Mathletics
3P Learning Progressions
Understanding Practice and Fluency (UPF)

Years 7 – 8 | New Zealand

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Mathletics

New Zealand Curriculum
Understanding, Practice and Fluency (UPF)

Contents

Part I

Level 4 - Year 7 (Early Stage 7)

1 Number and Algebra

1.1 Number strategies and knowledge

NA4-1: Use a range of multiplicative strategies when operating on whole numbers.			
Use numeracy strategies to multiply			
Learning Journey	Steps	Content	Details
Using numeracy strategies to multiply	1	Using doubling and halving to solve multiplication problems with 1-2 digit numbers	• explain and justify the use of the strategy
			• mentally adjust a multiplication problem by doubling one number and halving the other, eg 3 x 14 as 6 x 7
	2	Multiplying 2-3-digit numbers by 5 using the strategy to x10 then halve	• use the strategy to multiply by 10 and then halve
	3	Multiplying by 8 using the numeracy strategy of double double double	• use the strategy of double double double to multiply by 8
	4	Using the multiply by 11 strategy with 2-digit numbers (without regrouping)	• explain and justify the use of the strategy
			• multiply 2-digit numbers by 11 (without regrouping)
		Using the multiply by 11 strategy with 2-digit numbers (with regrouping)	• explain and justify the use of the strategy
			• multiply 2-digit numbers by 11 (with regrouping)
	5	Multiplying 3-digit numbers by 2-digit numbers using Napier's bones	• use Napier's bones to multiply (without regrouping)
			• use Napier's bones to multiply (with regrouping)
Use strategies to multiply/divide			
Using strategies to multiply whole numbers	1	Recalling start unknown and change unknown division facts up to 10 x 10 with automaticity	• recall start unknown division facts up to 10 x 10 with automaticity
			• recall change unknown division facts up to 10 x 10 with automaticity
	2	Multiplying any numbers by 10, 100, 1000 and their multiples	• use mental strategies to multiply by 10, 100, 1000 and their multiples
	3	Multiplying 4-digit numbers by 1-digit numbers using split method	• multiply the thousands, then the hundreds, then the tens and then the ones
			• check answers to mental calculations using digital technologies
			• use inverse operations to justify solutions
	4	Multiplying 4-digit numbers by 1-digit numbers using an area model	• use an area model for 4-digit by 1-digit multiplication
			• check answers to mental calculations using digital technologies

Learning Journey	Steps	Content	Details
			• use inverse operations to justify solutions
	5	Selecting efficient strategies to multiply whole numbers of up to 4 digits by 1- and 2-digit numbers	• apply mental strategies
			• apply efficient use of formal algorithms
			• use digital technologies
			• estimate solutions to problems and check to justify solutions
Using standard algorithms to multiply	1	Multiplying 4-digit numbers by 1-digit numbers using the expanded algorithm	• multiply the ones, then the tens, then the hundreds and then the thousands, with and without regrouping
			• model the method with place value models or diagrams; relate to the area model
	2	Multiplying 4-digit numbers by 1-digit numbers using the contracted algorithm	• multiply the ones, then the tens, then the hundreds and then the thousands, with and without regrouping
			• use inverse operations or digital technologies to check solutions
	3	Multiply multi-digit whole numbers using the standard algorithm	• apply the written algorithm to multiply multi-digit whole numbers
Using strategies to divide whole numbers	1	Dividing any numbers by 10, 100, 1000 and their multiples	• use mental strategies to divide by 10, 100, 1000 and their multiples
		Selecting efficient strategies to divide whole numbers of up to 4 digits by a 1-digit divisor	• apply mental strategies
			• apply efficient use of formal algorithms
			• use digital technologies
			• estimate solutions to problems and check to justify solutions
		Rounding to estimate quotients	• estimate quotients using rounding
Using standard algorithms to divide	1	Dividing a 4-digit number by a 1-digit divisor using the extended algorithm, no remainders or zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, without remainders and without zeros in the answer
		Dividing a 4-digit number by a 1-digit divisor using the extended algorithm, with remainders but without zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, with remainders but without zeros in the answer
	2	Dividing a 4-digit number by a 1-digit divisor using the extended algorithm, with and without remainders and zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, with and without remainders and zeros in the answer
	3	Dividing a 4-digit number by a 1-digit divisor using the contracted algorithm, no remainders or zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, without remainders and without zeros in the answer
		Dividing a 4-digit number by a 1-digit divisor using the contracted algorithm, with remainders but without zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, with remainders but without zeros in the answer

Learning Journey	Steps	Content	Details
	4	Dividing a 4-digit number by a 1-digit divisor using the contracted algorithm, with and without remainders and zeros in answers	• apply the written algorithm to divide a 4-digit number by a 1-digit number, with and without remainders and zeros in the answer
Multiplying & dividing whole numbers in context	1	Solving word problems involving multiplication and division	• use appropriate language to compare quantities, eg 'twice as much', 'half as much'
			• use a table or similar organiser to record methods used to solve problems
	2	Solving word problems involving multiplication and division by 10, 100, 1000 and their multiples	• solve word problems for multiplying or dividing by 10, 100, 1000 and their multiples
	3	Showing the connection between division and multiplication, including where there is a remainder	• show the connection between division and multiplication, including where there is a remainder
	4	Using non-standard partitioning with numbers of any size	• partition numbers of any size in non-standard forms
	5	Understanding the distributive law	• understand the distributive law
			• understand the distributive law can be extended to expanding expressions containing 3 or more terms within the grouping symbols
			• identify common misconceptions when working with distributive property
		Solving problems within a given context by applying the distributive law	• solve problems within a given context by applying the distributive law
Using the associative law for multiplication	1	Understanding the associative law of multiplication	• understand the associative law of multiplication
		Demonstrating how the associative law for addition/subtraction does not affect the outcome of the application of the distributive law for numerical examples	• demonstrate how the associative law for addition/subtraction does not affect the outcome of the application of the distributive law for numerical examples
	2	Applying the associative law of multiplication to aid in mental computation	• apply the associative law of multiplication to aid in mental computation
	3	Determining, by example, that associativity holds true for multiplication of 3 or more numbers but does not apply to calculations involving division	• determine, by example, that associativity holds true for multiplication of 3 or more numbers but does not apply to calculations involving division
Using the commutative law for multiplication	1	Understanding the commutative law of multiplication	• understand the commutative law of multiplication

