fractions. Recognise and use inverse operations. Use a calculator to calculate accurately. Round numbers [dp or sf]. Calculate simple percentages. Find HCF, LCM and factor trees. Use standard units of mass, length, time, money. 4 operations for improper fractions& mixed numbers. Deal confidently with negative and positive numbers. Express 1 quantity as a percentage of another, compare 2 quantities using percentages, percentages greater than 100% Apply BIDMAS to calculations involving powers and roots. Recognise powers of 2, 3, 4, 5. Interpret fractions and percentages as operators
	Proficient	4 operations for improper fractions& mixed numbers. Deal confidently with negative and positive numbers. Express 1 quantity as a percentage of another, compare 2 quantities using percentages, percentages greater than 100% Apply BIDMAS to calculations involving powers and roots. Recognise powers of 2, 3, 4, 5. Interpret fractions and percentages as operators.	Apply BIDMAS to calculations involving powers and roots. Recognise powers of 2, 3, 4, 5. Interpret fractions and percentages as operators. Write numbers in standard form. Find the reciprocal of a number. Identify upper and lower bounds of a number	Write numbers in standard form. Find the reciprocal of a number. Identify upper and lower bounds of a number Add and subtract numbers in standard form. Order numbers written in standard index form Use a calculator to calculate with values in standard form.
	Exceptional	Write numbers in standard form. Find the reciprocal of a number. Identify upper and lower bounds of a number Add and subtract numbers in standard form. Order numbers written in standard index form Use a calculator to calculate with values in standard form. Find HCF and LCM using Prime Factors. Convert between currencies and use simple metric and imperial conversions.	Add and subtract numbers in standard form. Order numbers written in standard index form Use a calculator to calculate with values in standard form. Find HCF and LCM using Prime Factors. Convert between currencies and use simple metric and imperial conversions. Multiply and divide numbers in standard form. Understand and use: density; pressure; speed. Multiply and divide numbers in index notation. Use index laws including negative power answers.	Find HCF and LCM using Prime Factors. Convert between currencies and use simple metric and imperial conversions. Multiply and divide numbers in standard form. Understand and use: density; pressure; speed. Multiply and divide numbers in index notation. Use index laws including negative power answers. Calculate with surds and fractional indices. Multiply an inequality by a negative number. Understand a recurring decimal to fraction proof. Use fractions, surds and p in exact calculations, without a calculator.

	Learning Path	Year 7	Year 8	Year 9
Algebra	Foundation	Use function machine. Use notation for 2-D co-ordinates in all four quadrants. Draw, label and scale axes. Generate terms of a simple sequence using term to term rules.	Read values from straight-line graphs for real-life situations. Find next term in a sequence. Generate terms of a simple sequence from practical contexts.	Substitute numerical values into expressions. Simplify algebraic expressions by collecting like terms. Show inequalities on a number line. Write the term-to-term definition of a sequence in words.
