Mathletics 3P Learning Progressions

Understanding Practice and Fluency (UPF)

Levels 9 – 10 | Australia

May, 2021

Mathletics

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3P Learning Progressions

Understanding, Practice and Fluency (UPF)
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Contents

Part I

Level 9

1 Number and Algebra

Fractions, decimals and percentages			
Scientific notation (UK standard form)			
Learning Journey	Steps	Content	Details
Scientific notation and standard form	1	Converting from scientific notation to basic numbers for very large numerals	• convert from scientific notation to basic numerals for very large numbers
	2	Converting from scientific notation to basic numbers for very small numerals	• convert from scientific notation to basic numerals for very small numbers
	3	Converting from basic numerals to scientific notation for very large numbers	• convert from basic numerals to scientific notation for very large numbers
	4	Converting from basic numerals to scientific notation for very small numbers	• convert from basic numerals to scientific notation for very small numbers
	5	Combination of previous content	• Combination of previous details
Calculating in scientific notation	1	Calculating in scientific notation	• perform calculations involving scientific notation (without a calculator) applying imdex laws where there is 1 bracket
			• perform calculations involving scientific notation (without a calculator) using index laws and 2 brackets to be multiplied
			• perform calculations involving scientific notation (without a calculator) using index laws with 2 brackets involving division

Financial maths			
Interest			
Learning Journey	Steps	Content	Details
Calculating simple interest	1	Solving problems involving simple interest	• solve problems involving simple interest
Calculating compound interest without a formula	1	Calculating compound interest without using a formula; calculations based on simple interest (using appropriate digital technology)	• calculate compound interest based on using repeated calculations of simple interest, for up to 3 years

Learning Journey	Steps	Content	Details
Calculating compound interest	1	Establishing and calculating compound interest using a formula in the form A= P(1 + R)n	• establish the formula to find compound interest, A= P(1 + R)n, where A is the total amount, P is the principal, R is the rate per compounding period as a decimal and n is the number of compounding periods
	2	Solving problems involving the compound interest formula finding the variables other than A	• solve problems involving the compound interest formula finding the variables other than A
			• calculate the interest earned on a sum of money, given the amount, the interest rate and the number of years invested using I = A – P
	3	Solving problems involving compound interest, determining the time period required to achieve a particular total amount invested	• solve problems involving compound interest, by calculating the principal or interest rate needed to obtain a particular total amount for a compound interest investment
			• use a "guess and check" strategy to determine the number of time periods required to obtain a particular total amount for a compound interest investment
	4	Solving problems involving compound interest, determining the amount of money to be invested in order to achieve a particular total amount invested after a given number of time periods with a given interest rate	• solve problems involving compound interest, determining the amount of money to be invested in order to achieve a particular total amount invested after a given number of time periods with a given interest rate
	5	Calculating and comparing investments for different compounding periods	• calculate and compare investments where the interest is applied at different times, eg applied monthly or annually

Rates and ratios			
Proportion			
Learning Journey	Steps	Content	Details
Understanding direct proportion	1	Recognising proportional relationships between quantities	• interpret information between 2 quantities and decide if they are in a proportional relationship
	2	Investigating and understanding direct variation/proportion	• investigate situations which are examples of direct variation/proportion
			• understand that x and y are directly proportional - if a value of x increases the value of y increases in the same proportion and as the value of x decreases then the value of y decreases in the same proportion
	3	Understanding what direct variation/proportion graphs look like	• understand that straight-line graphs represent direct variation/proportion for the values given on each axis

Learning Journey	Steps	Content	Details
	4	Interpreting and comparing direct variation/proportion graphs	• interpret and compare graphs in real-life situations to make informed choices, eg mobile phone charges, temperature conversions, time/distance/speed etc
Investigating indirect/inverse proportion	1	Investigating and understanding indirect or inverse variation/proportion	• investigate situations which are examples of indirect or inverse variation/proportion
	2	Solving problems based on indirect (inverse) variation/proportion with and without digital technology	• solve problems using an understanding of indirect (inverse) variation/proportion with and without digital technology
Creating direct and inversely proportionate graphs	1	Applying information to create indirect (inverse) variation/proportion graphs	• create tables of values for indirect (inverse) variation/proportion problems and then plot on the number plane
			• understand and/or comment on the significance of the shape of a graph representing indirect variation/proportionality
	2	Interpreting graphs which represent direct and indirect variation/proportion	• recognise and interpret graphs representing direct and indirect variation/proportion
			• identify whether a linear graph represents direct or indirect variation/proportion with reference to the values on each axis
Determining the constant of proportionality	1	Identifying the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships	• identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships
		Finding the value of the constant of variation (or proportionality) and using it to solve problems	• use information to write a direct variation/proportion equation and find the value of the constant of variation/proportion/proportionality
			• write, apply and solve equations within the context of direct variation/proportion problems
	2	Representing proportional relationships by equations	• represent proportional relationships by equations
		Solving direct variation/proportion problems in various contexts	• solve problems involving rates and directly proportional relationships in various contexts, using dynamic geometry software to construct and measure scale drawings
	3	Determining the constant of proportionality (k = y/x) within mathematical problems	• determine the constant of proportionality (k = y/x) within mathematical problems

Learning Journey	Steps	Content	Details
	4	Determining the constant of proportionality (k = y/x) within real-world problems	• determine the constant of proportionality (k = y/x) within real-world problems
Graphing equations of direct proportion	1	Applying unitary information to create graphs	• apply the unitary information to create a table of values which can be plotted on the number plane
			• understand the significance of the slope and direction of the graph (as 1 value increases so does the other or as 1 value decreases so does the other)
	2	Graphing proportional relationships	• graph proportional relationships

Algebra			
Index/exponent laws			
Learning Journey	Steps	Content	Details
Applying the distributive law/property	1	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive or negative integers and b is a variable with coefficient of 1	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a and c are positive or negative integers and b is a variable with coefficient of 1
	2	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients 1 or -1)	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients 1 or -1)
	3	Expanding algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients integers not limited to 1)	• expand algebraic expressions in the form a(b+c) by removing grouping symbols (distributive law) where a, b and c can be positive or negative numbers or variables (coefficients integers not limited to 1)
	4	Expanding algebraic expressions in the form a(b + c) by removing grouping symbols (distributive law). Coefficients of pronumerals to be positive integers. Involve indices where power is a positive integer.	• expand algebraic expressions in the form a(b + c) by removing grouping symbols (distributive law). Coefficients of pronumerals to be positive integers. Involve indices where power is a positive integer.
	5	Expanding algebraic expressions in the form a(b + c) by removing grouping symbols (distributive law). Coefficients of pronumerals to be positive or negative integers. Involve indices where power is a positive integer.	• expand algebraic expressions in the form a(b + c) by removing grouping symbols (distributive law). Coefficients of pronumerals to be positive or negative integers. Involve indices where power is a positive integer.

Learning Journey	Steps	Content	Details
Distribute law (property): Adding like terms	1	Expanding algebraic expressions by removing grouping symbols and collecting like terms where applicable	• expand algebraic expressions by removing grouping symbols and collecting like terms where applicable
Indices (exponents): Multiplication	1	Applying index laws further: multiplication with integer indices (positive and negative indices)	• apply the index law for multiplying expressions with the same numerical base and integer indices (introducing negative indices)
			• apply the index law to simplify the multiplication of 2 or more terms with numerical bases and integer indices, leaving solutions in index form
			• apply the index law to simplify the multiplication of 2 or more terms with numerical bases and integer indices, evaluating the solution with and without a calculator
	2	Applying index laws further: multiplication with integer indices (algebraic bases)	• apply the index law for multiplying expressions with the same algebraic base and integer indices
			• apply the index law to simplify the multiplication of 2 or more terms with algebraic bases and integer indices, leaving solutions in index form
Indices (exponents): Division	1	Applying index laws further: division with integer indices (positive and negative indices)	• apply the index law to simplify the division of 2 or more terms with numerical bases and integer indices (introducing negative indices)
			• apply the index law to simplify the division of 2 or more terms with numerical bases and integer indices, leaving solutions in index form
			• apply the index law to simplify the division of two or more terms with numerical bases and integer indices, evaluating the solution with and without a calculator
	2	Applying index laws further: division with integer indices (algebraic bases)	• apply the index law for dividing expressions with the same algebraic base and integer indices
			• apply the index law to simplify the division of 2 or more terms with algebraic bases and integer indices, leaving solutions in index form
Indices (exponents): Power of a power	1	Applying index laws further: power of a power with integer indices (positive whole number bases)	• apply the index law for raising an expression in index form to another index (positive numerical bases, positive and negative integer indices)
			• apply the index law to simplify expressions involving raising a term written in index form to another index, leaving solutions in index form (positive numerical bases, integer indices)

Learning Journey	Steps	Content	Details
			• apply the index law to simplify expressions involving raising a term written in index form to another index, evaluating the solution with and without a calculator (positive numerical bases, integer indices)
	2	Applying index laws further: power of a power with integer indices (algebraic bases)	• apply the index law for raising an expression in index form to another index (algebraic bases and integer indices)
			• apply the index law to simplify expressions involving raising a term written in index form to another index, leaving solutions in index form (algebraic bases and integer indices)
Indices (exponents): Zero index	1	Applying index laws further: zero index (positive and negative whole number bases)	• apply the meaning of the zero index for expressions with positive and negative numerical bases
			• apply the zero index to simplify expressions involving the zero index and integer numerical bases
	2	Applying index laws further: zero index (algebraic bases)	• apply index laws: zero index (algebraic bases)
			• apply the zero index to simplify expressions involving the zero index and algebraic bases
Indices (exponents): Mixed ops, coefficient = 1	1	Applying index laws further: mixed index laws (integer bases) expressions to involve either 2 or more terms	• select the necessary index law(s) and apply them to simplify expressions of 2 or more terms involving indices with numerical bases and the operations of multiplication, division, power of a power, and the zero index
	2	Applying index laws further: mixed index laws (algebraic bases)	• select the necessary index law(s) and apply them to simplify expressions of 2 or more terms involving indices with algebraic bases and the operations of multiplication, division, power of a power, and the zero index. Expressions to include positive and negative integers
Indices (exponents): Mixed ops, coefficient >1	1	Simplifying expressions that involve the product of simple algebraic terms containing positive-integer indices with integer coefficients ≥1	• simplify expressions that involve the product of simple algebraic terms containing positive-integer indices with integer coefficients ≥1
	2	Simplifying expressions that involve the quotient of simple algebraic terms containing positive-integer indices with integer coefficients ≥1	• simplify expressions that involve the quotient of simple algebraic terms containing positive-integer indices with integer coefficients ≥1

Learning Journey	Steps	Content	Details
	3	Simplifying expressions that involve raising a power to a power involving simple algebraic terms containing positive-integer indices with integer coefficients ≥1	• simplify expressions that involve raising a power to a power involving simple algebraic terms containing positive-integer indices with integer coefficients ≥1
	4	Comparing expressions such as $3a^2 \times 5a$ and $3a^2 + 5a$ by substituting values for a	• compare expressions such as $3a^2 \times 5a$ and $3a^2 + 5a$ by substituting values for a
Indices (exponents): Neg index, numerical base	1	Evaluating numerical expressions involving a negative index by first rewriting with a positive index, eg $3^{-1} = 1/3$ with an index of -1	• evaluate numerical expressions involving a negative index by first rewriting with a positive index, eg $3^{-1} = 1/3$ with an index of -1
	2	Evaluating numerical expressions involving a negative index by first rewriting with a positive index, eg $3^{-4} = 1/3^4 = 1/81$	• evaluate numerical expressions involving a negative index by first rewriting with a positive index, eg $3^{-4} = 1/3^4 = 1/81$
Indices (exponents): Negative index	1	Evaluating algebraic expressions involving a negative index by first rewriting with a positive index, eg $a^{-1} = 1/a$ with an index of -1 and a coefficient of 1	• evaluate algebraic expressions involving a negative index by first rewriting with a positive index, eg $a^{-1} = 1/a$ with an index of -1 and a coefficient of 1
	2	Evaluating algebraic expressions involving a negative index by first rewriting with a positive index, eg $a^{-1} = 1/a$ with an index of -1 and a coefficient greater or equal to 1	• evaluate algebraic expressions involving a negative index by first rewriting with a positive index, eg $a^{-1} = 1/a$ with an index of -1 and a coefficient greater or equal to 1
Indices (exponents): Mixed with negative indices	1	Simplifying expressions that involve the product of simple algebraic terms with integer coefficients ≥1 with some negative powers	• simplify expressions that involve the product of simple algebraic terms containing positive-integer indices with integer coefficients ≥1
	2	Simplifying expressions that involve the quotient of simple algebraic terms with integer coefficients ≥1 with some negative powers	• simplify expressions that involve the quotient of simple algebraic terms containing positive-integer indices with integer coefficients ≥1
	3	Simplifying expressions that involve the raising a power to a power involving simple algebraic terms with integer coefficients ≥1 with some negative powers	• simplify expressions that involve the raising a power to a power involving simple algebraic terms containing positive-integer indices with integer coefficients ≥1
	4	Verifying whether a given expression represents a correct simplification of another algebraic expression by substituting numbers for pronumerals	• verify whether a given expression represents a correct simplification of another algebraic expression by substituting numbers for pronumerals