Learning Journey	Steps	Content	Details
		Applying the commutative law of multiplication to aid mental computation	• apply the commutative law to aid mental computation
Testing for divisibility	1	Determining and applying tests of divisibility for 2, 3, 4, 5, 6 and 10	• determine and apply tests of divisibility for 2, 3, 4, 5, 6 and 10
			• verify the various tests of divisibility using a calculator
Find factors/multiples/primes up to 100			
Finding factors of numbers up to 100	1	Finding factors for whole numbers up to 100	• determine all 'factors' of a given whole number up to 100
			• determine the 'highest common factor' (HCF) of 2 whole numbers
			• determine whether a particular number is a factor of a given number using digital technologies
			• recognise that when a given number is divided by 1 of its factors, the result must be a whole number
	2	Listing factors for whole numbers up to 100	• list factors in pairs for whole numbers up to 100
	3	Finding common factors for two numbers	• find common factors for two numbers
Finding multiples of numbers up to 100	1	Finding multiples up to 100	• determine 'multiples' of a given whole number
			• determine the 'lowest common multiple' (LCM) of 2 whole numbers
	2	Solving problems using factors and multiples	• solve problems using knowledge of factors and multiples, eg 'There are 48 people at a party. In how many ways can you set up the tables and chairs, so that each table seats the same number of people and there are no empty chairs?'
Finding prime factors for numbers up to 100	1	Expressing a whole number between 2 - 50 as a product of its prime factors	• express a whole number in the range 2–50 as a product of its prime factors, eg find the prime factors of 24 and express 24 as $2 \times 2 \times 2 \times 3$
	2	Finding greatest common divisor from prime factors (no indices)	• determine the greatest common factor of 2 whole numbers using their prime factorisations (no indices)
	3	Using prime factorisation of a whole number to express a number as a product of its prime factors (without exponents)	• factorise a whole number to determine its unique factorisation, expressing the result as a product of its prime factors without exponents
			• determine common factors and common multiples using the prime factorisation of numbers
			• use factor trees to determine the prime factors of a whole number
			• use factor ladders to determine the prime factors of a whole number

Learning Journey	Steps	Content	Details
	4	Finding the greatest common divisor from prime factors (without exponents)	• determine the greatest common factor of 2 whole numbers using their prime factorisations (without exponents)
Add/subtract whole numbers			
Adding/subtracting whole numbers	1	Rounding large numbers (up to 100 000) to the nearest 1000 to estimate sums	• round large numbers to the nearest 1000 to estimate sums
		Rounding large numbers (up to 100 000) to the nearest 1000 to estimate differences	• round large numbers to the nearest 1000 to estimate differences
	2	Using a formal written algorithm for addition calculations of 3 or more addends up to any size (with and without regrouping)	• apply algorithms with 3 or more addends with the same number of places and with a different number of places; include opportunities for students to write their own algorithms with digits in correct place value positions; include word problems
	3	Applying efficient strategies for addition and subtraction calculations involving numbers of any size	• add 3 or more numbers with different numbers of digits
			• use mental and/or written strategies efficiently
			• use mathematical language to describe addition and subtraction strategies
			• apply efficient strategies to solve word problems involving addition and subtraction
			• represent calculations using appropriate recording strategies
			• justify the choice of strategy for a given calculation
	4	Checking accuracy of addition and subtraction calculations with 4-digit and 5-digit numbers	• check solutions to problems by using the inverse operation
			• round numbers appropriately when obtaining estimates to numerical calculations
			• use estimation to check the reasonableness of answers to addition and subtraction calculations
	5	Solving word problems requiring both addition and subtraction involving numbers of any size	• select and apply efficient mental strategies to solve word problems
			• select and apply efficient written strategies to solve word problems
			• justify the use digital technologies to solve word problems
			• interpret words that indicate the required operation/s
			• justify the choice of strategy for a given calculation

Learning Journey	Steps	Content	Details
Use squares, cubes & roots			
Finding squares and cubes	1	Introducing square numbers	• establish and define the concept of square numbers, including the exponential notation
			• generate square numbers up to at least 100
			• know and recall square numbers up to and including 100
	2	Introducing cube numbers	• establish and define the concept of cube numbers, including the index notation
			• generate cube numbers up to at least 125
			• know and recall cube numbers up to and including 125
	3	Finding squares and cubes	• generate square numbers up to at 12^2
			• generate cube numbers up to at 6^3
	4	Comparing square and cube numbers using inequality symbols	• compare square and cube numbers using inequality symbols (<, >, =), eg, 3 cubed [?] 4 squared
Finding square and cube roots	1	Investigating square roots and cube roots	• investigate and use square roots of square numbers
			• use the notations for square root ($\sqrt{}$) and cube root ($\sqrt[3]{}$)
	2	Knowing that when the $\sqrt{}$ symbol is used, that it is conventionally referring to the principal square root which is the positive square root	• know that when the $\sqrt{}$ symbol is used, that it is conventionally referring to the principal square root which is the positive square root
		Establishing and defining square roots of whole numbers and their symbolic notation	• establish and define square roots of whole numbers and their symbolic notation
	3	Recognising the link between squares and square roots	• recognise the link between squares and square roots
		Finding square roots of perfect square whole numbers only	• find the square roots of perfect square whole numbers up to 100
	4	Recognising the link between cubes and cube roots	• recognise the link between cubes and cube roots
		Finding cube roots of perfect cube whole numbers	• find the cube roots of perfect cube whole numbers up to 125
Use index notation			
Using index notation	1	Understanding the zero exponent law	• understand the meaning of the zero exponent for expressions with algebraic bases
			• verify the zero exponent law using a calculator

