

Mathematics overview: Stage 7 Star

Unit	Hrs	KNOWLEDGE
Numbers and the number system	6	<ul style="list-style-type: none"> use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple (6*,7*, 8*) use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 (7*) recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions (7*) appreciate the infinite nature of the sets of integers, real and rational numbers (7*) order positive and negative integers, decimals and fractions (6*,7*) use the symbols =, ≠, <, >, ≤, ≥ (6*,7*)
Counting and comparing	3	<ul style="list-style-type: none"> identify the value of each digit in numbers given to three decimal places (7*) understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals) (7*) solve problems involving addition, subtraction, multiplication and division (6*,7*, 8*) multiply one-digit numbers with up to two decimal places by whole numbers (7*, 8*)
Calculating	9	<ul style="list-style-type: none"> associate a fraction with division and calculate decimal fraction equivalents (for example 0.375) for a simple fraction (for example 3/8) (6*,7*) use conventional notation for priority of operations, including brackets and powers (7*, 8*) recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions) (7*)
Visualising and constructing	6	<ul style="list-style-type: none"> use conventional terms and notations: points, lines, vertices, edges, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries (6*,7*) use the standard conventions for labelling and referring to the sides and angles of triangles (6*,7*) draw diagrams from written description (6*,7*)
Investigating properties of shapes	6	<ul style="list-style-type: none"> identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres (7*) find unknown angles in any triangles, quadrilaterals and regular polygons (7*) derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia (7*) identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference (6*,7*) understand and use the concepts and vocabulary of expressions, equations, formulae, terms, identities and factors (6*,7*) use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a/b in place of $a \div b$, brackets (6*,7*,8*)
Algebraic proficiency: tinkering		<ul style="list-style-type: none"> simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket (7*) simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices (7*) substitute numerical values into formulae and expressions (6*,7*) express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1 (7*) recall and use equivalencies between simple fractions, decimals and percentages, including in different contexts (7*) define percentage as 'number of parts per hundred' (7*)
Exploring fractions, decimals and percentages	6	<ul style="list-style-type: none"> use ratio notation, including reduction to simplest form (6*,7*) divide a given quantity into two parts in a given part: part or part: whole ratio (6*,7*, 8*) identify and work with fractions in ratio problems (7*,8*) generate terms of a sequence from a term-to-term rule or a position-to-term rule (7*, 8*) deduce expressions to calculate the nth term of a linear sequence (7*, 8*) use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places. (6*, 7*) change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts (7*)
Proportional reasoning	3	<ul style="list-style-type: none"> apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles, corresponding and alternate angles (6*,7*) apply the four operations, including formal written methods, to simple fractions (proper and improper), and mixed numbers (7*) add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions (6*,7*) multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{2}{3} \times \frac{1}{4} = \frac{1}{6}$] (6*,7*) divide proper fractions by whole numbers (for example, $1/3$ divided by 2 = $1/6$) (6*,7*)
Pattern sniffing	3	<ul style="list-style-type: none"> interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively (7*, 8*)

Measuring space	3	<ul style="list-style-type: none"> compare two quantities using percentages (6*,7*) work with percentages greater than 100% (7*, 8*) solve linear equations in one unknown algebraically (7*) solve linear equations with the unknown on both sides of the equation (7*, 8*)
Investigating angles	3	<ul style="list-style-type: none"> round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures) (7*) estimate answers; check calculations using approximation and estimation, including answers obtained using technology (6*,7*) solve problems which require answers to be rounded to specified degrees of accuracy (6*,7*)
Calculating fractions, decimals and percentages	9	<ul style="list-style-type: none"> work with coordinates in all four quadrants (6*,7*) understand and use lines parallel to the axes, $y = x$ and $y = -x$ (7*) plot graphs of equations that correspond to straight-line graphs in the coordinate plane (7*) solve geometrical problems on coordinate axes (6*,7*) identify, describe and construct congruent shapes including on coordinate axes, by considering rotation, reflection and translation (6*,7*) relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale (7*) record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees (7*, 8*) construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities trees (7*, 8*)
Solving equations and inequalities	6	<ul style="list-style-type: none"> apply the property that the probabilities of an exhaustive set of outcomes sum to one (7*) apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments (7*) interpret and construct tables, charts and diagrams, including frequency tables, bar charts, frequency diagrams, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use (7*, 9*) Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean and mode) and spread (range) (6*,7*)
Calculating space	9	<p>Key Stage 4</p> <ul style="list-style-type: none"> convert between miles and kilometres (KS4) calculate surface area of cubes and cuboids (KS4) calculate the surface area of a triangular prism when lengths are known (KS4) describe translations as 2D vectors (KS4)
Checking, approximating and estimating	3	
Mathematical movement	6	
Understanding Risk 1	3	
Presentation of data	6	
Measuring data	3	