	Core	Read values from straight-line graphs for real-life situations. Find next term in a sequence. Generate terms of a simple sequence from practical contexts. Substitute numerical values into expressions. Simplify algebraic expressions by collecting like terms. Show inequalities on a number line. Write the term-to-term definition of a sequence in words. Spot expressions & equations and understand 'term'. Use correct notation, e.g. ab for a × b, 3y for y + y + y or 3 × y, a² for a × a. Use expressions for the nth term in a one-step arithmetic sequence (e.g. 3n, n + 5) Use coordinates in all 4 quadrants. Multiply a(x+b). Find a term of a practical sequence given position. Predict how a sequence continues, test it. Solve two-step linear equations.	Substitute numerical values into expressions. Simplify algebraic expressions by collecting like terms. Show inequalities on a number line. Write the term-to-term definition of a sequence in words. Spot expressions & equations and understand 'term'. Use correct notation, e.g. ab for a × b, 3y for y + y + y or 3 × y, a² for a × a. Use expressions for the nth term in a one-step arithmetic sequence (e.g. 3n, n + 5) Use coordinates in all 4 quadrants. Multiply a(x+b). Find a term of a practical sequence given position. Predict how a sequence continues, test it. Solve two-step linear equations. Recognise equations, formulae or functions. Find coordinates of simple functions. Draw/ use graphs of distance-time problems. Plot /draw graphs of straight lines. Use linear nth terms for two-step sequence.	Spot expressions & equations and understand 'term'. Use correct notation, e.g. ab for a × b, 3y for y + y + y or 3 × y, a² for a × a. Use expressions for the nth term in a one-step arithmetic sequence (e.g. 3n, n + 5) . Use coordinates in all 4 quadrants. Multiply a(x+b). Find a term of a practical sequence given position. Predict how a sequence continues, test it. Solve two-step linear equations. . Recognise equations, formulae or functions. Find coordinates of simple functions. Draw/ use graphs of distance-time problems. Plot /draw graphs of straight lines. Use linear nth terms for two-step sequence. Solve linear equations with unknown on both sides of the equation and with brackets. Rearrange basic equations. Identify parallel lines from equations. Plot linear graphs ,y = mx + c -recognise their features.
	Proficient	Recognise equations, formulae or functions. Find coordinates of simple functions. Draw/ use graphs of distance-time problems. Plot /draw graphs of straight lines. Use linear nth terms for two-step sequence. Solve linear equations with unknown on both sides of the equation and with brackets. Rearrange basic equations. Identify parallel lines from equations. Plot linear graphs ,y = mx + c -recognise their features.	Solve linear equations with unknown on both sides of the equation and with brackets. Rearrange basic equations. Identify parallel lines from equations. Plot linear graphs ,y = mx + c -recognise their features. Use gradients to interpret how one variable changes in relation to another. Factorise to one bracket by taking out HCF for all terms e.g. $2x^2y + 6xy^2 = 2xy(x + 3y)$	Use gradients to interpret how one variable changes in relation to another. Factorise to one bracket by taking out HCF for all terms e.g. $2x^2y + 6xy^2 = 2xy(x + 3y)$ Solve linear equations with brackets/simple fractions. Trial and improvement to find the approx. solution to 1 dp of equations such as x³ + x = 50. Simplify simple expressions involving index notation
	Exceptional	Use gradients to interpret how one variable changes in relation to another. Factorise to one bracket by taking out HCF for all terms e.g. $2x^2y + 6xy^2 = 2xy(x + 3y)$ Solve linear equations with brackets/simple fractions. Trial and improvement to find the approx. solution to 1 dp of equations such as x³ + x = 50. Simplify simple expressions involving index notation Find the coordinates of midpoint of a line. Multiply out brackets involving positive terms such as (a + b)(c + d). Interpret distance-time graphs and calculate the speed of sections, total distance, total time.	Solve linear equations with brackets/simple fractions. Trial and improvement to find the approx. solution to 1 dp of equations such as x³ + x = 50. Simplify simple expressions involving index notation Find the coordinates of midpoint of a line. Multiply out brackets involving positive terms such as (a + b)(c + d). Interpret distance-time graphs and calculate the speed of sections, total distance, total time. Given the coordinates of points A and B, calculate the length AB. Solve linear equations with fractions. Solve linear simultaneous equations graphically or algebraically. Recognise & sketch cubic graphs	Find the coordinates of midpoint of a line. Multiply out brackets involving positive terms such as (a + b)(c + d). Interpret distance-time graphs and calculate the speed of sections, total distance, total time. Given the coordinates of points A and B, calculate the length AB. Solve linear equations with fractions. Solve linear simultaneous equations graphically or algebraically. Recognise & sketch cubic graphs Solve quadratic equations by factorising. Change the subject of formula- subject on both sides. Form/solve simultaneous equations. Identify gradient of ax+by=c. Recognise/ sketch reciprocal graphs .Distinguish between arithmetic & geometric sequences

	Learning Path	Year 7	Year 8	Year 9
Geometry and Measures	Foundation	Use a protractor to measure angles. Use correct notation for labelling angles. Identify perpendicular and parallel lines.	Calculate perimeter and area of triangles /rectangles Use a protractor to draw angles Calculate angles around a point ,on a line and in a triangle.	Use units of measurement to estimate and solve problems In everyday contexts involving length, area, volume, mass, time and angle
	Core	Calculate perimeter and area of triangles /rectangles Use a protractor to draw angles Calculate angles around a point , on a line and in a triangle.