Learning Journey	Steps	Content	Details
	2	Investigating exponential notation	• describe numbers written in 'exponent form' using terms such as 'base', 'power', 'index', 'exponent', 'to the power of', 'squared', 'cubed'
			• use exponential notation to express powers of numbers (positive exponents only)
			• evaluate numbers expressed as powers of integers
			• investigate and generalise the effect of raising a negative number to an odd or even power on the sign of the result
	3	Representing repeated multiplication of whole numbers using exponents	• represent repeated multiplication of whole numbers using exponents
			• represent expressions given in exponential notation as the repeated multiplication of the base
	4	Solving problems in contexts involving numbers in exponential form	• solve problems in contexts involving numbers in exponential form

NA4-2: Understand addition and subtraction of fractions, decimals, and integers.			
Add/subtract fractions			
Learning Journey	Steps	Content	Details
Add & subtract fractions - common denominator	1	Adding proper fractions with common denominators	• add proper fractions with common denominators
		Subtracting proper fractions with common denominators	• subtract proper fractions with common denominators
	2	Adding improper fractions with common denominators	• add improper fractions with common denominators
			• add improper fractions with common denominators expressing answers as a mixed number
		Subtracting improper fractions with common denominators	• subtract improper fractions with common denominators
			• subtract improper fractions with common denominators, expressing answers as a mixed number
	3	Adding mixed numbers with common denominators	• add mixed numbers with common denominators
		Subtracting mixed numbers with common denominators	• subtract mixed numbers with common denominators
Add & subtract fractions - related denominator	1	Adding and subtracting simple proper fractions in which 1 denominator is a multiple of another (denominators 2, 3, 4, 5, 6, 7, 8, 10, 12, 100)	• add and subtract proper fractions where 1 denominator is the same as, or a multiple of, the other
			• use knowledge of equivalence to simplify answers when adding and subtracting fractions

Learning Journey	Steps	Content	Details
	2	Adding and subtracting proper fractions with related denominators and answers less than 1 whole	• add and subtract proper fractions where the denominators are related
			• model and represent strategies, including using diagrams and written representations
			• use knowledge of equivalence to simplify answers when adding and subtracting fractions
	3	Adding mixed numbers with related denominators	• add mixed numbers with related denominators
		Subtracting mixed numbers with related denominators	• subtract mixed numbers with related denominators
	4	Adding and subtracting fractions including mixed numbers, with related denominators	• add and subtract fractions where the denominators are related
			• use knowledge of equivalence to simplify answers when adding and subtracting fractions
			• where the answer is greater than 1 convert the fraction to a mixed number
Add/subtract decimals			
Adding & subtracting decimals	1	Counting in decimal hundredths	• count forwards and backwards by hundredths from any decimal number expressed to 2 decimal places, using concrete materials and number lines
	2	Investigating decimal complements of 1	• use addition and subtraction to explore decimal complements of 1, eg 0.83 + 0.17 = 1
	3	Adding decimals to hundredths	• add a whole number and a decimal (to hundredths)
			• add 2 decimal numbers in tenths
			• add 2 decimals numbers in hundredths
			• add decimal numbers to 2 places (mixed place value)
		Adding decimals using mental strategies and place value understanding	• add decimals mentally using place value understanding
	4	Subtracting decimals to hundredths	• subtract a decimal up to the hundredths place from a whole number
			• subtract 2 decimal numbers in tenths
			• subtract 2 decimal numbers in hundredths
			• subtract 2 decimal numbers to 2 places (mixed place value)
	5	Subtracting decimals using mental strategies and place value understanding	• subtract decimals using place value understanding

Learning Journey	Steps	Content	Details
		Adding and subtracting decimals using mental strategies and place value understanding	• add and subtract decimals using place value understanding
Add/subtract integers			
Adding & subtracting integers	1	Understanding addition and subtraction of integers concretely	• understand addition and subtraction of integers concretely
	2	Understanding addition and subtraction of integers pictorially	• understand addition and subtraction of integers pictorially
	3	Adding and subtracting negative integers	• add and subtract negative integers
			• understand the way negative integers subtract from something actually adds positively
			• understand that 9–(–4) = 13 because –4 is 13 away from +9
	4	Representing addition and subtraction on a horizontal or vertical number line diagram	• represent addition and subtraction on a horizontal or vertical number line diagram
	5	Adding and subtracting integers with order of operations	• add and subtract integers with order of operations

NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.			
Calculate fraction of a quantity			
Learning Journey	Steps	Content	Details
Calculating a fraction of a quantity	1	Multiplying proper fractions by a whole number greater than 1	• multiply proper fractions by a whole number greater than 1
	2	Calculating fractions of quantities using mental or written strategies	• calculate fractions of quantities using mental or written strategies
	3	Calculating proper fractions of quantities	• calculate fractions of quantities using mental and written strategies
	4	Calculating fractions of amounts using bar models not exceeding 1000 (denominators 3–12)	• calculate the unit fraction of amounts using bar models, eg, 1/5 of 600 = ?
			• calculate the whole amount from a proper fraction of amounts using bar models, eg 11/5 of 240 = ?
Multiplying fractions by whole numbers	1	Multiplying proper or improper fractions by whole numbers using models and diagrams	• apply and extend previous understandings of multiplication to multiply a fraction by a whole number supported by models and/or diagrams, eg 2/5 × 3 = 2/5 + 2/5 + 2/5 = 6/5 = 1 1/5
			• apply and extend previous understandings of multiplication to multiply an improper fraction by a whole number supported by models and/or diagrams, eg 6/5 × 3 = 6/5 + 6/5 + 6/5 = 18/5 = 3 3/5