Learning Journey	Steps	Content	Details
	5	Writing the numerical value of a given numerical fraction raised to the power of −1, leading to $(a/b)^{-1} = b/a$	• write the numerical value of a given numerical fraction raised to the power of −1, leading to $(a/b)^{-1} = b/a$
Factorising/factoring			
Factorising (factoring)	1	Factorising algebraic expressions by identifying only algebraic factors	• factorise algebraic expressions by finding a common algebraic factor and bringing it out the front of the brackets with its product inside the brackets
	2	Factorising algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with 1 pronumeral and the power of the pronumeral is 1	• factorise algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with 1 pronumeral and the power of the pronumeral is 1
	3	Factorising algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with one pronumeral and the power of the pronumeral is an integer greater or equal to 1.	• factorise algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with one pronumeral and the power of the pronumeral is an integer greater or equal to 1.
	4	Factorising algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with multiple pronumerals and the power of the pronumerals is an integer greater or equal to 1.	• factorise algebraic expressions by taking out a common algebraic factor where the highest common factor is a term with multiple pronumerals and the power of the pronumerals is an integer greater or equal to 1.
	5	Recognising that expressions such as $24x^2y + 16xy^2 = 4xy(6x + 4y)$ may represent 'partial factorisation' and that further factorisation is necessary to 'factorise fully'	• fully factorise expressions that have only been partially factorised
Algebraic fractions			
Algebraic fractions: 4 ops numerical denominators	1	Simplifying expressions that involve algebraic fractions requiring addition with numerical denominators	• simplify expressions that involve algebraic fractions with numerical denominators involving addition
	2	Simplifying expressions that involve algebraic fractions requiring subtraction with numerical denominators	• simplify expressions that involve algebraic fractions with numerical denominators involving subtraction
	3	Simplifying expressions that involve algebraic fractions requiring multiplication with numerical denominators	• simplify expressions that involve algebraic fractions with numerical denominators involving multiplication
	4	Simplifying expressions that involve algebraic fractions requiring division with numerical denominators	• simplify expressions that involve algebraic fractions with numerical denominators involving division

Learning Journey	Steps	Content	Details
Algebraic fractions: Simplifying	1	Simplifying algebraic fractions with pronumerals in numerator only	• simplify algebraic fractions with pronumerals in numerator only
	2	Simplifying algebraic fractions with pronumerals in numerator and/or denominator	• simplify algebraic fractions with pronumerals in numerator and/or denominator
	3	Simplifying algebraic fractions with pronumerals in numerator and/or denominator including those involving indices	• simplify algebraic fractions with pronumerals in numerator and/or denominator including those involving indices
Algebraic formulas			
Using formulas	1	Using authentic formulas to solve problems involving substituting in known variables to solve a problem	• use authentic formulas to solve problems involving substituting in known variables to solve a problem
	2	Solving equations arising from substitution into formulas, eg given P = 2l + 2b and P = 20, l = 6, solve for b	• solve equations arising from substitution into formulas, eg given P = 2l + 2b and P = 20, l = 6, solve for b
	3	Substituting into formulas from other strands of the syllabus or from other subjects to solve problems and interpret solutions, eg A = 1/2xy, v = u + at, C = 5/9(F – 32), V = $\pi r^2 h$	• substitute into formulas from other strands of the syllabus or from other subjects to solve problems and interpret solutions, eg A = 1/2xy, v = u + at, C = 5/9(F – 32), V = $\pi r^2 h$
Solving word problems	1	Translating word problems into linear equations	• translate word problems into linear equations
			• solve word problems involving familiar formulas, eg 'If the area of a triangle is 30 square centimetres and the base length is 12 centimetres, find the perpendicular height of the triangle'
	2	Solving word equations and interpret the solutions within a given context	• solve word equations and interpret the solutions within a given context
Binomial products			
Expanding binomial products	1	Expanding binomial products by finding the areas of rectangles	• expand binomial products by finding the areas of rectangles
	2	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators are +'s	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators are +'s
	3	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators can be + or –	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient of 1 and operators can be + or -

Learning Journey	Steps	Content	Details
	4	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or –	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or -
	5	Using algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or – and expansion involves indices	• use algebraic methods to expand binomial products in the form (a+b)(c+d) where a and c are pronumerals with coefficient greater or equal to 1 and operators can be + or – and expansion involves indices
Solving equations			
Solving linear equations involving brackets	1	Solving equations involving multiple sets of brackets	• solve equations involving multiple sets of brackets
	2	Solving equations involving brackets with pronumerals on both sides	• solve equations involving brackets with pronumerals on both sides
Solving equations involving algebraic fractions	1	Solving linear equations involving algebraic fractions	• solve a range of linear equations, including equations that involve 2 or more fractions
	2	Solving monic linear equations involving algebraic fractions where at least 1 entire expression is in the numerator or denominator of a fraction	• solve monic linear equations involving algebraic fractions where at least 1 entire expression is in the numerator or denominator of a fraction
	3	Solving non-monic linear equations involving algebraic fractions where at least 1 entire expression is in the numerator or denominator of a fraction	• solve non-monic linear equations involving algebraic fractions where at least 1 entire expression is in the numerator or denominator of a fraction
	4	Combination of previous content	• Combination of previous details
Solving simple quadratic equations	1	Checking solutions of a quadratic equation by substituting	• check solutions of a quadratic equation by substituting
	2	Solving simple quadratic equations of the form $ax^2 = c$, leaving answers as decimal approximations	• solve simple quadratic equations of the form $ax^2 = c$, leaving answers as decimal approximations
	3	Solving simple quadratic equations of the form $ax^2 = c$, leaving answers in exact form	• solve simple quadratic equations of the form $ax^2 = c$, leaving answers in exact form
Inequalities			
Solving linear inequalities with two steps	1	Solving inequalities using inverse operations involving 2 steps with integer solutions	• solve inequalities using inverse operations involving 2 steps with integer solutions

Learning Journey	Steps	Content	Details
	2	Solving inequalities using inverse operations involving 2 steps with integer solutions, plotting solution on a number line	• solve inequalities using inverse operations involving 2 steps with integer solutions plotting the solution on a number line
	3	Solving inequalities using inverse operations involving 2 steps with integer and non-integer solutions	• solve inequalities using inverse operations involving 2 steps with integer and non-integer solutions
	4	Solving inequalities using inverse operations involving 2 steps with integer and non-integer solutions plotting solution on a number line	• solve inequalities using inverse operations involving 2 steps with integer and non-integer solutions plotting the solution on a number line
Solving linear inequalities with multiple steps	1	Solving inequalities using inverse operations involving 3 steps with integer and non-integer solutions	• solve inequalities using inverse operations involving 3 steps with integer and non-integer solutions
	2	Solving inequalities using inverse operations involving 3 steps with integer and non-integer solutions, plotting solution on a number line	• solve inequalities using inverse operations involving 3 steps with integer and non-integer solutions plotting the solution on a number line
	3	Solving inequalities with variables either side of the equals sign	• solve inequalities with variables either side of the equals sign
	4	Representing and solving real-life scenario's using inequalities	• represent and solving real-life scenario's using inequalities
Simultaneous equations			
Solving simultaneous equations graphically	1	Understanding simultaneous equations	• understand that solutions to a system of 2 linear equations in 2 variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously
	2	Solving simultaneous equations with 2 variables graphically	• solve simultaneous equations graphically
Solving simultaneous equations algebraically	1	Solving simultaneous equations algebraically using the substitution method	• solve simultaneous equations algebraically using the substitution method
	2	Solving simultaneous equations algebraically using the elimination method	• solve simultaneous equations algebraically using the elimination method
	3	Checking the solution of simultaneous equations either graphically or algebraically	• check solution of simultaneous equation either graphically or algebraically
	4	Solving real-world and mathematical problems leading to 2 linear equations in 2 variables	• solve real-world and mathematical problems leading to 2 linear equations in 2 variables, eg given coordinates for 2 pairs of points, determine whether the line through the first pair of points intersects the line through the second pair

Coordinate geometry			
Distance between two points			
Learning Journey	Steps	Content	Details
Distance between two points without the formula	1	Using graphing software to find the distance between 2 points on the Cartesian plane	• use graphing software to find the distance between 2 points on the Cartesian plane
	2	Using the interval between 2 points on the Cartesian plane as the hypotenuse of a right-angled triangle and apply Pythagoras' theorem to determine the length of the interval joining the 2 points (ie 'the distance between the 2 points')	• use the interval between 2 points on the Cartesian plane as the hypotenuse of a right-angled triangle and apply Pythagoras' theorem to determine the length of the interval joining the 2 points (ie 'the distance between the 2 points')
			• describe how the distance between (or the length of the interval joining) 2 points can be calculated using Pythagoras' theorem
Distance between two points using the formula	1	Using the formula to find the distance between 2 points on the Cartesian plane	• use the formula to find the distance between 2 points on the Cartesian plane
	2	Using the formula to find the distance of the interval joining 2 points in order to solve a problem in a given context	• use the formula to find the distance of the interval joining two points on the Cartesian plane in order to solve a problem in a given context
			• use the formula to find the distance of the interval joining 2 points on a diagram in order to solve a real-life problem in a given context
Midpoint			
Finding the midpoint without the formula	1	Determining the midpoint of an interval using a diagram	• determine the midpoint of an interval using a diagram
	2	Using the process for calculating the 'mean' to find the midpoint, M, of the interval joining 2 points on the Cartesian plane	• use the process for calculating the 'mean' to find the midpoint, M, of the interval joining 2 points on the Cartesian plane
Finding the midpoint using the formula	1	Using the formula to find the midpoint of the interval joining 2 points on the Cartesian plane	• use the formula to find the midpoint of the interval joining 2 points on the Cartesian plane
	2	Using the formula to find the midpoint of the interval joining 2 points in order to solve a problem in a given context	• use the formula to find the midpoint of the interval joining 2 points on the Cartesian plane in order to solve a problem in a given context
			• use the formula to find the midpoint of the interval joining 2 points on a map in order to solve a real-life problem in a given context
	3	Using the midpoint formula to find the missing point on the line interval given 1 point and the midpoint	• use the midpoint formula to find the missing point on the line interval given 1 point and the midpoint

Learning Journey	Steps	Content	Details
Gradient			
Finding the gradient without the formula	1	Plotting and joining 2 points to form an interval on the Cartesian plane and form a right-angled triangle by drawing a vertical side from the higher point and a horizontal side from the lower point	• plot and join 2 points to form an interval on the Cartesian plane and form a right-angled triangle by drawing a vertical side from the higher point and a horizontal side from the lower point
	2	Using the interval between 2 points on the Cartesian plane as the hypotenuse of a right-angled triangle and use the relationship gradient = rise/run to find the gradient of the interval joining the 2 points	• use the interval between 2 points on the Cartesian plane as the hypotenuse of a right-angled triangle and use the relationship gradient = rise/run to find the gradient of the interval joining the 2 points
			• distinguish between positive and negative gradients from a diagram
Finding the gradient using the formula	1	Using the formula to find the gradient of the interval joining 2 points on the Cartesian plane	• use the formula to find the gradient of the interval joining 2 points on the Cartesian plane
	2	Using the formula to find the gradient of the interval joining 2 points in order to solve a problem in a given context	• use the formula to find the gradient of the interval joining 2 points on the Cartesian plane in order to solve a problem in a given context
			• use the formula to find the gradient of the interval joining 2 points on a diagram in order to solve a real-life problem in a given context
Linear relationships			
Graphing vertical and horizontal lines	1	Graphing horizontal linear relationships from the equation where there is no x involved	• graph horizontal linear relationships from the equation where there is no x involved
			• know that a horizontal line has a zero gradient
	2	Graphing vertical linear relationships from the equation where there is no y involved	• graph vertical linear relationships from the equation where there is no y involved
			• know that a vertical line has an infinite gradient
Writing equations of vertical and horizontal lines	1	Finding the equation of a given horizontal line	• find the equation of a given horizontal line
		Establishing and using the fact that substituting $y = 0$ into a linear equation will give you the x-intercept	• substitute $y = 0$ into a linear equation in order to find the x-intercept
			• reproduce the x-intercept in coordinate form
	2	Finding the equation of a given vertical line	• find the equation of a given vertical line
		Establishing and using the fact that substituting $x = 0$ into a linear equation will give you the y-intercept	• substitute $x = 0$ into a linear equation in order to find the y-intercept
			• reproduce the y-intercept in coordinate form