Use units of measurement to estimate and solve problems In everyday contexts involving length, area, volume, mass, time and angle
Identify properties of shapes inc. line /rotational symmetry. Use plans & elevations. Find perimeter/area of basic compound shapes
Use ruler /protractor/compasses to construct simple nets of 3D shapes and triangles (SSS, ASA, SAS). Transform shapes by reflection and translation	Use units of measurement to estimate and solve problems In everyday contexts involving length, area, volume, mass, time and angle
Identify properties of shapes inc. line /rotational symmetry. Use plans & elevations. Find perimeter/area of basic compound shapes
Use ruler /protractor/compasses to construct simple nets of 3D shapes and triangles (SSS, ASA, SAS). Transform shapes by reflection and translation
Give a bearing between points. Identify alternate & corresponding angles. Enlarge and rotate shapes. Find volume of simple compound shapes. Use congruence criteria -triangles (SSS, SAS, ASA, RHS)	Identify properties of shapes inc. line /rotational symmetry. Use plans & elevations. Find perimeter/area of basic compound shapes
Use ruler /protractor/compasses to construct simple nets of 3D shapes and triangles (SSS, ASA, SAS). Transform shapes by reflection and translation
Give a bearing between points. Identify alternate & corresponding angles. Enlarge and rotate shapes. Find volume of simple compound shapes. Use congruence criteria -triangles (SSS, SAS, ASA, RHS)
Enlarge a given shape using (0, 0) as the centre of enlargement. Mark on a diagram the position of point *B* given its bearing from the point *A*. Describe a transformation
	Proficient	Give a bearing between points. Identify alternate & corresponding angles. Enlarge and rotate shapes. Find volume of simple compound shapes. Use congruence criteria -triangles (SSS, SAS, ASA, RHS)
Enlarge a given shape using (0, 0) as the centre of enlargement. Mark on a diagram the position of point *B* given its bearing from the point *A*. Describe a transformation	Enlarge a given shape using (0, 0) as the centre of enlargement. Mark on a diagram the position of point *B* given its bearing from the point *A*. Describe a transformation
Calculate the interior angles of regular polygons
Use formulae for area/ circumference of a circle, given the radius /diameter. Use vector notation for translations. Enlarge 2D shapes, given fractional SF.	Calculate the interior angles of regular polygons
Use formulae for area/ circumference of a circle, given the radius /diameter. Use vector notation for translations. Enlarge 2D shapes, given fractional SF. Find the perimeters and areas of semicircles and quarter circles. Produce shapes and paths by using descriptions of loci.
	Exceptional	Calculate the interior angles of regular polygons
Use formulae for area/ circumference of a circle, given the radius /diameter. Use vector notation for translations. Enlarge 2D shapes, given fractional SF.
Find the perimeters and areas of semicircles and quarter circles. Produce shapes and paths by using descriptions of loci.
Use straight edge and compasses to construct the mid -point /perpendicular bisector of a line segment. Pythagoras' theorem - use to find the hypotenuse. Construct angles of 60°, 90°, 30°, 45°	Find the perimeters and areas of semicircles and quarter circles. Produce shapes and paths by using descriptions of loci.