Learning Journey	Steps	Content	Details
			• develop a rule for multiplying fractions by whole numbers eg multiply the numerator by the whole number
			• solve word problems involving multiplication of fractions by whole numbers, including area and length problems
	2	Solving word problems involving multiplication of fractions by whole numbers using models and equations	• solve word problems involving multiplication of fractions by whole numbers using models
Multiply fractions			
Multiplying fractions	1	Multiplying 2 proper fractions	• multiply 2 proper fractions using written methods
	2	Expressing 1 quantity as a fraction (proper/improper/mixed) of another	• choose appropriate units to compare 2 quantities as a fraction
Calculate decimals of a quantity			
Calculating decimals of a quantity	1	Calculating decimals of quantities using mental/written methods	• calculate decimals of quantities using mental, written and calculator methods
	2	Calculating decimals of quantities using a calculator	• calculate decimals of quantities using a calculator
Multiply & divide decimals			
Multiplying decimals	1	Multiplying decimals up to 2 places using the standard algorithm	• multiply a whole number and a decimal up to hundredths
			• multiply 2 decimal numbers in tenths
			• multiply 2 decimal numbers in hundredths
			• multiply 2 decimal numbers up to 2 places
Dividing decimals	1	Dividing whole numbers and decimals up to 2 places using the standard algorithm	• divide whole numbers by decimals up to 2 places
			• divide a decimal number up to hundredths by another decimal number up to hundredths
	2	Dividing decimals by 10	• recognise that the digits move one place the right
			• use zero as a place holder
			• use PV equipment to divide decimals by 10
	3	Dividing decimals by 100	• recognise that the digits move 2 places to the right
			• use zero as a place holder
			• use PV equipment to divide decimals by 100
Calculate percentage of a quantity			
Calculating a percentage of a quantity	1	Calculating 10% of a quantity	• calculate 10% of a quantity ending in zeros
			• calculate 10% of a quantity not ending in zeros

Learning Journey	Steps	Content	Details
	2	Calculating 20% of a quantity	• calculate 10% and double
	3	Calculating 5% of a quantity	• calculate 10% and halve
		Calculating any multiple of 5% of a quantity	• explain the strategy not the answer
			• calculate using 10%, halve, double and addition or subtraction
	4	Calculating simple percentages	• estimate 0%, 1%, 10%, 25%, 50% and 100% of an amount including examples in context (exclude discounts), explain estimation
			• model 10%, 25% and 50% of an amount
			• calculate 10%, 25% and 50% of an amount including examples in context (exclude discounts)
	5	Calculating simple percentages of quantities	• equate 10% to 1/10, 25% to 1/4 and 50% to 1/2
			• use mental strategies to estimate discounts of 10%, 25% and 50%,
			• calculate the sale price of an item after a discount of 10%, 25% and 50%, recording the strategy and result
Calculating percentage discounts	1	Calculating simple percentage discounts	• investigate and calculate percentage discounts of 10%, 25% and 50% on sale items
			• estimate quantities using benchmarks of 10%, 25% and 50%
			• calculate sale price by subtracting the proportion from the original amount
			• calculate common percentages of quantities
			• choose the most appropriate equivalent form of a percentage to aid calculation
	2	Spending money: Percentage discounts of 10%, 25%, 50%	• calculate the discount on the sale price of items after a percentage discount of 10%, 25% and 50% without the use of a calculator, using the equivalences 10% = 1/10, 25% =1/4 and 50% = 1/2
			• calculate the sale price of an item after a percentage discount of 10%, 25% and 50% without the use of a calculator, using the equivalences 10% = 1/10, 25% =1/4 and 50% =1/2
	3	Spending money: Percentage discounts of any size	• calculate the discount on the sale price of items after a percentage discount of any size
			• calculate the sale price of an item after a percentage discount of any size

Learning Journey	Steps	Content	Details
			• calculate the percentage discount given the original (pre-discount) price and discounted price
			• calculate the original (pre-discount) price of an item given its price after a percentage discount of any size
	4	Calculating the final price given the original price and the amount it has been discounted by	• calculate the final price given the original price and the amount it has been discounted by
	5	Calculating discounts given the original price	• calculate a discount amount given the original price and the percentage discount
			• calculate the final price of an item given the discount percentage and original price
Calculating best buy amounts	1	Spending money: Best buys	• determine the 'best buy'/'best value for money' for different quantities of the same type of substance by comparing the price per unit
			• determine the 'best buy'/'best value for money' by comparing two or more special offers for the same item
		Calculating 'best buys' by comparing price per unit, or quantity per monetary unit, with the use of digital technologies	• calculate 'best buys' by comparing price per unit, or quantity per monetary unit, with the use of digital technologies, eg 500 g for $4.50 compared with 300 g for $2.75
			• use price comparison websites to make informed decisions related to purchases under given conditions
Calculating taxation: GST	1	Understanding taxation: Goods and Services Tax (GST) New Zealand	• know that GST on most goods and services in New Zealand is charged at 15% and that some goods and services are exempt from GST, and investigate the types of goods and services on which GST is applied or not applied (exemptions)
			• calculate the GST payable on items given the pre-GST price (and 15% GST) with answers that are whole numbers
	2	Understanding taxation: Goods and Services Tax (GST) – whole number answers (New Zealand)	• calculate the GST-inclusive price of items given the pre-GST price (and 15% GST) with answers that are whole numbers
Multiply/divide integers			
Multiplying & dividing integers	1	Multiplying integers	• multiply integers
	2	Understanding that integers can be divided, provided that the divisor is not 0	• understand that integers can be divided, provided that the divisor is not 0

Learning Journey	Steps	Content	Details
		Using the 4 operations with integers	• use the 4 operations to solve problems involving integers