Learning Journey	Steps	Content	Details
	3	Identifying the x-axis as the line $y = 0$ and the y-axis as the line $x = 0$	• identify the x-axis as the line $y = 0$ and the y-axis as the line $x = 0$
		Finding the x and y-intercepts of any linear graphs	• find the x and y-intercepts of any linear graphs by substituting in $x=0$ for the y-intercept and $y=0$ for the x-intercept
	4	Graphing a linear relationship on the Cartesian plane using the x and y intercepts	• graph a linear relationship on the Cartesian plane by finding the x and y intercepts and ruling a line through them
Graphing using a table of values	1	Graphing a linear relationship on the Cartesian plane using a table of values	• graph a linear relationship on the Cartesian plane using a table of values
			• graph the number pairs on the Cartesian plane
Graphing using the gradient-intercept method	1	Establishing that when given in the form $y = mx + b$, m is the gradient in the form rise/run	• establish that when given in the form $y = mx + b$, m is the gradient in the form rise/run
	2	Understanding that the gradient is the slope of a line in the form rise/run	• understand that the gradient is the slope of a line in the form rise/run
			• understand how a negative and positive gradient differ
	3	Establishing that when given in the form $y = mx + b$, b is the y-intercept	• establish that when given in the form $y = mx + b$, b is the y-intercept
			• explain why b is always the y-intercept
	4	Graphing a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is in the form $y = mx + b$	• graph a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is in the form $y = mx + b$ by first plotting the y-intercept
	5	Graphing a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is not in the form $y = mx + b$ by rearranging to be in this form	• graph a linear relationship on the Cartesian plane using the gradient and y-intercept when the equation is not in the form $y = mx + b$ by rearranging to be in this form first
Non-linear relationships			
Graphing simple non-linear relations	1	Graphing simple quadratics by completing a table of values	• graph simple quadratics by completing a table of values
			• compare graphs of quadratics drawn from a table of values with quadratics drawn using digital technology
Solving simple non-linear relationships	1	Solving simple quadratic equations by inspection eg $x^2 = 49$	• solve simple quadratic equations by inspection eg $x^2=49$
	2	Solving simple cubic equations of the form $ax^3 = k$, leaving answers in exact form and as decimal approximations	• solve simple cubic equations of the form $ax^3=k$, leaving answers in exact form

Learning Journey	Steps	Content	Details
			• solve simple cubic equations of the form $ax^3=k$, leaving answers as decimal approximations
	3	Solving exponential equations containing equal bases	• solve exponential equations containing equal bases (linear exponents only)eg: $53x=57x-2$
Understanding parabolas and their graphs	1	Understanding the language and important features of parabolas	• understand the language of parabolas, turning point (vertex), concavity, roots, x-intercept, y-intercept, axis of symmetry
		Investigating how the parabola with the equation $y = ax^2$ changes as the value of a is changed using digital technology	• describe the features of the graph and how they change as the value of 'a' changes for both positive and negative values of 'a'
			• understand that the sign of the coefficient of x^2 (a) is what makes a parabola concave up or down. If $a > 0$ the parabola is concave up, If $a < 0$ the parabola is concave down
	2	Understanding that $y = ax^2 + bx + c$ is the general equation of a parabola and manipulate equations to be in this form	• manipulate equations to be in the form $y=ax^2+bx+c$
		Investigating how the parabola with the equation $y = ax^2 + k$ changes as the value of k is changed using digital technology	• describe the features of the graph and how they change as the value of k changes for both positive and negative values of k
Finding the x- and y-intercepts of a parabola	1	Finding y-intercept for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $x=0$	• find y-intercept for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $x=0$
Graphing parabolas	1	Graphing parabolas in the form $y = ax^2 + k$ with different values of a and k	• graph parabolas in the form $y = ax^2 + k$ with different values of a and k
	2	Determining the equation of a parabola, given a graph of the parabola with the main features clearly indicated	• determine the equation of a parabola, given a graph of the parabola with the main features clearly indicated

2 Measurement

Measurement – Area			
Area of composite shapes			
Learning Journey	Steps	Content	Details
Areas of composite shapes	1	Using appropriate units of time to measure very small or very large time intervals	• identify possible dissections of composite shapes to facilitate calculating the area of the composite shape
	2	Calculating the areas of composite figures by dissection into triangles, special quadrilaterals, quadrants, semicircles and sectors	• calculate the areas of composite figures by dissection into triangles, special quadrilaterals, quadrants, semicircles and sectors
	3	Solving a variety of practical problems involving the areas of quadrilaterals and composite shapes	• solve a variety of practical problems involving the areas of quadrilaterals and composite shapes
	4	Defining an annulus and its associated terminology	• know the specific terms associated with an annulus: concentric circles, larger/external radius ('R'), smaller/interior radius ('r')
	5	Establishing and applying the area of an annulus	• find the area of an annulus by applying the area of an annulus formula
			• find the unknown variable using the area of an annulus formula in the context of a problem

Measurement – Surface area			
Surface area			
Learning Journey	Steps	Content	Details
Finding surface area of cylinders	1	Finding the surface area: cylinders	• find the surface area of cylinders
	2	Finding the surface area of parts of cylinders	• find the surface area of parts of cylinders
	3	Finding the surface area of cylinders within the context of a problem	• find the surface area of cylinders within the context of a problem
	4	Finding the surface area of parts of cylinders within the context of a problem	• find the surface area of parts of cylinders within the context of a problem
Finding surface area problems	1	Finding the surface area: rectangular prisms	• find the surface area of rectangular prisms
	2	Finding the surface area of rectangular prisms within the context of a problem	• find the surface area of rectangular prisms within the context of a problem
	3	Finding the surface area: triangular prisms (with and without Pythagoras' theorem)	• find the surface area of triangular prisms (with and without Pythagoras' theorem)

Learning Journey	Steps	Content	Details
	4	Finding the surface area of triangular prisms (with and without Pythagoras' theorem) within the context of a problem	• find the surface area of triangular prisms (with and without Pythagoras' theorem) within the context of a problem

Measurement – Volume			
Volume			
Learning Journey	Steps	Content	Details
Finding volumes of cylinders	1	Using the formula to find the volumes of cylinders	• find the volume of a right cylinder given the area of the circle cross-section and perpendicular height in the same units
			• find the volume of a right cylinder given the area of the circle cross-section and perpendicular height in different units
	2	Finding the height or area of the circle cross-section for a right cylinder given the volume in the same units	• find the height or area of the circle cross-section for a right cylinder given the volume in the same units
			• find the height or area of the circle cross-section for a right cylinder given the volume in different units
	3	Finding the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross-sections all in the same units	• find the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross sections all in the same units
			• find the volume of right cylinders, given their perpendicular heights and radius/diameter of their circular cross sections all in different units
	4	Finding the radius, diameter or height of right cylinders, given their volume all in the same units	• find the radius, diameter or height of right cylinders, given their volume all in the same units
			• find the radius, diameter or height of right cylinders, given their volume all in different units
	5	Solving a variety of practical problems involving the volume and capacity of right prisms and cylinders	• solve a variety of practical problems involving the volumes and capacities of right prisms and cylinders
Finding volumes of composite right prisms	1	Calculating the volumes of composite right prisms with cross-sections that may be dissected into triangles and special quadrilaterals	• calculate the volumes of composite right prisms with cross-sections that may be dissected into triangles and special quadrilaterals
	2	Calculating the volumes of composite right prisms with cross-sections that may be dissected into triangles and special quadrilaterals requiring the use of Pythagoras' theorem	• calculate the volumes of composite right prisms with cross-sections that may be dissected into triangles and special quadrilaterals requiring the use of Pythagoras' theorem
	3	Comparing the surface areas of prisms with the same volume	• compare the surface areas of prisms with the same volume

Learning Journey	Steps	Content	Details
	4	Solving a variety of practical problems related to the volumes and capacities of composite right prisms with and without the use of Pythagoras' theorem	• solve a variety of practical problems related to the volumes and capacities of composite right prisms with and without the use of Pythagoras' theorem

3 Geometry

Geometry			
Similarity and scale factors			
Learning Journey	Steps	Content	Details
Introducing similarity	1	Introducing similarity	• introduce the definition of similarity
			• introduce the symbol for similarity
	2	Identifying that the ratio of corresponding sides of similar shapes are proportional, including its shape and dilation	• identify the ratio in which a shape has been dilated
Identifying and constructing similar triangles	1	Identifying similar triangles, with coordinate grids	• identify which of a set of given triangles are similar with coordinate grids
	2	Identifying similar triangles without coordinate grids	• identify which of a set of given triangles are similar without coordinate grids
	3	Constructing similar triangles by enlargement	• construct and label a similar triangle to a given triangle and scaling constant by enlarging the triangle
			• construct and label a similar triangle to a given triangle and scaling constant by reducing the triangle
Understanding enlargement in similarity	1	Understanding the importance of enlargement transformations in reasoning and proofs	• use enlargement transformations to establish and explain similarity
Using the four tests for similar triangles	1	Establishing and using the 4 tests for 2 triangles to be similar: if the 3 sides of a triangle are proportional to the 3 sides of another triangle, then the 2 triangles are similar	• establish and use the 4 tests for 2 triangles to be similar: if the 3 sides of a triangle are proportional to the 3 sides of another triangle, then the 2 triangles are similar
	2	Establishing and using the 4 tests for 2 triangles to be similar: if 2 sides of a triangle are proportional to 2 sides of another triangle, and the included angles are equal, then the 2 triangles are similar	• establish and use the 4 tests for 2 triangles to be similar: if 2 sides of a triangle are proportional to 2 sides of another triangle, and the included angles are equal, then the 2 triangles are similar
	3	Establishing and using the 4 tests for 4 triangles to be similar: if 4 angles of a triangle are equal to 4 angles of another triangle, then the 4 triangles are similar	• establish and use the 4 tests for 2 triangles to be similar: if 2 angles of a triangle are equal to 2 angles of another triangle, then the 2 triangles are similar
	4	Establishing and using the 4 tests for 2 triangles to be similar: if the hypotenuse and a second side of a right-angled triangle are proportional to the hypotenuse and a second side of another right-angled triangle, then the 2 triangles are similar	• establish and use the 4 tests, for 2 triangles to be similar: if the hypotenuse and a second side of a right-angled triangle are proportional to the hypotenuse and a second side of another right-angled triangle, then the 2 triangles are similar

Learning Journey	Steps	Content	Details
Using scale factors to understand similar triangles	1	Using scale to analyse similar triangles	• find the missing side on a triangle given its similar figure and scale factor
			• find the missing angle on a triangle given its similar figure and scale factor
Using scale factors to find missing sides & angles	1	Finding the missing side on a shape given its similar figure and scale factor	• find the missing side on a shape given its similar figure and scale factor
	2	Finding the missing angle on a shape given its similar figure and scale factor	• find the missing angle on a shape given its similar figure and scale factor
Applying scale factors	1	Applying the scale factor to find unknown lengths in similar figures in a variety of practical situations	• apply the scale factor to find unknown lengths in similar figures in a variety of practical situations
		Establishing the relationship between linear and area scale factors (ratio)	• compare the areas of similar shapes, where the original shape has been enlarged by a given scale factor
			• understand and use the connection between the linear scale factor and the area scale factor to calculate the area of the enlarged shape, given the area of the original shape and the scale factor
			• understand and use the connection between the linear scale factor and the area scale factor to calculate the length of a missing side when the area and the related side length are known
	2	Calculating the scale factor between an object and its image and vice versa involving similar 2D shapes	• calculate the scale factor between an object and its image and vice versa involving similar 2D shapes
		Solving problems in similar figures using area ratios	• solve problems in similar figures using the knowledge of the ratio of corresponding sides and their areas
	3	Calculating the scale factor between an object and its image and vice versa involving similar figures in a variety of practical situations	• calculate the scale factor between an object and its image and vice versa involving similar figures in a variety of practical situations
		Establishing the relationship between linear and volume scale factors (ratio)	• compare the volumes of similar shapes, where the original shape has been enlarged by a given scale factor
			• understand and use the connection between the linear scale factor and the volume scale factor to calculate the volume of the enlarged shape, given the volume of the original shape and the scale factor

Learning Journey	Steps	Content	Details
			• understand and use the connection between the linear scale factor and the volume scale factor to calculate the length of a missing side when the volume and the related side length are known
	4	Using scales on maps and diagrams to solve practical problems	• use scales on maps and diagrams to solve practical problems
		Solving problems in similar figures using volume ratios	• solve problems in similar figures using the knowledge of the ratio of corresponding sides and their volumes
	5	Constructing scale drawings given an object and the scale factor	• construct scale drawings given an object and the scale factor

Pythagoras' theorem			
Triangles with right angles			
Learning Journey	Steps	Content	Details
Identifying sides of triangles with right angles	1	Identifying the hypotenuse as the longest side in any right-angled triangle and also as the side opposite the right angle	• identify the hypotenuse as the longest side in any right-angled triangle and also as the side opposite the right angle
	2	Identifying and labelling sides of a right-angled triangle without any angle measures given	• identify and label the hypotenuse and the 2 shorter sides of a right-angled triangle
			• label the hypotenuse c and the shorter sides a and b in a right-angled triangle
			• label the hypotenuse c and the shorter sides a and b in a right-angled triangle within a given context
Pythagoras' Theorem			
Finding a shorter side using Pythagoras' theorem	1	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem
	2	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem rounding answers	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem rounding answers
	3	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
Finding the hypotenuse using Pythagoras' theorem	1	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem

Learning Journey	Steps	Content	Details
	2	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem rounding answers	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem rounding answers
	3	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
Solving problems involving Pythagoras' theorem	1	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem
	2	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem rounding answers	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem rounding answers
	3	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given
	4	Solving a variety of practical problems involving Pythagoras' theorem within given contexts involving finding missing sides and calculating perimeters with and without diagrams given	• solve a variety of practical problems within given contexts involving finding missing sides
			• solve a variety of practical problems within given contexts involving calculating perimeters
			• solve a variety of practical problems within given contexts including when sides have different units
	5	Solving a variety of problems involving unknown lengths in two-dimensional shapes that contain right-angled triangles within them	• solve a variety of problems involving unknown lengths in two-dimensional shapes that contain right-angled triangles within them
Exploring Pythagorean triads	1	Identifying a Pythagorean triad as a set of 3 numbers that satisfy Pythagoras' theorem	• identify a Pythagorean triad as a set of 3 numbers that satisfy Pythagoras' theorem
			• establish new Pythagorean triads by starting with another
Using the converse of Pythagoras' theorem	1	Using the converse of Pythagoras' theorem to solve problems	• use the converse of Pythagoras' theorem to establish whether a triangle is a right-angled triangle
			• use the converse of Pythagoras' theorem to establish whether a triangle is a right-angled triangle for a practical problem within a given context

Learning Journey	Steps	Content	Details
Solving Pythagoras' theorem problems: Exact values	1	Finding the length of an unknown side (shorter sides only) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (shorter sides only) using Pythagoras' theorem leaving answers in surd form (exact form)
	2	Finding the length of an unknown side (hypotenuse only) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (hypotenuse only) using Pythagoras' theorem leaving answers in surd form (exact form)
	3	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem leaving answers in surd form (exact form)	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem leaving answers in surd form (exact form)
	4	Finding the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given, with answers given in surd form	• find the length of an unknown side (shorter side and hypotenuse) using Pythagoras' theorem in a variety of practical problems within a given context with and without diagrams given, with answers given in surd form

Trigonometry			
Trigonometry			
Learning Journey	Steps	Content	Details
Adding labels to triangles with right angles	1	Identifying and labelling parts of a right-angled triangle with reference to a given angle	• identify the location of the opposite, adjacent and hypotenuse in right-angled triangles of different orientation
	2	Labelling and assigning sides and their corresponding angles in triangles	• label sides in relation to angles in any triangle, eg side c is opposite angle C
Establishing trigonometric relationships	1	Establishing the sine trigonometric relationship on right-angled triangles	• establish the relationship of the opposite side to the hypotenuse with respect to a given angle as the sine of that angle
	2	Establishing the cosine trigonometric relationship on right-angled triangles	• establish the relationship of the adjacent side to the hypotenuse with respect to a given angle as the cosine of that angle.
	3	Establishing the tangent trigonometric relationship on right-angled triangles	• establish the relationship of the opposite side to the adjacent with respect to a given angle as the tangent of that angle
Determining trigonometric ratios	1	Determining which 2 sides each trigonometric ratio applies with reference to a given angle	• determine which 2 sides of a right-angled triangle each trigonometric ratio applies to
			• select correct trigonometric ratio on triangles of different orientation

Learning Journey	Steps	Content	Details
	2	Attaining the 3 primary trigonometric ratios on simple right-angled triangles with respect to a given angle	• attain the sine ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals
			• attain the cosine ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals
			• attain the tangent ratio in a right-angled triangle of different orientations with respect to each acute angle in the triangle. Sides are either values or pronumerals
	3	Identifying which trigonometric ratio to use given 2 sides and an angle in a right-angled triangle	• identify that the sine ratio is relevant when given the opposite and hypotenuse sides with respect to a given angle
			• identify that the cosine ratio is relevant when given the adjacent and hypotenuse sides with respect to a given angle
			• identify that the tangent ratio is relevant when given the opposite and adjacent sides with respect to a given angle
Calculating trigonometric ratios and angles	1	Calculating the approximation of trigonometric ratios for a given angle measured in degrees using the calculator	• calculate the approximate value of the sine ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg $\sin 30° = 0.5$
			• calculate the approximate value of the cosine ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg $\cos 60° = 0.5$
			• calculate the approximate value of the tangent ratio for a given angle measured in whole degrees on right-angled triangles with different orientation using the calculator, eg $\tan 45° = 1$
	2	Using a calculator to find an angle correct to the nearest degree, given one of the trigonometric ratios for the angle	• use a calculator to find an angle correct to the nearest degree, given one of the trigonometric ratios for the angle
Finding the missing side using trig ratios	1	Using trigonometric ratios to find the length of the missing numerator side on a right-angled triangles	• use the tangent ratio to calculate the length of the 'opposite' side given the respective angle and adjacent side in a right-angled triangle

Learning Journey	Steps	Content	Details
			• use the sine ratio to calculate the length of the 'opposite' side given the respective angle and hypotenuse in a right-angled triangle
			• use the cosine ratio to calculate the length of the 'adjacent' side given the respective angle and hypotenuse in a right-angled triangle
		Introducing inverse trigonometric ratios as undoing the original function of the trigonometric ratio	• use inverse trigonometric functions to find an angle, given the ratio eg if sin C = 1/2, find the size of angle C C = sin-1(1/2) C = 30°
	2	Selecting the correct ratio in order to calculate the missing numerator side given an angle in a right-angled triangle with different orientations	• select the correct ratio in order to calculate the missing numerator side given an angle in a right-angled triangle with different orientations
		Using trigonometric ratios to find the size of a missing angle on a right-angled triangle	• use the inverse tangent ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations
			• use the inverse sine ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations
			• use the inverse cosine ratio to find the size of a missing angle given the respective opposite and adjacent sides in right-angled triangles of different orientations
	3	Using trigonometric ratios to find the length of the missing denominator side on a right-angled triangles	• use the tangent ratio to calculate the length of the 'adjacent' side given the respective angle and opposite side in a right-angled triangle
			• use the sine ratio to calculate the length of the 'hypotenuse' side given the respective angle and opposite side in a right-angled triangle
			• use the cosine ratio to calculate the length of the 'hypotenuse' side given the respective angle and adjacent side in a right-angled triangle
		Selecting the correct inverse ratio in order to calculate any missing angle given 2 or more sides in a right-angled triangle with different orientations	• select the correct inverse ratio in order to calculate any missing angle given 2 or more sides in a right-angled triangle with different orientations

Learning Journey	Steps	Content	Details
	4	Selecting the correct ratio in order to calculate any missing denominator given an angle in a right-angled triangle with different orientations	• select the correct ratio in order to calculate any missing denominator given an angle in a right-angled triangle with different orientations
		Solving more complex problems involving finding the missing angle on a right-angled triangle	• solve a range of more complex right-angled triangle problems that involve finding the missing angle with diagrams included
			• solve a range of more complex worded right-angled triangle problems that involve finding the missing angle without diagrams included
			• solve a range of more complex problems involving 1 or more than 1 right-angled triangle where angle needs to be found. Include examples in context using metric units, eg shadows, reflections, scale models, surveying, navigation, inaccessible objects around the school (using a clinometer)
	5	Solving more complex problems involving finding the missing side on a right-angled triangle	• solve a range of more complex right-angled triangle problems that involve finding the missing side given 1 angle with diagrams included
			• solve a range of more complex worded right-angled triangle problems that involve finding the missing side given 1 angle without diagrams included
			• solve a range of more complex problems involving 1 or more than 1 right-angled triangle where side lengths needs to be found. Include examples in context using metric units, eg shadows, reflections, scale models, surveying, navigation, inaccessible objects around the school (using a clinometer)
Angles of elevation and depression	1	Introducing angles of elevation and depression	• introduce and define angles of elevation and depression
			• identify angles of elevation and depression on diagrams
			• interpret, construct and label diagrams involving angles of depression and elevation
	2	Solving problems involving angles of elevation and depression	• connect the alternate angles formed when parallel lines are cut by a transversal with angles of elevation and depression
			• solve problems involving angles of elevation and depression with and without diagrams provided

Learning Journey	Steps	Content	Details
Solving 2D and 3D problems using trig ratios	1	Solving various right-angled triangle problems involving two-dimensional problems	• represent word problems with a sketch with all important details
			• solve various two-dimensional problems involving right-angled triangles of different orientation, with or without a diagram. Sides and/or angles
	2	Solving various right-angled triangle problems involving three-dimensional problems	• use the trigonometric ratios to calculate the lengths of edges and diagonals in rectangular prisms. Pythagoras can also be used in this context. Solve problems when the diagram is provided
			• solve various authentic three-dimensional problems involving right-angled triangles of different orientation, with or without a diagram

4 Chance and probability

Chance			
Chance experiments			
Learning Journey	Steps	Content	Details
The fundamental counting principle	1	Understanding the fundamental counting principle	• understand the fundamental counting principle
	2	Solving problems involving the fundamental counting principle	• solve problems involving the fundamental counting principle
Two-step chance experiments with replacement	1	Listing all outcomes for 2-step chance experiments, with replacement and assign probabilities to outcomes	• list all outcomes for 2-step chance experiments, with replacement and assign probabilities to outcomes
	2	Determining probabilities for events for 2-step chance experiments with replacement	• determine probabilities for events for 2-step chance experiments with replacement
	3	Calculating probabilities of simple and compound events in 2-step chance experiments, with replacement	• calculate probabilities of simple and compound events in 2-step chance experiments, with replacement
Two-step chance experiments without replacement	1	Listing all outcomes for 2-step chance experiments, without replacement and assign probabilities to outcomes	• list all outcomes for 2-step chance experiments, without replacement and assign probabilities to outcomes
	2	Determining probabilities for events for 2-step chance experiments without replacement	• determine probabilities for events for 2-step chance experiments without replacement
	3	Calculating probabilities of simple and compound events in 2-step chance experiments without replacement	• calculate probabilities of simple and compound events in 2-step chance experiments without replacement
Relative frequency			
Calculating and using relative frequency	1	Predicting future relative outcomes using relative frequency	• predict future relative outcomes using relative frequency
	2	Calculating probabilities of events, including events involving 'and', 'or' and 'not', from data contained in Venn diagrams representing 2 or 3 attributes	• calculate probabilities of events, including events involving 'and', 'or' and 'not', from data contained in Venn diagrams representing two or three attributes
	3	Calculating probabilities of events, including events involving 'and', 'or' and 'not', from data contained in two-way tables	• calculate probabilities of events, including events involving 'and', 'or' and 'not', from data contained in two-way tables
Using data to make predictions about populations	1	Making predictions from a sample that may apply to the whole population	• make predictions from a sample that may apply to the whole population • consider the size of the sample when making predictions about the population

Learning Journey	Steps	Content	Details
	2	Investigating the appropriateness of sampling methods and sample size used in reports where statements about a population are based on a sample	• investigate the appropriateness of sampling methods and sample size used in reports where statements about a population are based on a sample

5 Data

Data			
Collecting data			
Learning Journey	Steps	Content	Details
Collecting everyday data	1	Identifying everyday questions and issues involving at least 1 numerical and at least 1 categorical-variable	• identify everyday questions and issues involving at least 1 numerical and at least 1categorical-variable
	2	Investigating relevant issues involving at least 1 numerical and at least 1 categorical variable using information gained from secondary sources	• investigate relevant issues involving at least 1 numerical and at least 1 categorical variable using information gained from secondary sources
Displaying data			
Constructing and interpreting data displays	1	Constructing frequency histograms and polygons from a frequency distribution table	• construct frequency histograms and polygons from a frequency distribution table
	2	Constructing back-to-back stem-and-leaf plots to display and compare 2 like sets of numerical-data	• construct back-to-back stem-and-leaf plots to display and compare 2 like sets of numerical-data
			• construct back-to-back stem-and-leaf plots with decimal values to display and compare 2 like sets of numerical-data
	3	Describing the shape of distributions of data using the terms 'positively skewed', 'negatively skewed', 'symmetric' or 'bi-modal'	• describe the shape of distributions of data using the terms 'positively skewed', 'negatively skewed', 'symmetric' or 'bi-modal'
	4	Describing the shape of data displayed in stem-and-leaf plots, dot plots and histograms	• describe the shape of data displayed in stem-and-leaf plots, dot plots and histograms
Comparing data displays	1	Calculating and comparing means, medians and ranges of 2 sets of numerical data displayed in back-to-back stem-and-leaf plots	• calculate and compare means, medians and ranges of 2 sets of numerical data displayed in back-to-back stem-and-leaf plots
			• make comparisons between 2 like sets of data by referring to the mean, median and/or range for data displayed in back-to-back stem-and-leaf plots
	2	Calculating and comparing means, medians and ranges of 2 sets of numerical data displayed in parallel dot plots	• calculate and compare means, medians and ranges of 2 sets of numerical data displayed in parallel dot plots
			• make comparisons between 2 like sets of data by referring to the mean, median and/or range for data displayed in parallel dot plots