Use straight edge and compasses to construct the mid -point /perpendicular bisector of a line segment. Pythagoras' theorem - use to find the hypotenuse. Construct angles of 60°, 90°, 30°, 45°
Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders. Use Pythagoras' theorem in 3-D problems	Use straight edge and compasses to construct the mid -point /perpendicular bisector of a line segment. Pythagoras' theorem - use to find the hypotenuse. Construct angles of 60°, 90°, 30°, 45°
Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders. Use Pythagoras' theorem in 3-D problems
Use the sine, cosine and tangent ratios to find the lengths of unknown sides in a right-angled triangle, Prove and use circle theorems. Enlarge 2D shapes, given a negative,/ fractional scale factor

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Learning Path	Year 7	Year 8	Year 9
Foundation	Use a probability scale with words. Extract data and interpret discrete bar charts. Draw bar charts, line graphs and pictograms for discrete data	Mark probabilities on a probability scale of 0 to 1 Calculate the mode and range for discrete data	Use the probabilities of an exhaustive set of outcomes sum to 1.Interpret simple pie charts
Core	Mark probabilities on a probability scale of 0 to 1 Calculate the mode and range for discrete data Use the probabilities of an exhaustive set of outcomes sum to 1.Interpret simple pie charts Identify all mutually exclusive outcomes of an event. Calculate the mean and median for discrete data. Design and use data collection sheets. Know probability of an event is p, probability of not is 1-p. Write probability in words, a/b, decimals and %. Compare distributions using range, median/ mean.	Use the probabilities of an exhaustive set of outcomes sum to 1.Interpret simple pie charts Identify all mutually exclusive outcomes of an event. Calculate the mean and median for discrete data. Design and use data collection sheets. Know probability of an event is p, probability of not is 1-p. Write probability in words, a/b, decimals and %. Compare distributions using range, median/ mean. Use experimental & theoretical probability (inc. relative freq).Find probabilities from tables. Pie charts. Design questionnaires. Ordered stem &leaf diagrams.	Identify all mutually exclusive outcomes of an event. Calculate the mean and median for discrete data. Design and use data collection sheets. Know probability of an event is p, probability of not is 1-p. Write probability in words, a/b, decimals and %. Compare distributions using range, median/ mean. Use experimental & theoretical probability (inc. relative freq).Find probabilities from tables. Pie charts. Design questionnaires. Ordered stem &leaf diagrams. Work out probabilities from two-way tables. Draw scatter graphs. Produce ordered back-to-back stem and leaf diagrams
Proficient	Use experimental & theoretical probability (inc. relative freq).Find probabilities from tables. Pie charts. Design questionnaires. Ordered stem &leaf diagrams. Work out probabilities from two-way tables. Draw scatter graphs. Produce ordered back-to-back stem and leaf diagrams	Work out probabilities from two-way tables. Draw scatter graphs. Produce ordered back-to-back stem and leaf diagrams Compare relative frequencies -samples different sizes. Range, modal/ median class, estimate mean of a grouped data / stem & Leaf. Types of correlation.	Compare relative frequencies -samples different sizes. Range, modal/ median class, estimate mean of a grouped data / stem & Leaf. Types of correlation. Use and draw sample space diagrams. Recognise quantitative and qualitative data. Use the line of best fit to make predictions.