NA4-4: Apply simple linear proportions, including ordering fractions.			
Order fractions, decimals & percentages			
Learning Journey	Steps	Content	Details
Ordering & comparing fractions	1	Counting in fractions on a number line (denominators up to 12)	• count in proper and improper fractions (starting on any fraction) using number lines and models, eg, 7/8, 8/8, 9/8, 10/8
			• create sequences of fractions following the pattern provided
	2	Comparing and ordering proper fractions with the same numerators but different denominators (denominators of 2, 3, 4, 5, 6, 8, 10, 12 and 100)	• compare and order proper fractions using a benchmark fraction for support, eg half or quarter
			• compare and order fractions using the relationship between the size of the denominator and the size of the parts
			• record comparisons using >, < or =
			• recognise that comparisons are only valid when the 2 fractions refer to the same whole
	3	Using benchmarks to compare and order fractions	• use benchmarks, eg 1/2, 1/3, 1/4, 3/4 to compare and order fractions
	4	Comparing and ordering proper fractions	• compare and order proper fractions where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
Ordering & comparing decimals	1	Locating decimals on a number line	• locate decimals on a number line
	2	Finding a decimal between 2 decimals	• find a decimal between 2 decimals
	3	Ordering terminating decimals	• order terminating decimals
Ordering & comparing percentages	1	Comparing and ordering percentages	• compare and order percentages
	2	Comparing and ordering fractions, decimals and percentages	• compare and order a mix of fractions, decimals and percentages
Ordering fractions, decimals & percentages	1	Comparing and ordering a combination of fractions, decimals and percentages	• compare and order a combination of decimals (up to 2dp), percentages and fractions with denominators 2, 4, 5, 10, 20, 25, 50, 100
	2	Comparing and ordering fractions, decimals and percentages (halves thirds, quarters, fifths,	• compare and order fractions, decimals and percentages using <, >, =
Order/compare integers			
Ordering & comparing integers	1	Investigating integers	• recognise the location of negative whole numbers in relation to zero and place them on a number line

Learning Journey	Steps	Content	Details
			• use the term 'integers' to describe positive and negative whole numbers and zero
			• investigate negative whole numbers and the number patterns created when counting backwards on a calculator
			• recognise that negative whole numbers can result from subtraction
	2	Interpreting integers in context	• use a model to interpret intervals across zero (in context)
	3	Comparing the relative value of integers, including recording the comparison by using the symbols < and >	• compare the relative value of integers, including recording the comparison by using the symbols and < and > including negative integers
	4	Ordering integers	• order integers of any size in ascending and descending order including negative numbers
	5	Comparing and ordering positive and negative integers	• compare the relative value of integers by using or visualising a number line
			• use the phrases 'greater than', 'less than' and 'equal to' to compare integers
			• use the symbols <, > and = to compare a pair of integers
			• arrange a set of 3 or more integers in 'ascending order' or 'descending order' separated by commas
Use ratios/rates to solve problems			
Investigating ratios	1	Introducing the language of ratio	• use the language of ratio
		Defining ratios	• define ratios
			• understand the symbol :
		Identifying terms of a ratio as 'parts' of the ratio	• identify terms of a ratio as 'parts' of the ratio
	2	Representing ratios using a bar model	• represent ratios using a bar model eg, 2:3:4 pink:yellow:blue. What fraction of the bar is pink?
	3	Identifying why the ratio a:b is different to the ratio b:a	• identify why the ratio a:b is different to the ratio b:a
			• understand that a ratio of a:b is expressed as the ratio of 'a to b'
	4	Simplifying ratios	• use highest common factor to simplify ratios
			• understand the simplest form of a ratio as being one expressed using the lowest possible integer terms
	5	Simplifying ratios using highest common factors	• simplify ratios using highest common factors

Learning Journey	Steps	Content	Details
			• understand the simplest form of a ratio as being one expressed using the lowest possible integer terms
Using ratios to solve problems	1	Comparing quantities measured in the same units using ratios	• compare quantities measured in the same units using ratios
	2	Expressing 1 part of a ratio as a fraction of the whole	• express 1 part of a ratio as a fraction of the whole
		Dividing a quantity in a given ratio	• divide a quantity in a given ratio
			• solve a variety of real-life problems involving ratio
			• describe 'sharing' in a given ratio
	3	Identifying equivalent ratios	• identify equivalent ratios
			• understand how a change made to 1 part of a ratio affects the other parts of the same ratio
	4	Calculating ratios from word problems	• calculate ratios from word problems
	5	Solving real world ratio problems using bar models	• solve real-world ratio problems using bar models
Using rates to solve problems	1	Modelling rates	• model real-life relationships involving constant rates where the initial condition starts at 0

NA4-5: Know the equivalent decimal and percentage forms for everyday fractions.			
Calculate equivalent fractions			
Learning Journey	Steps	Content	Details
Calculating equivalent fractions	1	Using common factors to simplify proper fractions to their simplest form	• determine a common factor of the numerator and denominator of a fractions and use to find an equivalent fraction. Repeat until the fraction is reduced to its simplest form
			• write a fraction in its simplest form using the highest common factor
			• know that a fraction is reduced to its simplest form when the only common factor of the numerator and denominator is 1
	2	Recognising and finding equivalent simple fractions and mixed numbers using multiplicative thinking	• use strategies for generating equivalent fractions, such as multiplying or dividing the numerator and the denominator by the same number
			• explain or demonstrate why 2 fractions are or are not equivalent
			• use multiplication and division to make equivalent fractions with a given denominator
Converting between mixed and improper fractions	1	Expressing improper fractions as mixed numbers	• express improper fractions as mixed numbers that do not require simplification of the proper fraction