Learning Journey	Steps	Content	Details
	3	Calculating and comparing means, medians and ranges of 2 sets of numerical data displayed in histograms	• calculate and compare means, medians and ranges of 2 sets of numerical data displayed in histograms
			• make comparisons between 2 like sets of data by referring to the mean, median and/or range for data displayed in histograms

Part II

Level 10

6 Number and Algebra

Algebra			
Factorising (Factoring)			
Learning Journey	Steps	Content	Details
Factorising (Factoring)	1	Factorising algebraic expressions by identifying only algebraic factors	• factorise algebraic expressions by finding a common algebraic factor and bringing it out the front of the brackets with its product inside the brackets
Factorising (factoring) using difference of 2 sq	1	Factorising monic quadratic expressions involving the difference of 2 squares	• factorise monic quadratic expressions involving the difference of 2 squares
	2	Factorising non-monic quadratic expressions involving the difference of 2 squares	• factorise non-monic quadratic expressions involving the difference of 2 squares
	3	Factorising non-monic quadratic expressions involving the difference of 2 squares where a HCF needs to be taken out first	• factorise non-monic quadratic expressions involving the difference of 2 squares where a HCF needs to be taken out first
Factorising (factoring) using grouping	1	Factorising monic quadratic expressions involving grouping in pairs with four-term expressions	• factorise monic quadratic expressions involving grouping in pairs with four-term expressions
	2	Factorising non-monic quadratic expressions involving grouping in pairs with four-term expressions	• factorise non-monic quadratic expressions involving grouping in pairs with four-term expressions
	3	Factorising non-monic quadratic expressions involving grouping in pairs with four-term expressions where a HCF needs to be taken out first	• factorise non-monic quadratic expressions involving grouping in pairs with four-term expressions where a HCF needs to be taken out first
Factorising (factoring) using perfect squares	1	Factorising monic quadratic expressions involving perfect squares	• factorise monic quadratic expressions involving perfect squares
	2	Factorising non-monic quadratic expressions involving perfect squares	• factorise non-monic quadratic expressions involving perfect squares
	3	Factorising non-monic quadratic expressions involving perfect squares where a HCF needs to be taken out first	• factorise non-monic quadratic expressions involving perfect squares where a HCF needs to be taken out first
Factorising (factoring) quadratic trinomials	1	Factorising monic quadratic expressions involving quadratic trinomials	• factorise monic quadratic expressions involving quadratic trinomials

Learning Journey	Steps	Content	Details
	2	Factorising non-monic quadratic expressions involving quadratic trinomials	• factorise non-monic quadratic expressions involving quadratic trinomials
	3	Factorising non-monic quadratic expressions involving quadratic trinomials where a HCF needs to be taken out first	• factorise non-monic quadratic expressions involving quadratic trinomials where a HCF needs to be taken out first
Factorising (factoring) complex fractions	1	Factorising and simplifying expressions where at least one entire quadratic expression sits in the numerator or denominator position of a fraction	• factorise and simplify expressions where at least one entire quadratic expression sits in the numerator or denominator and must be factorised first
	2	Factorising and simplifying expressions where at least 1 entire quadratic expression sits in the numerator or denominator position of a fraction where a HCF needs to be taken out first	• factorise and simplify expressions where at least 1 entire quadratic expression sits in the numerator or denominator and must be factorised first where a HCF needs to be taken out first
Quadratic equations			
Solving quadratic equations by factorisation	1	Solving non-monic quadratic equations of the form $ax^2 + bx + c = 0$ by factorisation	• solve non-monic quadratic equations of the form $ax^2+bx+c=0$ by factorisation
Solving quadratic equations: Completing the square	1	Solving monic quadratic equations of the form $ax^2 + bx + c = 0$ by completing the square	• solve monic quadratic equations of the form $ax^2+bx+c=0$ by completing the square
	2	Solving non-monic quadratic equations of the form $ax^2 + bx + c = 0$ by completing the square	• solve non-monic quadratic equations of the form $ax^2+bx+c=0$ by completing the square
Solving quadratic equations with quadratic formula	1	Solving monic quadratic equations of the form $ax^2 + bx + c = 0$ by using the quadratic formula	• solve monic quadratic equations of the form $ax^2+bx+c=0$ by using the quadratic formula
	2	Solving non-monic quadratic equations of the form $ax^2 + bx + c = 0$ by using the quadratic formula	• solve non-monic quadratic equations of the form $ax^2+bx+c=0$ by using the quadratic formula
Solving a variety of quadratic equations	1	Solving a variety of monic quadratic equations	• solve a variety of monic quadratic equations
	2	Solving a variety of non-monic quadratic equations	• solve a variety of non-monic quadratic equations
		Using the discriminant to identify whether a given quadratic equation has real solutions and whether those solutions are unique or equal	• identify whether a given quadratic equation has real solutions, and if there are real solutions, whether they are or are not equal
			• predict the number of distinct real solutions for a particular quadratic equation

Learning Journey	Steps	Content	Details
	3	Checking solutions of a quadratic equation by substituting	• check solutions of a quadratic equation by substituting
Quadratic equations in context	1	Solving quadratic equations resulting from substitution into formulas	• solve quadratic equations resulting from substitution into formulas
	2	Solving real-life problems involving quadratic equations within a given context	• solve real-life problems involving quadratic equations within a given context
		Understanding the definitions involved with polynomials	• understand the terms 'degree', 'leading term', 'leading coefficient', 'constant term' and 'monic polynomial'
	3	Creating quadratic equations to solve a variety of problems and check solutions	• create quadratic equations to solve a variety of problems and check solutions
		Stating the number of zeros that a polynomial of degree n can have	• state the number of zeros that a polynomial of degree n can have
	4	Explaining why one of the solutions to a quadratic equation generated from a word problem may not be a possible solution to the problem	• explain why one of the solutions to a quadratic equation generated from a word problem may not be a possible solution to the problem
		Understanding the definition of a polynomial to be an expression in the form $a_nx_n + a_{n-1}x_{n-1} + ... + a_1x_1 + a_0x_0$	• recognise a polynomial
		Performing operations with polynomials	• add and subtract polynomials
			• multiply polynomials by linear expressions
Using the remainder and factor theorems	1	Using the remainder theorem to find the remainder when a polynomial is divided by the expression (x-a)	• use the remainder theorem to find the remainder when a polynomial is divided by the expression (x-a)
	2	Using the remainder and factor theorems to determine whether (x-a) is a factor of a given polynomial	• use the remainder and factor theorems to determine whether (x-a) is a factor of a given polynomial
	3	Solving problems involving the factor and/or remainder theorems where an unknown variable must be found	• solve problems involving the factor and/or remainder theorems where an unknown variable must be found
Dividing polynomials	1	Dividing polynomials by linear expressions to find the quotient and remainder, expressing the polynomial as the product of the linear expression and another polynomial plus a remainder, ie P(x)=(x−a)Q(x)+c	• divide polynomials by linear expressions to find the quotient and remainder, expressing the polynomial as the product of the linear expression and another polynomial plus a remainder, ie P(x)=(x−a)Q(x)+c

Learning Journey	Steps	Content	Details
Using theorems to factor and solve polynomials	1	Using the factor theorem to factorise particular polynomials completely	• use the factor theorem to factorise particular polynomials completely
	2	Using the factor theorem and long division to find all zeros of a simple polynomial P(x) and then solve P(x)=0	• use the factor theorem and long division to find all zeros of a simple polynomial P(x) and then solve P(x)=0 (degree ≤ 4)
Understanding key points of polynomial graphs	1	Connecting the roots of the equation P(x)=0 to the x-intercepts, and the constant term to the y-intercept, of the graph of y=P(x)	• connect the roots of the equation P(x)=0 to the x-intercepts, and the constant term to the y-intercept, of the graph of y=P(x)
		Determining the importance of the sign of the leading term of a polynomial on the behaviour of the curve as $x \to \pm\infty$	• explain the importance of the sign of the leading term of a polynomial on the behaviour of the curve as $x \to \pm\infty$
	3	Determining the effect of single, double and triple roots of a polynomial equation P(x)=0 on the shape of the graph of y=P(x)	• determine the effect of single, double and triple roots of a polynomial equation P(x)=0 on the shape of the graph of y=P(x)
Sketching polynomials	1	Using the leading term, the roots of the equation P(x)=0, and the x- and y-intercepts to sketch the graph of y=P(x)	• use the leading term, the roots of the equation P(x)=0, and the x- and y-intercepts to sketch the graph of y=P(x)
			• describe the key features of a polynomial
	2	Sketching the graph of a polynomial, given its key features including zeros	• sketch the graph of a polynomial, given its key features including zeros
	3	Sketching a polynomial curve given the polynomial of any degree in factored form	• sketch a polynomial curve given the polynomial of any degree in factored form
	4	Finding the polynomial in factored form given a sketch of its graph	• find the polynomial in factored form given a sketch of its graph
	5	Using the graph of y=P(x) to sketch y=−P(x), y=P(−x), y=P(x)+c, y=kP(x)	• use the graph of y=P(x) to sketch y=−P(x), y=P(−x), y=P(x)+c, y=kP(x)

Number theory			
Surds (radicals)			
Learning Journey	Steps	Content	Details
Introducing surds (radicals)	1	Converting from surd form (with nth root) to index form	• write surds in index form for positive fractions with a numerator of 1
			• write surds in index form for positive/negative fractions with a numerator of 1
			• write surds in index form for positive proper fractions with numerator greater or equal to 1

Learning Journey	Steps	Content	Details
			• write surds in index form for positive/negative proper fractions with numerator greater or equal to 1
			• write surds in index form for positive/negative improper/vulgar fractions with numerator greater or equal to 1
Understanding surd (radicals) general rules	1	Understanding multiplication general formulae for surd rules	• understand multiplication general formulae for surd rules
	2	Understanding division general formulae for surd rules	• understand division general formulae for surd rules
		Simplifying a surd: the radicand being a whole number	• apply the method to simplify a single surd realising you need to look for a factor that is a perfect square
		Rewriting simplified surds	• return a simplified surd into a single surd (unsimplified form)
	3	Simplifying expressions involving surds in calculations: addition/subtraction where surd simplification is not necessary	• simplify surds in calculations: addition/subtraction where surd simplification is not necessary
	4	Simplifying expressions involving surds in calculations: addition/subtraction where surd simplification is necessary	• simplify surds in calculations: addition/subtraction where surd simplification is necessary
		Simplifying expressions involving surds in calculations: multiplication where surd simplification is not necessary	• apply simplifying surds to simple surd multiplication examples
		Simplifying expressions involving surds in calculations: multiplication where surd simplification is necessary	• apply simplifying expressions involving surds in calculations to simplify surd multiplication examples
		Simplifying surds in calculations: division	• apply simplifying surds n calculations to simple division examples
		Simplifying expressions involving surds in calculations: division where the surds have coefficients	• apply the method used to simplify the division of surds with coefficients
	5	Combination of previous content	• Combination of previous details
Expanding brackets with surds (radicals)	1	Simplifying expressions involving surds in calculations: use of the distributive law required	• extend simplifying expressions involving surds in calculations to find solutions when examples have single brackets requiring expansion by a single value
			• extend simplifying expressions involving surds in calculations to find solutions when examples have single brackets requiring expansion by a surd
			• extend simplifying expressions involving surds in calculations to find solutions when examples have single brackets requiring expansion by a surd with a coefficient

Learning Journey	Steps	Content	Details
	2	Expanding and simplifying expressions involving surds in calculations: binomial expansion required	• extend expanding and simplifying expressions involving surds in calculations to find solutions when examples have 2 brackets requiring expansion
			• extend expanding and simplifying expressions involving surds in calculations to find solutions when examples have 2 brackets requiring expansion involving surds with coefficients
	3	Expanding and simplifying expressions involving surds in calculations: expanding a square required	• expand and simplify surds in calculations: expanding a square required
Making the denominator rational	1	Rationalising the denominator with a single surd	• rationalise the denominator with a single surd
	2	Rationalising the denominator of a surd which has a coefficient	• rationalise the denominator of a surd which has a coefficient
	3	Rationalising more complex denominators using conjugate surds	• apply rationalising a denominator using conjugate surds to examples
Solving problems involving surds (radicals)	1	Applying surds to problems within context: trigonometry	• calculate the exact value of a trigonometric ratio in a right-angled triangle, given the lengths of 2 sides
	2	Solving problems using surds	• solve problems involving surds, with and without a calculator