<u>Numbers and the number system</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple (6*,7*, 8*) use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 (7*) recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions (7*) appreciate the infinite nature of the sets of integers, real and rational numbers (7*) 	
<u>Counting and comparing</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> order positive and negative integers, decimals and fractions (6*,7*) use the symbols =, ≠, <, >, ≤, ≥ (6*,7*) identify the value of each digit in numbers given to three decimal places (7*) 	
<u>Calculating</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals) (7*) solve problems involving addition, subtraction, multiplication and division (6*,7*, 8*) multiply one-digit numbers with up to two decimal places by whole numbers (7*, 8*) associate a fraction with division and calculate decimal fraction equivalents (for example 0.375) for a simple fraction (for example 3/8) (6*,7*) use conventional notation for priority of operations, including brackets and powers (7*, 8*) recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions) (7*) 	
<u>Visualising and constructing</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> use conventional terms and notations: points, lines, vertices, edges, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries (6*,7*) use the standard conventions for labelling and referring to the sides and angles of triangles (6*,7*) draw diagrams from written description (6*, 7*) 	
<u>Investigating properties of shapes</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres (7*) find unknown angles in any triangles and quadrilaterals (6*,7*) find unknown angles in regular polygons (7*) derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia (7*) identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference (6*,7*) 	
<u>Algebraic proficiency: tinkering</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> understand and use the concepts and vocabulary of expressions, equations, formulae, terms, identities and factors (6*,7*) use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a/b in place of $a \div b$, brackets (6*,7*,8*) simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket (7*) simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices (7*) substitute numerical values into formulae and expressions (6*, 7*) 	
<u>Exploring fractions, decimals and percentages</u>	
<p>KNOWLEDGE</p> <ul style="list-style-type: none"> express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1 (7*) recall and use equivalencies between simple fractions, decimals and percentages, including in different contexts (7*) define percentage as 'number of parts per hundred' (7*) 	

Proportional reasoning

KNOWLEDGE

- use ratio notation, including reduction to simplest form (6*,7*)
- divide a given quantity into two parts in a given part: part or part: whole ratio (6*,7*, 8*)
- identify and work with fractions in ratio problems (7*,8*)

Pattern sniffing

KNOWLEDGE

- generate terms of a sequence from a term-to-term rule or a position-to-term rule (7*, 8*)
- deduce expressions to calculate the nth term of a linear sequence (7*, 8*)

Measuring space

KNOWLEDGE

- use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places. (6*, 7*)
- change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts (7*)
- convert between miles and kilometres (KS4)

Investigating angles

KNOWLEDGE

- apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles, corresponding and alternate angles (6*, 7*)

Calculating fractions, decimals and percentages

KNOWLEDGE

- apply the four operations, including formal written methods, to simple fractions (proper and improper), and mixed numbers (7*)
- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions (6*,7*)
- multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$] (6*,7*)
- divide proper fractions by whole numbers (for example, $\frac{1}{3}$ divided by 2 = $\frac{1}{6}$) (6*,7*)
- interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively (7*, 8*)
- compare two quantities using percentages (6*,7*)
- work with percentages greater than 100% (7*, 8*)

Solving equations and inequalities

KNOWLEDGE

- solve linear equations in one unknown algebraically (7*)
- solve linear equations with the unknown on both sides of the equation (7*, 8*)

Calculating space

KNOWLEDGE

- calculate surface area of cubes and cuboids (KS4)
- calculate the surface area of a triangular prism when lengths are known (KS4)

Checking, approximating and estimating

KNOWLEDGE

- round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures) (7*)
- estimate answers; check calculations using approximation and estimation, including answers obtained using technology (6*, 7*)
- solve problems which require answers to be rounded to specified degrees of accuracy (6*,7*)

Mathematical movement

KNOWLEDGE

- work with coordinates in all four quadrants (6*,7*)
- understand and use lines parallel to the axes, $y = x$ and $y = -x$ (7*)
- plot graphs of equations that correspond to straight-line graphs in the coordinate plane (7*)
- solve geometrical problems on coordinate axes (6*,7*)
- identify, describe and construct congruent shapes including on coordinate axes, by considering rotation, reflection and translation (6*,7*)
- describe translations as 2D vectors (KS4)

Understanding risk I

KNOWLEDGE

- relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale (7*)
- record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees (7*, 8*)
- construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities trees (7*, 8*)
- apply the property that the probabilities of an exhaustive set of outcomes sum to one (7*)
- apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments (7*)

Presentation of data

KNOWLEDGE

- interpret and construct tables, charts and diagrams, including frequency tables, bar charts, frequency diagrams and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use (7*, 9*)
- interpret and construct pie charts (6*,7*)

Measuring data

KNOWLEDGE

- Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean and mode) and spread (range) (6*,7*)