Learning Journey	Steps	Content	Details
			• express improper fractions as mixed numbers that require simplification of the proper fraction
	2	Expressing mixed numbers as improper fractions	• express mixed numbers as improper fractions
Convert fractions/decimals/percentages			
Converting fractions to decimals	1	Knowing common fraction and decimal equivalences	• know fraction and decimal equivalences for thirds, quarters, fifths and eighths
	2	Connecting fraction and decimal equivalences for 1/2, 1/4 and 3/4	• connect fraction and decimal equivalences for 1/2, 1/4 and 3/4 using models, decimal and fraction notation
Converting decimals to fractions	1	Converting terminating decimals less than 1 into fractions	• convert terminating decimals less than 1 into fractions
	2	Converting terminating decimals greater than 1 into fractions	• convert terminating decimals greater than 1 into improper fractions
			• convert terminating decimals greater than 1 into mixed numbers
	3	Connecting decimals to equivalent fractions where the denominator is 10, 100 or 1000	• connect decimals to equivalent fractions
Converting decimals to percentages	1	Converting decimals to percentages	• convert decimals with up to 2 decimal places to percentages containing whole numbers only
			• convert decimals with more than 2 decimal places to percentages, writing answers as a percentage with decimal parts
			• convert decimals with 3–4 decimal places to percentages, writing answers in fraction form
			• convert decimals with 5 or more decimal places to percentages, writing answers in decimal form rounded to an appropriate degree of accuracy
Converting percentages to decimals	1	Representing percentages and decimals	• write decimals (< 1) to 2 decimal places as percentages
			• model percentages and decimals using diagrams, eg number line or 100 grid
			• write decimals as percentages and vice versa
Converting fractions to percentages	1	Converting common fractions to percentages using mental strategies	• use mental strategies to convert fractions to percentages
		Converting common fractions to percentages using a calculator	• use calculator strategies to convert fractions to percentages
Converting percentages to fractions	1	Converting percentages less than or equal to 100% into fractions	• convert percentages less than or equal to 100% into fractions

NA4-6: Know the relative size and place value structure of positive and negative integers and decimals to three places.			
Recognise place value in decimals			
Learning Journey	Steps	Content	Details
Recognising place value in decimals	1	Recognising the number of tenths and hundredths in all of a number	• recognise the number of tenths and hundredths in all of a number eg how many hundredths in all of 6.073
	2	Introducing decimal thousandths	• recognise that the place value system can be extended beyond hundredths
			• express thousandths as decimals
			• interpret decimal notation for thousandths, eg 0.123 = 123/1000
			• state the place value of digits in decimal numbers of up to 3 decimal places
			• model thousandths using concrete materials
			• represent decimal fractions, eg as fractions (tenths, hundredths and thousandths), using concrete materials and in diagrams
Round decimals			
Rounding decimals	1	Rounding decimals to any place	• use place value understanding to round decimals to any place
	2	Rounding decimals to a specified number of decimal places (simple rounding)	• round decimals to a given number of decimal places when rounding decimals up/down to the next decimal place value
			• use symbols for approximation, eg ≈
Use standard form			
Using standard form for whole numbers	1	Introducing scientific notation (also called standard form) for whole numbers	• understand that scientific notation is a way of writing numbers which has 2 parts to it
			• establish how to write 1, 10, 100, 1000 etc as an exponent of the 10
			• write whole numbers as a number between 1 and 10 multiplied by 10, 100, 1000 etc
			• represent whole numbers in scientific notation
	2	Converting from scientific notation to basic numbers for very large numerals	• convert from scientific notation to basic numerals for very large numbers
		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

Learning Journey	Steps	Content	Details
		Converting from basic numerals to scientific notation for very small numbers	• convert from basic numerals to scientific notation for very small numbers
	4	Converting very large numbers written with a prefix into scientific notation and vice versa	• convert very large numbers written with a prefix into scientific notation and vice versa
		Converting very small numbers written with a prefix into scientific notation and vice versa	• convert very small numbers written with a prefix into scientific notation and vice versa

1.2 Equations and expressions

NA4-7: Form and solve simple linear equations.			
Form & solve linear equations			
Learning Journey	Steps	Content	Details
Forming linear equations & expressions	1	Writing 1-step equations using variables (four operations)	• write 1-step equations using variables to represent a word problem (four operations), eg, 5 + y = 8
		Writing 1-step expressions using variables (four operations)	• write 1-step expressions using variables to represent a word problem (four operations) eg 5 + y
	2	Matching 1-step equations to bar model representation	• match 1-step equations to bar model representation
	3	Representing algebraic expressions	• represent generalisations arising from number relationships, using equations with letter variables
			• demonstrate and explain the meaning of preservation of equality, concretely and pictorially
	4	Replacing written statements describing patterns with equations written in algebraic symbols	• replace written statements describing patterns with equations written in algebraic symbols
Using substitution to solve/check answers	1	Substituting and finding unknown values represented by letters (values within 10)	• give general algebraic descriptions of the relationship between terms and its position in a sequence and justify the solution
			• generalise a pattern arising from a problem-solving context, using a linear equation, and verify by substitution
		Checking pattern descriptions by substituting further values	• check pattern descriptions by substituting further values
	2	Solving problems by substituting into formulas	• solve problems by substituting into formulas, eg, the rule for making a cake is 'use 3 times as much flour (f) as butter (b). Which is the correct formula?'
			• solve problems using formula, eg P=2l x 2w. Find the perimeter of rectangles when given one length and one width
	3	Creating algebraic expressions	• create algebraic expressions and evaluate them by substituting a given value for each variable
	4	Substituting into algebraic expressions and evaluating the result	• substitute into algebraic expressions and evaluate the result
			• substitute numerical values into formulas and expressions, including scientific formulas

Learning Journey	Steps	Content	Details
	5	Using substitution to determine whether a given number in a specified set makes an equation true	• use substitution to determine whether a given number in a specified set makes an equation true
Solving linear equations using models	1	Demonstrating an understanding of equivalence and the preservation of equality or 'balance'	• understand and use the '=' sign
			• model preservation of equality concretely
			• model preservation of equality pictorially
			• model preservation of equality symbolically
			• understand that applying the same operation to both sides of an equation preserves equality
	2	Solving 1-step equations using bar models	• solve 1-step equations using bar models
	3	Solving simple linear equations using concrete materials	• solve simple linear equations using concrete materials, such as the balance model or cups and counters, stressing the notion of performing the same operation on both sides of an equation
Solving linear equations	1	Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers) with integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers) with integer solutions
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form x + a = b, where a and b are integers
	2	Solving linear equations using inverse operations involving 1 step of addition or subtraction with positive integer solutions only	• solve linear equations using inverse operations involving 1 step of addition or subtraction with positive integer solutions only
	3	Solving linear equations using inverse operations involving 1 step of multiplication with integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication with integer solutions
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form ax = b, where a and b are integers
	4	Solving linear equations using inverse operations involving 1 step of division needed with positive integer solutions only	• solve linear equations using inverse operations involving 1 step of division needed with positive integer solutions only
		Solving linear equations using inverse operations involving 1 step of division (integers) with integer solutions	• solve linear equations using inverse operations involving 1 step of division (integers) with integer solutions