Functions and graphs			
Functions			
Learning Journey	Steps	Content	Details
Identifying functions	1	Defining a function as a rule or relationship where for each input value there is only 1 output value, or that associates every member of 1 set with exactly 1 member of a second set	• define a function as a rule or relationship where for each input value there is only one output value, or that associates every member of one set with exactly one member of a second set
			• decide whether a given relationship is a function or a relation
		Understanding the language and important features of parabolas	• understand the important features to be marked on a parabola; y-intercept, x-intercept(s)/roots, turning point(vertex)
		Understanding that $y = ax^2 + bx + c$ is the general equation of a parabola and manipulate equations to be in this form	• manipulate equations to be in the form $y=ax^2+bx+c$
		Investigating how the parabola with the equation $y = ax^2$ changes as the value of a is changed using digital technology	• describe the features of the graph and how they change as the value of 'a' changes for both positive and negative values of 'a'

Learning Journey	Steps	Content	Details
			• understand that the sign of the co-efficient of x^2 (a) is what makes a parabola concave up or down. If $a > 0$ the parabola is concave up, If $a < 0$ the parabola is concave down
		Investigating how the parabola with the equation $y = ax^2 + k$ changes as the value of k is changed using digital technology	• describe the features of the graph and how they change as the value of k changes for both positive and negative values of k
	2	Using the vertical line test on a graph to decide whether it represents a function or a relation	• use the vertical line test on a graph to decide whether it represents a function or a relation
	3	Graphing parabolas in the form $y = ax^2 + k$ with different values of a and k	• graph parabolas in the form $y = ax^2 + k$ with different values of a and k
	4	Investigating how the parabola with the equation y = (x + a)2 changes as the value of a is changed using digital technology	• describe the features of the graph and how they change as the value of a changes for both positive and negative values of a
	5	Investigating how the parabola with the equation y=(x + a)2 + k changes as the value of k is changed using digital technology	• describe the features of the graph and how they change as the value of k changes for both positive and negative values of k
Parabolas: Vertex and axis of symmetry	1	Determining the equation of the axis of symmetry of a parabola using the midpoint of the interval joining the points at which the parabola cuts the x-axis	• determine the equation of the axis of symmetry of a parabola using the midpoint of the interval joining the points at which the parabola cuts the x-axis
	2	Determining the equation of the axis of symmetry of a parabola using the formula $x=-b/2a$	• determine the equation of the axis of symmetry of a parabola using the formula $x=-b/2a$
	3	Finding the coordinates of the vertex of a parabola by using the midpoint of the interval joining the points at which the parabola cuts the x-axis and substituting to obtain the y-coordinate of the vertex	• find the coordinates of the vertex of a parabola by using the midpoint of the interval joining the points at which the parabola cuts the x-axis and substituting to obtain the y-coordinate of the vertex
	4	Finding the coordinates of the vertex of a parabola by using the formula for the axis of symmetry to obtain the x-coordinate and substituting into the equation to obtain the y-coordinate of the vertex	• find the coordinates of the vertex of a parabola by using the formula for the axis of symmetry to obtain the x-coordinate and substituting to obtain the y-coordinate of the vertex
Finding x- and y-intercepts of parabolas	1	Finding y-intercept for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $x=0$	• find y-intercept for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $x=0$

Learning Journey	Steps	Content	Details
	2	Finding x-intercepts (roots or zeros) of a parabola, where relevant, for the graph of $y = ax^2 + bx + c$, given a, b and c by substituting in $y = 0$ and factorising	• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and factorising for monic equations
			• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and factorising for non-monic equations
	3	Finding x-intercepts (roots or zeros) of a parabola, where relevant, for the graph of $y = ax^2 + bx + c$, given a, b and c by substituting in $y = 0$ and completing the square	• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and completing the square for monic equations
			• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and completing the square for non-monic equations
	4	Finding x-intercepts (roots or zeros) of a parabola, where relevant, for the graph of $y = ax^2 + bx + c$, given a, b and c by substituting in $y = 0$ and using the quadratic formula	• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and using the quadratic formula for monic equations
			• find x-intercepts (roots or zeros), where relevant, for the graph of $y=ax^2+bx+c$, given a, b and c by substituting in $y=0$ and using the quadratic formula for non-monic equations
Graphing parabolas	1	Graphing a variety of parabolas where the equation is given in the form $y = ax^2 + bx + c$, for various values of a, b and c using a table of values	• graph a variety of parabolas where the equation is given in the form $y=ax^2+bx+c$, for various values of a, b and c using a table of values
	2	Graphing parabolas where the equation is given in the form $y = ax^2 + bx + c$, for various values of a, b and c by finding x-intercept(s) (using factorising), the y-intercept and the turning point (vertex)	• graph parabolas where the equation is given in the form $y=ax^2+bx+c$, for various values of a, b and c by finding x-intercept(s) (using factorising), the y-intercept and the turning point (vertex)
	3	Graphing parabolas where the equation is given in the form $y = ax^2 + bx + c$, for various values of a, b and c by finding x-intercept(s) (using completing the square), the y-intercept and the turning point (vertex)	• graph parabolas where the equation is given in the form $y=ax^2+bx+c$, for various values of a, b and c by finding x-intercept(s) (using completing the square), the y-intercept and the turning point (vertex)

Learning Journey	Steps	Content	Details
	4	Graphing parabolas where the equation is given in the form $y = ax^2 + bx + c$, for various values of a, b and c by finding x-intercept(s) (using the quadratic formula), the y-intercept and the turning point (vertex)	• graph parabolas where the equation is given in the form $y=ax^2+bx+c$, for various values of a, b and c by finding x-intercept(s) (using the quadratic formula), the y-intercept and the turning point (vertex)
Parabolas and their transformations	1	Describing, interpreting and sketching parabolas and their translations	• describe, interpret and sketch parabolas and their translations
	2	Describing, interpreting and sketching parabolas and their reflections	• describe, interpret and sketch parabolas and their reflections
	3	Describing, interpreting and sketching parabolas and their rotations	• describe, interpret and sketch parabolas and their rotations
	4	Describing, interpreting and sketching parabolas and their dilations	• describe, interpret and sketch parabolas and their dilations
Exponentials			
Exponential functions and their transformations	1	Describing, interpreting and sketching exponential functions and their translations	• describe, interpret and sketch exponential functions and their translations
	2	Describing, interpreting and sketching exponential functions and their reflections	• describe, interpret and sketch exponential functions and their reflections
	3	Describing, interpreting and sketching exponential functions and their rotations	• describe, interpret and sketch exponential functions and their rotations
	4	Describing, interpreting and sketching exponential functions and their dilations	• describe, interpret and sketch exponential functions and their dilations
Non-linear relationships			
Sketching non-linear graphs	1	Identifying and naming different types of graphs from their equations	• identify and name different types of graphs from their equations
	2	Sketching any particular curve by using a table of values	• sketch any particular curve by using a table of values
	3	Sketching any particular curve by determining its features from its equation	• sketch any particular curve by determining its features from its equation including x and y-intercepts, turning points (if applicable), asymptotes (if applicable)
Determining equations of non-linear graphs	1	Identifying equations whose graph is symmetrical about the y-axis	• identify equations whose graph is symmetrical about the y-axis
	2	Determining a possible equation from a given graph and check using digital technologies	• determine a possible equation from a given graph and check using digital technologies

Learning Journey	Steps	Content	Details
	3	Comparing and contrasting different types of graphs and determining possible equations from the key features	• compare and contrast different types of graphs and determine possible equations from the key features

Coordinate geometry			
Parallel and perpendicular lines			
Learning Journey	Steps	Content	Details
Identifying parallel lines	1	Solving problems involving parallel lines	• understand the characteristics of 2 lines that make them parallel and that they have the same gradients
			• determine whether 2 given lines are parallel
	2	Finding the equation of a line that is parallel to another given line using y=mx+c	• find the equation of a line that is parallel to another given line using y=mx+c
Identifying perpendicular lines	1	Solving problems involving perpendicular lines	• understand the characteristics of 2 lines that make them perpendicular: m1m2=-1 or m1 = -1/m2
			• determine whether 2 given lines are perpendicular
	2	Finding the equation of a line that is perpendicular to another given line using y=mx+c	• find the equation of a line that is perpendicular to another given line using y=mx+c
Equations of lines: parallel & perpendicular lines	1	Finding the equation of a line that is parallel to another given line and going through a given point	• find the equation of a line that is parallel to another given line and goes through a given point
		Solving problems involving collinearity	• show that 3 given points are collinear
	2	Finding the equation of a line that is perpendicular to another given line and going through a given point	• find the equation of a line that is perpendicular to another given line and goes through a given point
		Using coordinate geometry to investigate and describe the properties of triangles and quadrilaterals	• use coordinate geometry to investigate and describe the properties of triangles and quadrilaterals
	3	Finding the equation of a perpendicular bisector of a line interval	• find the equation of a perpendicular bisector of a line interval
		Showing that 4 specified points form the vertices of particular quadrilaterals	• show that 4 specified points form the vertices of particular quadrilaterals
	4	Proving that a particular triangle drawn on the Cartesian plane is right-angled	• prove that a particular triangle drawn on the Cartesian plane is right-angled

7 Measurement

Measurement – Surface area			
Surface area			
Learning Journey	Steps	Content	Details
Finding surface area of pyramids & cones	1	Finding the surface area: pyramids (without Pythagoras' theorem)	• find the surface area of pyramids (without Pythagoras' theorem)
			• find the surface area of pyramids (without Pythagoras' theorem) within the context of a problem
	2	Finding the surface area: pyramids (with and without Pythagoras' theorem)	• find the surface area of pyramids (with and without Pythagoras' theorem)
			• find the surface area of pyramids (with and without Pythagoras' theorem) within the context of a problem
	3	Finding the surface area: cones (without Pythagoras' theorem)	• find the surface area of cones (without Pythagoras' theorem)
			• find the surface area of cones (without Pythagoras' theorem) within the context of a problem
	4	Finding the surface area: cones (with and without Pythagoras' theorem)	• find the surface area of cones (with and without Pythagoras' theorem)
			• find the surface area of cones (with and without Pythagoras' theorem) within the context of a problem
Finding surface area of spheres	1	Finding the surface area: spheres	• find the surface area of spheres
			• find the surface area of spheres within the context of a problem
	2	Finding the surface area: parts of spheres	• find the surface area of parts of spheres
			• find the surface area of parts of spheres within the context of a problem
	3	Combination of previous content	• Combination of previous details
Finding dimensions of objects given surface area	1	Finding possible dimensions of three-dimensional objects given the surface area	• find possible dimensions of three-dimensional objects given the surface area
			• find possible dimensions of three-dimensional objects given the surface area within the context of a problem
	2	Finding the missing dimension, given the other necessary dimensions and the surface area	• find the missing dimension, given the other necessary dimensions and the surface area
			• find the missing dimension, given the other necessary dimensions and the surface area within the context of a problem
Surface area of composite solids			
Surface area of composite solids involving prisms	1	Finding the surface area: composite solids involving prisms	• find the surface area of composite three-dimensional objects involving prisms

Learning Journey	Steps	Content	Details
			• find the surface area of composite three-dimensional objects involving prisms within the context of a problem
	2	Finding the surface area: composite solids involving cylinders	• find the surface area of composite three-dimensional objects involving cylinders
			• find the surface area of composite three-dimensional objects involving cylinders within the context of a problem
	3	Solving a variety of practical problems related to surface areas of prisms, cylinders and related composite solids	• solve a variety of practical problems related to surface areas of prisms, cylinders and related composite solids
Surface area of composite solids with pyramids	1	Finding the surface area: composite solids involving pyramids	• find the surface area of composite three-dimensional objects involving pyramids
			• find the surface area of composite three-dimensional objects involving pyramids within the context of a problem
	2	Finding the surface area: composite solids involving cones	• find the surface area of composite three-dimensional objects involving cones
			• find the surface area of composite three-dimensional objects involving cones within the context of a problem
	3	Finding the surface area: composite solids involving spheres and parts of spheres	• find the surface area of composite three-dimensional objects involving spheres and parts of spheres
			• find the surface area of composite three-dimensional objects involving spheres within the context of a problem
	4	Finding the surface area: composite solids involving the addition of any three-dimensional objects	• find the surface area of composite three-dimensional objects involving the addition any three-dimensional shapes
			• find the surface area of composite three-dimensional objects involving the addition of shapes within the context of a problem
	5	Finding the surface area: composite solids involving the subtraction of any three-dimensional objects	• find the surface area of composite 3D objects involving the subtraction of any 3D shapes
			• find the surface area of composite 3D objects involving the subtraction of shapes within the context of a problem