Exceptional	Compare relative frequencies -samples different sizes. Range, modal/ median class, estimate mean of a grouped data / stem & Leaf. Types of correlation. Use and draw sample space diagrams. Recognise quantitative and qualitative data. Use the line of best fit to make predictions. Produce ordered back-to-back stem and leaf diagrams. Understand primary and secondary data sources. Know the definition of random sampling.	Use and draw sample space diagrams. Recognise quantitative and qualitative data. Use the line of best fit to make predictions. Produce ordered back-to-back stem and leaf diagrams. Understand primary and secondary data sources. Know the definition of random sampling. Draw a probability tree diagram based on given information. Use tree diagrams to calculate the probability of two independent events. Record outcomes of events in a Venn Diagram. Interpret scatter graphs in terms of the relationship between two variables	Produce ordered back-to-back stem and leaf diagrams. Understand primary and secondary data sources. Know the definition of random sampling. Draw a probability tree diagram based on given information. Use tree diagrams to calculate the probability of two independent events. Record outcomes of events in a Venn Diagram. Interpret scatter graphs in terms of the relationship between two variables Use tree diagrams to calculate the probability of dependent events. Correlation does not imply causality. Interpolate and extrapolate apparent trends-know the dangers of doing so. Construct cumulative frequency tables/diagrams. Produce box plots from raw data and spot outliers. Select/ justify sampling including random and stratified sampling

Probability and Statistics

Learning Path	Year 7	Year 8	Year 9
Foundation	Estimate length using a scale diagram	Define percentages as number of parts per hundred Use fraction notation to describe parts of shapes	Draw lines and shapes to scale
Core	Define percentages as number of parts per hundred Use fraction notation to describe parts of shapes Draw lines and shapes to scale Recognise the equivalence of % , a/b and decimals. Convert a larger whole number metric unit to a smaller unit (e.g. 3 kg to 3000 g). Use ratio notation. Divide quantity into a given ratio. Convert between simple metric units. Express one number as a fraction of another. Equivalent fractions, decimals and %.	Draw lines and shapes to scale Recognise the equivalence of % , a/b and decimals. Convert a larger whole number metric unit to a smaller unit (e.g. 3 kg to 3000 g). Use ratio notation. Divide quantity into a given ratio. Convert between simple metric units. Express one number as a fraction of another. Equivalent fractions, decimals and %. Divide a quantity into more than two parts in a given ratio.	Recognise the equivalence of % , a/b and decimals. Convert a larger whole number metric unit to a smaller unit (e.g. 3 kg to 3000 g). Use ratio notation. Divide quantity into a given ratio. Convert between simple metric units. Express one number as a fraction of another. Equivalent fractions, decimals and %. Divide a quantity into more than two parts in a given ratio. Use a ratio to find one quantity when the other is known. Use percentages in real-life : VAT, value of profit or loss, simple interest, income tax calculations
Proficient	Divide a quantity into more than two parts in a given ratio. Use a ratio to find one quantity when the other is known. Use percentages in real-life : VAT, value of profit or loss, simple interest, income tax calculations	Use a ratio to find one quantity when the other is known. Use percentages in real-life : VAT, value of profit or loss, simple interest, income tax calculations Use a multiplier to increase or decrease by a %. Compare ratios by changing to the form 1 : m or m : 1. Use/ interpret maps, using map scales (1 : 25 000)	Use a multiplier to increase or decrease by a %. Compare ratios by changing to the form 1 : m or m : 1. Use/ interpret maps, using map scales (1 : 25 000) Solve a ratio problem in context. Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons)
Exceptional	Use a multiplier to increase or decrease by a %. Compare ratios by changing to the form 1 : m or m : 1. Use/ interpret maps, using map scales (1 : 25 000) Solve a ratio problem in context. Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons) Convert between area measures (e.g. mm² to cm², cm² to m²,) and metric and imperial measures or imperial units to imperial units. Use graphs to calculate measures including unit price, average speed, distance, time, acceleration	Solve a ratio problem in context. Know rough metric equivalents of imperial measures in daily use (feet, miles, pounds, pints, gallons) Convert between area measures (e.g. mm² to cm², cm² to m²,) and metric and imperial measures or imperial units to imperial units. Use graphs to calculate measures including unit price, average speed, distance, time, acceleration Form equations to show direct proportion. Recognise graphs showing constant rates of change, average rates of change and variable rates of change Understand /use -density, speed, pressure. Use compound interest. Use reverse percentages	Convert between area measures (e.g. mm² to cm², cm² to m²,) and metric and imperial measures or imperial units to imperial units. Use graphs to calculate measures including unit price, average speed, distance, time, acceleration Form equations to show direct proportion. Recognise graphs showing constant rates of change, average rates of change and variable rates of change Understand /use -density, speed, pressure. Use compound interest. Use reverse percentages Use expressions of the form y α x. Use expressions of the form y α 1/x. Identify direct proportion from a table of values by comparing ratios of values Calculate the new area of a shape after enlargement

Ratio, Proportion and Rates of Change