Learning Journey	Steps	Content	Details
			• solve concretely, pictorially and symbolically problems that can be represented by 1-step linear equations of the form x/a = b, a>0, where a and b are integers
	5	Solving linear equations using inverse operations involving 1 step with mixed operations with integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer solutions
		Solving linear equations using inverse operations involving 1 step with mixed operations with positive integer solutions only	• solve linear equations using inverse operations involving 1 step with mixed operations with positive integer solutions only
Linear equations including non-integer solutions	1	Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers or decimals) with integer and non-integer solutions
		Solving linear equations using inverse operations involving 1 step of addition or subtraction with positive integer and non-integer (decimals and fractions) solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction with positive integer and non-integer (decimals and fractions) solutions
		Solving linear equations using inverse operations involving 1 step of addition or subtraction (integers or fractions) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of addition or subtraction (integers or fractions) with integer and non-integer solutions
	2	Solving linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions
		Solving linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step of multiplication (integers or decimals) with integer and non-integer solutions
		Solving linear equations using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)	• solve linear equations using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)
	3	Solving linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions

Learning Journey	Steps	Content	Details
	4	Solving linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients integer and non-integer solutions
	5	Finding values of a pair of variables using the four operations (positive whole numbers only)	• find values of a pair of variables eg, a + b = 6

1.3 Patterns and relationships

NA4-8: Generalise properties of multiplication and division with whole numbers.			
Identify linear patterns			
Learning Journey	Steps	Content	Details
Identifying linear patterns	1	Describing, continuing and creating patterns resulting from addition and subtraction including decimals	• identify, continue and create simple number patterns involving addition and subtraction including decimals
			• describe patterns using the terms 'increase' and 'decrease', eg for the pattern 4.8, 4.1, 3.4, 2.7, ..., 'The terms decrease by 0.7'
			• create, with materials or digital technologies, a variety of patterns using decimals, eg 2.2, 2.0, 1.8, 1.6, ...
			• use a number line or other diagram to create patterns involving decimals
			• find missing terms in a number sequence
	2	Recognising equivalent descriptions of the same relationship or rule for numeric patterns	• determine equivalence of different descriptions of the same relationship or rule presented: verbally, in a flow diagram, in a table, by a number sentence
	3	Recognising equivalent descriptions of the same relationship or rule for geometric patterns	• determine equivalence of different descriptions of the same relationship or rule presented: verbally, in a flow diagram, in a table, by a number sentence
	4	Interpreting and creating number patterns involving 1 operation in the term-to-term rule	• complete number patterns involving one operation
			• describe the pattern in a variety of ways and record descriptions in words, eg 'It goes up by ones, starting from four'
			• interpret explanations written by peers and teachers that accurately describe number patterns
			• use the rule to predict the next few terms and predict whether a particular value will be in the pattern
			• find missing terms in the number sequence
	5	Determining whether a particular pattern can be described using algebraic symbols	• determine whether a particular pattern can be described using algebraic symbols
			• describe patterns using algebraic symbols
Simplify algebraic expressions			
Simplifying algebraic expressions	1	Introducing algebraic expressions	• Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient)

Learning Journey	Steps	Content	Details
	2	Linking algebraic expressions to concrete models	• model expressions that involve a pronumeral, and a pronumeral added to a constant
			• model expressions that involve a pronumeral multiplied by a constant
			• model sums and products
			• model simplifying expressions

NA4-9: Use graphs, tables, and rules to describe linear relationships found in number and spatial patterns.			
Use tables/graphs for linear patterns			
Learning Journey	Steps	Content	Details
Using tables to describe linear patterns	1	Modelling number patterns presented in a table of values	• build a model to represent a number pattern presented in a table of values that shows the term number and the term
			• describe the pattern
			• predict the next term/s in the pattern
	2	Using objects to build a geometric pattern, record the results in a table of values, describe the pattern in words and algebraic symbols, and represent the relationship on a number grid	• use objects to build a geometric pattern, record the results in a table of values, describe the pattern in words and algebraic symbols, and represent the relationship on a number grid
Using graphs to describe linear patterns	1	Interpreting linear growing patterns using graphs in the first quadrant	• determine the term number of a given term (positive numbers only)
			• record terms and term numbers in a table
			• describe the gradient and direction of the line and relate this to the number pattern
			• analyse the graph to draw conclusions and solve problems

2 Geometry and Measurement

2.1 Measurement

GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time.			
Use metric units - length/mass/capacity			
Learning Journey	Steps	Content	Details
Using length units - km, m, cm, mm	1	Selecting appropriate units of measurement for length: metres, centimetres, kilometres	• select and justify the most appropriate metric unit to measure given lengths and distances (metres, centimetres, kilometres)
	2	Measuring length using standard metric units	• select and use the appropriate unit and measuring device to measure lengths and distances
			• describe how a length or distance is estimated and measured
			• explain why different results may be obtained from the same measurements
Using weight/mass units - kg, g, mg	1	Use a range of measuring instruments to find mass	• measure mass using bathroom scales (analogue and digital), kitchen scales (analogue and digital) and balances
			• choose appropriate measuring tools
	2	Introducing formal units for mass: the tonne	• establish the need for formal units for very large masses and introduce tonnes, including that 1000 kg = 1 tonne
			• identify everyday situations where tonnes are an appropriate unit for measuring the mass
			• apply place value understanding to modelling, describing and recording metric units of measurement
			• introduce the abbreviation 't' for recording mass in tonnes and record masses using tonnes and kilograms, eg 1 t 750 kg
			• calculate the number of kilograms in a whole number of tonnes
			• interpret simple fractions ($\frac{1}{4}$, $\frac{1}{2}$, ¾) of a tonne and relate these to the number of kilograms
	3	Solving multi-step problems involving mass	• solve a variety of problems involving mass, including same and different units of mass
Using capacity/volume units - mL, L	1	Selecting and justifying appropriate metric units to measure volume and capacity (mL and L)	• select and use appropriate units to measure the capacities of a variety of containers
			• select and use appropriate units to estimate the volumes of a variety of objects