Measurement – Volume			
Volume of solids			
Learning Journey	Steps	Content	Details
Volume of cones	1	Developing the formula for the volume of cones	• develop and use the formula to find the volumes of cones
	2	Solving a variety of practical problems involving the volume of cones	• solve a variety of practical problems involving the volume of cones
	3	Developing a formula to find the volume of pyramids	• develop and use the formula to find the volumes of pyramids
	4	Solving a variety of practical problems involving the volume of pyramids	• solve a variety of practical problems involving the volume of pyramids
	5	Combination of previous content	• Combination of previous details
Volume of spheres	1	Developing the formula for the volume of a sphere	• develop and use the formula to find the volumes of spheres
	2	Solving a variety of practical problems involving the volume of spheres	• solve a variety of practical problems involving the volume of spheres including related problems such as half of spheres
	3	Finding dimensions of a sphere given its volume (metric units)	• find the dimensions of a sphere, given its volume, by substitution into a formula
			• find the dimensions of a sphere, given its volume, by substitution into a formula within the context of a problem
	4	Finding dimensions of part of a sphere given its volume (metric units)	• find the dimensions of a part of a sphere, given its volume, by substitution into a formula
			• find the dimensions of a part of a sphere, given its volume, by substitution into a formula within the context of a problem
	5	Combination of previous content	• Combination of previous details
Volume of composite solids			
Finding the volume of composite solids	1	Finding the volumes of solids that have uniform cross-sections that are sectors, including semicircles and quadrants	• find the volumes of solids that have uniform cross-sections that are sectors, including semicircles and quadrants
	2	Finding the volumes of composite solids involving prisms and cylinders, eg a cylinder on top of a rectangular prism	• find the volumes of composite solids involving prisms and cylinders, eg a cylinder on top of a rectangular prism
			• dissect composite solids into 2 or more simpler solids to find their volumes
	3	Solving a variety of practical problems related to the volumes and capacities of prisms, cylinders and related composite solids	• solve a variety of practical problems related to the volumes and capacities of prisms, cylinders and related composite solids

Learning Journey	Steps	Content	Details
Calculating the volume of composite solids	1	Calculating the volume of composite solids without spheres and cones (metric units)	• dissect composite solids into 2 or more simpler solids, without spheres or cones
			• find the volumes of composite solids without spheres or cones
			• solve a variety of practical problems in context without spheres or cones
	2	Calculating the volume of composite solids with spheres and cones included (metric units)	• dissect composite solids into 2 or more simpler solids with spheres or cones
			• find the volumes of composite solids with spheres or cones
			• solve a variety of practical problems in context with spheres or cones
	3	Calculating the volume of composite solids (metric units) (Pythagoras' theorem necessary)	• dissect composite solids into 2 or more simpler solids (Pythagoras' theorem necessary)
			• find the volumes of composite solids (Pythagoras' theorem necessary)
			• solve a variety of practical problems in context (Pythagoras' theorem necessary)
	4	Solving real-life problems involving the calculations of composite solids	• solve real-life problems involving the calculations of composite solids

8 Geometry

Geometry – Circles			
Circle terminology			
Learning Journey	Steps	Content	Details
Circle terminology	1	Identifying and naming the primary parts of the circle	• identify and name parts of a circle (centre, radius, diameter, circumference, sector, arc, tangents, semicircle)
	2	Understanding the use of the terms 'major' and 'minor' within the context of circles	• understand the terms 'major sector' and 'minor sector'
			• understand the terms 'major arc' and 'minor arc'
			• understand the terms 'major segment' and 'minor segment'
	3	Identifying and naming further parts of the circle	• identify and name parts of a circle (chord, secant, segment)
	4	Using terminology associated with angles in circles	• use terminology associated with angles in circles
	5	Identifying the arc on which an angle at the centre or circumference stands	• identify the arc on which an angle at the centre or circumference stands
Circle properties			
Circle properties: Tangents	1	Understanding and demonstrating that at any point on a circle there is a unique tangent to the circle	• understand and demonstrate that at any point on a circle there is a unique tangent to the circle
	2	Understanding and demonstrating that a tangent is perpendicular to the radius at the point of contact	• understand and demonstrate that a tangent is perpendicular to the radius at the point of contact
Circle properties: Equal radii	1	Applying the property that all radii on a circle are equal in length	• apply the property that all radii on a circle are equal in length including the implication that any triangle formed with 2 radii will be isosceles to solve problems
		Proving and applying the property that chords of equal length in a circle subtend equal angles at the centre and are equidistant from the centre	• apply the property that chords of equal length in a circle are equidistant from the centre to solve problems
		Proving and applying the property that the angle in a semicircle is a right angle	• apply the property that the angle in a semicircle is a right angle to solve problems involving the value of unknown angles
		Proving and applying the property that the angle at the centre of a circle is twice the angle at the circumference standing on the same arc	• apply the property that the angle at the centre of a circle is twice the angle at the circumference standing on the same arc to solve problems

Learning Journey	Steps	Content	Details
	2	Using the property that all radii on a circle are equal in length to find the length of a chord given the angle at the centre (angle in degrees)	• use the property that all radii on a circle are equal in length to find the length of a chord given the angle at the centre (angle in degrees)
		Proving and applying the property that a perpendicular from the centre of a circle to a chord bisects the chord and that conversely, the line from the centre of a circle to the midpoint of a chord is perpendicular to the chord	• apply the property that a perpendicular from the centre of a circle to a chord bisects the chord and that conversely, the line from the centre of a circle to the midpoint of a chord is perpendicular to the chord to solve problems
		Applying the property that the angle in a semicircle is a right angle involving Pythagoras' theorem	• apply the property that the angle in a semicircle is a right angle involving Pythagoras' theorem to find an unknown diameter length (Pythagoras' theorem finding the hypotenuse)
			• apply the property that the angle in a semicircle is a right angle involving Pythagoras' theorem to find an unknown chord length (Pythagoras' theorem finding a shorter side)
		Proving and applying the property that angles at the circumference, standing on the same arc, are equal	• apply the property that angles at the circumference, standing on the same arc, are equal to solve problems
	3	Using the property that all radii on a circle are equal in length to find the area of the isosceles triangle given the angle at the centre (angle in degrees)	• use the property that all radii on a circle are equal in length to find the area of the isosceles triangle given the angle at the centre (angle in degrees)
		Proving and applying the property that the perpendicular bisector of a chord of a circle passes through the centre	• apply the property that the perpendicular bisector of a chord of a circle passes through the centre to solve problems
		Applying the property that the angle in a semicircle is a right angle involving trigonometric ratios	• apply the property that the angle in a semicircle is a right angle involving trigonometric ratios to find an unknown diameter length
			• apply the property that the angle in a semicircle is a right angle involving trigonometric ratios to find an unknown chord length
			• apply the property that the angle in a semicircle is a right angle involving trigonometric ratios to find an unknown angle
		Proving and applying the property that the opposite angles of cyclic quadrilaterals are supplementary	• apply the property that the opposite angles of cyclic quadrilaterals are supplementary to solve problems
	4	Using the property that all radii on a circle are equal in length to find the area of the minor segment given the angle at the centre (angle in degrees)	• use the property that all radii on a circle are equal in length to derive the formula for the area of the minor segment given the angle at the centre

Learning Journey	Steps	Content	Details
			• use the property that all radii on a circle are equal in length to find the area of the minor segment given the angle at the centre
		Proving and applying the property that given any 3 non-collinear points, the point of intersection of the perpendicular bisectors of any 2 sides of the triangle, formed by the 3 points, is the centre of the circle through all 3 points	• apply the property that given any 3 non-collinear points, the point of intersection of the perpendicular bisectors of any 2 sides of the triangle, formed by the 3 points, is the centre of the circle through all 3 points to solve problems
		Applying the property that the angle in a semicircle is a right angle to find the area of a triangle	• apply the property that the angle in a semicircle is a right angle to find the area of a triangle
		Proving and applying the property that an exterior angle at a vertex of a cyclic quadrilateral is equal to the interior opposite angle	• apply the property that an exterior angle at a vertex of a cyclic quadrilateral is equal to the interior opposite angle to solve problems
	5	Using the area of the minor segment, find the area of the major segment	• use the area of the minor segment find the area of the major segment
		Proving and applying the property that when 2 circles intersect, the line joining their centres bisects their common chord at right angles	• apply the property that when 2 circles intersect, the line joining their centres bisects their common chord at right angles to solve problems
		Applying the property that the angle in a semicircle is a right angle to find the area of a triangle in order to find the area of the segment	• apply the property that the angle in a semicircle is a right angle to find the area of a triangle in order to find the area of the minor segment
			• apply the property that the angle in a semicircle is a right angle to find the area of a triangle in order to find the area of the minor segment in order to find the major segment
		Combination of previous content	• Combination of previous details
Circle properties: Solve problems using properties	1	Applying chord properties of circles to find unknown angles, lengths and areas in diagrams	• apply chord properties of circles to find unknown angles, lengths and areas in diagrams
	2	Applying angle properties of circles to find unknown angles, lengths and areas in diagrams	• apply angle properties of circles to find unknown angles, lengths and areas in diagrams
	3	Combination of previous content	• Combination of previous details

Geometry – Reasoning			
Geometric reasoning to solve problems			
Learning Journey	Steps	Content	Details
Solving problems using geometric reasoning	1	Proving and applying theorems to triangles	• prove and apply that the exterior angle of a triangle is equal to the sum of the 2 interior opposite angles
	2	Solving problems involving similarity ratios and areas and volumes	• solve problems involving similarity ratios and areas and volumes
	3	Applying theorems and properties related to triangles and quadrilaterals in order to solve problems, giving reasons for each step	• apply theorems and properties related to triangles and quadrilaterals in order to solve problems, giving reasons for each step. Find both missing angles and/or missing sides.
	4	Applying tests for quadrilaterals	• apply tests for quadrilaterals

Trigonometry			
Bearings			
Learning Journey	Steps	Content	Details
True bearings	1	Introducing true bearings	• introduce true bearings including using degrees, eg 045°
			• convert between true bearings and compass bearings
	2	Constructing diagrams of given information (true bearings)	• construct accurate scale diagrams of given information (true bearings)
			• represent problems involving true bearings in diagrammatic form in order to assist solving problems
	3	Solving problems involving true bearings using Pythagoras' theorem	• solve problems involving true bearings using Pythagoras' theorem with and without diagrams
			• solve a variety of practical problems involving true bearings using Pythagoras' theorem within a given context
	4	Solving problems involving true bearings using trigonometric ratios	• solve problems involving true bearings using trigonometric ratios with and without diagrams
			• solve a variety of practical problems involving true bearings using trigonometric ratios within a given context
	5	Solving problems involving true bearings	• solve problems involving true bearings with and without diagrams
			• solve a variety of practical problems involving true bearings within a given context
Triangles with no right angles			
Using the sine rule	1	Applying the sine rule	• identify relevant information on a triangle for input into the sine rule
	2	Finding an unknown side using the sine rule	• apply the sine rule as a formula isolating the lower case pronumeral (side length)

Learning Journey	Steps	Content	Details
			• find the missing side on a triangle using the sine rule given its corresponding angle and another side and angle that are corresponding
	3	Finding an unknown angle using the sine rule	• apply the sine rule as a formula isolating the upper case pronumeral (angle)
			• find the missing angle on a triangle using the sine rule given its corresponding side and another side and angle that are corresponding. Include the ambiguous case
	4	Solving problems using the sine rule	• solve problems in context using the sine rule
Using the cosine rule	1	Applying the cosine rule	• apply the cosine rule as a formula isolating the lower case pronumeral (side length)
			• apply the cosine rule as a formula isolating the upper case pronumeral (angle)
			• rearrange cosine rule to make different pronumerals the subject
	2	Using the cosine rule to find a missing side	• find the missing side on a triangle using the cosine rule given its corresponding angle and the other 2 sides
	3	Using the cosine rule to find a missing angle	• find the missing angle on a triangle using the cosine rule given the 3 sides of the triangle
	4	Solving problems using the cosine rule	• solve problems in context using the cosine rule in order to extend the knowledge of the cosine rule
Using the area rule	1	Applying the area of a triangle rule	• apply the area of a triangle rule as a formula isolating the lower case pronumeral (side length)
			• apply the area of a triangle rule as a formula isolating the upper case pronumeral (angle)
			• rearrange the area of a triangle rule to make different pronumerals the subject
	2	Using the area of a triangle rule to find the area of a triangle	• find the area of a triangle using the area of a triangle rule given 2 sides and the included angle
	3	Using the area of a triangle rule to find a missing side	• find the missing side on a triangle using the area of a triangle rule given the other 3 variables
	4	Using the area of a triangle rule to find a missing angle	• find the missing angle in a triangle using the area of a triangle rule given the other 3 variables
	5	Using the area of a triangle rule to solve problems	• solve problems in context using the area of a triangle rule in order to extend the knowledge of the area of a triangle rule

Learning Journey	Steps	Content	Details
Solve problems using trigonometry			
Solving problems in triangles without right angles	1	Solving a variety of two-dimensional problems involving the sine, cosine and area of a triangle rules of different orientation	• solve a variety of two-dimensional problems involving the sine, cosine and area of a triangle rules of different orientation
		Deriving and using the trigonometric identitiy $\tan\theta = \sin\theta/\cos\theta$ using the unit circle (using θ)	• use the trigonometric identity that the tangent ratio is expressed as $\tan\theta = \sin\theta/\cos\theta$ using the unit circle
		Investigating the sine, cosine, tangent ratios for (at least) $0° \leq \theta \leq 360°$ using the unit circle and dynamic mathematical software (using θ)	• communicate how the value of each trigonometric ratio changes as θ travels from 0° to 360°
			• find the value of each trigonometric ratio for angles of any magnitude using the calculator and confirming with the aid of the unit circle
	2	Solving a variety of three-dimensional problems involving the sine, cosine and area of a triangle rules of different orientation	• solve a variety of three-dimensional problems involving the sine, cosine and area of a triangle rules of different orientation
		Deriving and using the Pythagorean identity $\sin2\theta+\cos2\theta = 1$ (using θ)	• use the Pythagorean identity $\sin2\theta + \cos2\theta = 1$
		Comparing the features of trigonometric curves, including periodicity and symmetry	• compare the features of trigonometric curves, including periodicity and symmetry
	3	Sketching the sine, cosine, tangent ratios for (at least) $0° \leq \theta \leq 360°$	• sketch the sine, cosine, tangent ratios for (at least) $0° \leq \theta \leq 360°$
Angles of any magnitude			
Angles of any magnitude	1	Investigating graphs of the sine, cosine and tangent functions for angles of any magnitude, including negative angles	• investigate graphs of the sine, cosine and tangent functions for angles of any magnitude, including negative angles
	2	Using the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\sin A = \sin(180° – A)$	• use the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\sin A = \sin(180° – A)$
	3	Using the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\cos A = -\cos(180° – A)$	• use the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\cos A = -\cos(180° – A)$
	4	Using the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\tan A = -\tan(180° – A)$	• use the unit circle or graphs of trigonometric functions to establish and use the following relationships for obtuse angles, where $0° \leq A \leq 90°$: $\tan A = -\tan(180° – A)$

Learning Journey	Steps	Content	Details
	5	Solving problems using the angles of any magnitude identities	• solve problems using the angles of any magnitude identities
Trigonometric equations			
Solving simple trigonometric equations	1	Finding the exact values of trigonometric ratios	• construct triangles in order to obtain exact trigonometric ratios for 0°, 30°, 45°, 60°
			• find the exact value for sine ratio for angles 0°, 30°, 45°, 60°
			• find the exact value for cosine ratio for angles 0°, 30°, 45°, 60°
			• find the exact value for tangent ratio for angles 0°, 30°, 45°, 60°
	2	Solving problems using the exact trigonometric ratios	• solve problems using the of trigonometric ratios leaving in exact form where necessary
	3	Deriving relationships between sine and cosine ratios of complementary angles in right-angled triangles (using θ)	• use complementary angle relationships to solve problems
	4	Solving trigonometric equations involving exact ratios and complementary angles giving all possible solutions	• solve trigonometric equations involving exact ratios and complementary angles giving all possible solutions

9 Chance and probability

Chance			
Chance experiments			
Learning Journey	Steps	Content	Details
Three-step chance experiments with replacement	1	Listing all outcomes for 3-step chance experiments, with replacement and assign probabilities to outcomes	• list all outcomes for 3-step chance experiments, with replacement and assign probabilities to outcomes
	2	Determining probabilities for events for 3-step chance experiments with replacement	• determine probabilities for events for 3-step chance experiments with replacement
	3	Calculating probabilities of simple and compound events in 3-step chance experiments, with replacement	• calculate probabilities of simple and compound events in 3-step chance experiments, with replacement
Three-step chance experiments without replacement	1	Listing all outcomes for 3-step chance experiments, without replacement and assigning probabilities to outcomes	• list all outcomes for 3-step chance experiments, without replacement and assign probabilities to outcomes
		Understanding that independent events have a set probability that do not rely on previous events	• explore examples of independent events, eg consecutive rolls of dice
	2	Determining probabilities for events for 3-step chance experiments without replacement	• determine probabilities for events for 3-step chance experiments without replacement
		Understanding that dependent events have a probability that changes according to previous events	• explore examples of dependent events, eg drawing cards from a deck
	3	Calculating probabilities of simple and compound events in 3-step chance experiments without replacement	• calculate probabilities of simple and compound events in 3-step chance experiments without replacement
		Determining if 2 events, A and B, are independent by using the characteristic that if the probability of A and B occurring together is the product of their probabilities	• determine if 2 events, A and B, are independent by using the characteristic that if the probability of A and B occurring together is the product of their probabilities
	4	Recognising and using the fact that for independent events P(A and B) = P(A) × P(B)	• recognise and use the fact that for independent events P(A and B) = P(A) × P(B)
Conditional probability			
Introducing conditional probability	1	Identifying mistakes in interpreting conditional probability statements	• identify mistakes in interpreting conditional probability statements
	2	Determining the conditional probability of A given B as the fraction of B's outcomes that also belong to A	• determine the conditional probability of A given B as the fraction of B's outcomes that also belong to A

Learning Journey	Steps	Content	Details
			• interpret the answer to questions modelled on conditional probability calculations
	3	Applying the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B), and interpreting the answer in terms of the model	• apply the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B)
			• interpret the answer to questions modelled on the addition rule for probability
	4	Applying the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpreting the answer in terms of the model	• apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B)
			• interpret the answer to questions modelled on the multiplication rule for probability
Conditional probability and two-way tables	1	Constructing and interpreting two-way frequency tables of data when 2 categories are associated with each object being classified	• construct and interpret two-way frequency tables of data when two categories are associated with each object being classified
	2	Determining if events are independent using a two-way table as a sample space	• determine if events are independent using a two-way table as a sample space
	3	Approximating conditional probabilities using two-way tables as a samples space	• approximate conditional probabilities using two-way tables as a samples space
	4	Calculating and interpreting conditional probabilities through representation using expected frequencies with two-way tables	• calculate probabilities through representation using expected frequencies with two-way tables
			• interpret conditional probabilities through representation using expected frequencies with two-way tables
	5	Calculating and interpreting probabilities of compound events using two-way tables	• calculate probabilities of compound events using two-way tables
			• interpret probabilities of compound events using two-way tables
Conditional probability and tree diagrams	1	Calculating and interpreting conditional probabilities through representation using expected frequencies with tree diagrams	• calculate conditional probabilities through representation using expected frequencies with tree diagrams
			• interpret conditional probabilities through representation using expected frequencies with tree diagrams
	2	Calculating and interpreting probabilities of compound events using tree diagrams	• calculate and interpret probabilities of compound events using tree diagrams
			• interpret probabilities of compound events using tree diagrams

Learning Journey	Steps	Content	Details
Conditional probability and arrays	1	Calculating and interpreting conditional probabilities through representation using expected frequencies with arrays	• calculate conditional probabilities through representation using expected frequencies with arrays
			• interpret conditional probabilities through representation using expected frequencies with arrays
	2	Calculating and interpreting probabilities of compound events using arrays	• calculate probabilities of compound events using arrays
			• interpret probabilities of compound events using arrays
Conditional probability and Venn diagrams	1	Calculating and interpreting conditional probabilities through representation using expected frequencies with Venn diagrams	• calculate conditional probabilities through representation using expected frequencies with Venn diagrams
			• interpret conditional probabilities through representation using expected frequencies with Venn diagrams
	2	Calculating and interpreting probabilities of compound events using Venn diagrams	• calculate probabilities of compound events using Venn diagrams
			• interpret probabilities of compound events using Venn diagrams
Set theory and Venn diagrams	1	Defining unions, intersections and complements of subsets using symbols	• define unions as the combination of subsets, ie if an element is in A U B then the element can be in either A or B
			• define intersections as the crossover between subsets, ie if an element is in A ▯ B then the element must be in A and B
			• define complements of an event as all outcomes that are not the event
	2	Identifying different regions on a Venn diagram using set theory	• identify different regions on a Venn diagram using set theory

10 Data

Data			
Interquartile range			
Learning Journey	Steps	Content	Details
Interquartile range	1	Defining quartiles and interquartile-range	• defining quartiles and interquartile-range
	2	Describing the proportion of data values contained between various quartiles	• describe the proportion of data values contained between various quartiles
	3	Determining the upper and lower extremes, median, and upper and lower quartiles for sets of numerical-data	• determine the upper and lower extremes, median, and upper and lower quartiles for sets of numerical-data
	4	Determining the interquartile range for sets of data	• determine the interquartile range for sets of data
Box-and-whisker plots			
Constructing and interpreting box-and-whisker plot	1	Constructing a box-and-whisker plot using the median, the upper and lower quartiles, and the upper and lower extremes of a set of data	• construct a box-and-whisker plot using the median, the upper and lower quartiles, and the upper and lower extremes of a set of data
	2	Comparing 2 or more sets of data using parallel box-and-whisker-plots drawn on the same scale	• compare 2 or more sets of data using parallel-box-and-whisker-plots drawn on the same scale
Comparing box-and-whisker plots	1	Determining quartiles from data displayed in histograms and dot plots, and using these to draw a box-and-whisker plot to represent the same set of data	• determine quartiles from data displayed in histograms and dot plots • draw a box-and-whisker plot to represent the same set of data displayed in a histogram
	2	Identifying skewed and symmetrical sets of data displayed in histograms and dot plots, and describing the shape/features of the corresponding box-and-whisker plot for such sets of data	• identify skewed and symmetrical sets of data displayed in histograms and dot plots • describe the shape/features of the corresponding box-and-whisker plot for such sets of data
Bivariate data			
Scatter plots	1	Describing, informally, the strength and direction of the relationship between 2 variables displayed in a scatter plot	• describe, informally, the strength and direction of the relationship between 2 variables displayed in a scatter plot
	2	Making predictions from a given scatter plot or other graph	• make predictions from a given scatter plot or other graph
	3	Drawing conclusions from a given scatter plot	• draw conclusions from a given scatter plot

Learning Journey	Steps	Content	Details
Line of best fit	1	Knowing that straight lines are widely used to model relationships between 2 quantitative variables. For scatter plots that suggest a linear association, informally fitting a straight line, and informally assessing the model fit by judging the closeness of the data points to the line	• know that straight lines are widely used to model relationships between 2 quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line
	2	Using the equation of a linear model to solve problems in the context of bivariate measurement data	• use the equation of a linear model to solve problems in the context of bivariate measurement data • interpret the gradient and intercept
Bivariate data	1	Recognising the difference between an independent variable and its dependent variable	• recognise the difference between an independent variable and its dependent variable
	2	Distinguishing bivariate data from single variable (univariate) data	• distinguish bivariate data from single variable (univariate) data
	3	Describing changes in the dependent variable over time	• describe changes in the dependent variable over time
	4	Interpreting data displays representing 2 or more dependent numerical-variables against time	• interpret data displays representing 2 or more dependent numerical-variables against time
Reviewing data in the media			
Evaluating statistical reports	1	Analysing graphical displays to recognise features that may have been manipulated to cause a misleading interpretation and/or support a particular point of view	• analyse graphical displays to recognise features that may have been manipulated to cause a misleading interpretation and/or support a particular point of view
Critical analysis of data in the media	1	Investigating the appropriateness of sampling methods and sample size used in reports where statements about a population are based on a sample	• investigate the appropriateness of sampling methods and sample size used in reports where statements about a population are based on a sample
	2	Determining whether a sample used enables inferences or conclusions to be drawn about the relevant population	• determine whether a sample used enables inferences or conclusions to be drawn about the relevant population
	3	Evaluating whether graphs in a report could mislead, and whether graphs and numerical information support the claims	• evaluate whether graphs in a report could mislead, and whether graphs and numerical information support the claims
Data analysis			
Using the mean and standard deviation of data sets	1	Defining standard deviation and the percentiles they represent	• define standard deviation and the percentiles they represent

Learning Journey	Steps	Content	Details
	2	Finding the standard deviation of a set of data using digital technologies	• find the standard deviation of a set of data using digital technologies
	3	Investigating and describing the effect, if any, on the standard deviation of adding a data value to the set of data	• investigate and describe the effect, if any, on the standard deviation of adding a data value to the set of data
	4	Investigating and describing the effect, if any, on the standard deviation of altering all of the data values in the set of data by operations such as doubling all data values or adding a constant to all data values	• investigate and describe the effect, if any, on the standard deviation of altering all of the data values in the set of data by operations such as doubling all data values or adding a constant to all data values
	5	Fitting a data set to a normal distribution using its mean and standard deviation	• fit a data set to a normal distribution using its mean and standard deviation
Estimating population percentages	1	Estimating population percentages of a data set using its mean and standard deviation	• estimate population percentages of a data set using its mean and standard deviation (assuming the population fits a normal distribution)
Comparing data using mean and standard deviation	1	Comparing 2 sets of data by using the mean and standard deviation	• compare 2 sets of data by using the mean and standard deviation
	2	Comparing and describing the spread of sets of data with the same mean but different standard deviations	• compare and describe the spread of sets of data with the same mean but different standard deviations
	3	Comparing and describing the spread of sets of data with different means by referring to standard deviation	• compare and describe the spread of sets of data with different means by referring to standard deviation
Bivariate data and lines of best fit	1	Predicting what might happen between known data values and predicting what might happen beyond known data values using lines of best fit	• predict what might happen between known data values (interpolation) and predict what might happen beyond known data values using lines of best fit

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