Learning Journey	Steps	Content	Details
	2	Estimating given capacities in millilitres and litres	• make appropriate estimations of capacities using millilitres and litres
	3	Solving problems involving capacity	• solve a variety of problems involving capacity, including different units of capacity to 3 decimal places, eg 'Find the total capacity of 3 items measuring 5 mL, 200 mL and 1.2 L'
Recognise suitable units - length/mass/capacity	1	Recognising suitable metric measures for length, mass and capacity	• recognise the most appropriate unit of measure (cm, kg, km, g, tonnes, ml, mm, l)
			• recognise the most appropriate measurement eg 5 mm, 5 cm, 5 m, 5 km (including simple fractions and decimals)
Use other units of measurement			
Measuring & using temperature	1	Measuring temperature scales	• interpret scales on thermometers to accurately read temperatures
	2	Calculating change in temperature	• calculate the difference in temperature between all ranges including between 0 and a negative or positive, both positive, both negative, 1 positive and 1 negative
	3	Solving problems within a given context involving a change in temperature	• solve problems within a given context involving a change in temperature
			• solve problems within a given context involving a change in temperature using temperature specific terminology, eg warmer
	4	Describing temperature change as a rise or fall in temperature	• describe temperature change as a rise or fall in temperature
	5	Describing the difference between a given minimum and maximum temperature using terms such as 'temperature range'	• describe the difference between a given minimum and maximum temperature using terms such as 'temperature range'
Using different measures of time	1	Converting between units of time (including quarter and half hours and minutes)	• convert between weeks and days (whole number of weeks only)
			• convert between months and years (whole number of years only)
			• convert between all units of time using whole numbers and record measurement equivalents in a two-column table
	2	Converting between units of time including using multiples and simple decimals	• convert between all units of time including multiples of time eg: 4 minutes = 240 seconds
	3	Introducing time zones	• recognise that there are different time zones by relating this to familiar experiences such as watching international events on television
			• use a world map (including a digital or interactive map) to compare different time zones

Learning Journey	Steps	Content	Details
			• understand the need for time zones due to Earth being round and spinning with the source of light being the Sun
	4	Calculating different time zones using a map	• use a map of the world showing different time zones to calculate the time difference between 2 different time zones of the world (ignoring seasonal time shifts)
			• use a map of the world showing different time zones to calculate the time in another part of the world (ignoring seasonal time shifts) given a time in a particular place (12-hour and 24-hour time)
			• identify that time zones generally change as you travel east/west and not north/south

GM4-2: Convert between metric units, using whole numbers and commonly used decimals.			
Convert units - length/mass/capacity			
Learning Journey	Steps	Content	Details
Converting between metric units of length	1	Converting between kilometres and metres (whole numbers only)	• describe 1 km as 1000 m
			• convert between kilometres and metres using whole numbers
			• record measurement equivalents in a table
			• explain the relationship between the size of a unit and the number of units needed
	2	Converting between metres and millimetres (whole numbers only)	• describe 1 metre as 1000 millimetres
			• convert between millimetres and metres using whole numbers and record measurement equivalents in a two-column table
			• explain the relationship between the size of a unit and the number of units needed
	3	Comparing lengths in metres and kilometres, up to 10 km using inequality symbols (whole numbers only)	• compare lengths in metres and kilometres, up to 10 km using inequality symbols
	4	Converting between standard metric units of length to 1 decimal place	• understand the meaning of metric prefixes, eg kilo-, centi- and milli-
			• convert between centimetres and metres and vice versa
			• convert between centimetres and millimetres and vice versa
			• convert between metres and kilometres and vice versa
			• convert among millimetres, centimetres, metres and kilometres

Learning Journey	Steps	Content	Details
	5	Using conversions in real-world multi-step problems	• use conversions in real-world multi-step problems
Converting between metric units of weight/mass	1	Converting between standard metric units of mass to 1 decimal place	• understand the meaning of metric prefixes, eg kilo-, centi-, milli-
			• convert between grams and kilograms and vice versa
			• convert between kilograms and tonnes and vice versa
			• convert among grams, kilograms and tonnes
Converting between metric units - capacity/volume	1	Converting between standard metric units of volume and capacity to 1 decimal place	• understand the meaning of metric prefixes, eg milli-
			• convert between millilitres and litres to 1 decimal place
			• convert between litres and millilitres to 1 decimal place
	2	Measuring the volumes of rectangular containers by packing them with cubic-centimetre blocks	• measure the volumes of rectangular containers by packing them with cubic-centimetre blocks
			• understand the advantages and disadvantages of using cubic-centimetre blocks as a unit to measure volume
			• describe arrangements of cubic-centimetre blocks in containers in terms of layers, eg 5 layers of 8 cubic-centimetre blocks
	3	Understanding that 1 cubic centimetre displaces/is 1 millilitre and 1000 cubic centimetres displaces/is 1 litre	• understand that 1 cubic centimetre displaces/is 1 millilitre and 1000 cubic centimetres displaces/is 1 litre
	4	Converting between units of capacity mL/cm³ and L/cm³	• convert between mL/cm³ and L/cm³
			• convert between cm³/mL and cm³/L

GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids.			
Calculate perimeters of 2D shapes			
Learning Journey	Steps	Content	Details
Calculating perimeters of 2D shapes	1	Calculating the perimeters of common two-dimensional shapes	• explain that the perimeters of two-dimensional shapes can be determined by calculating the sum of all the side lengths
			• record calculations used to find the perimeters of two-dimensional shapes
			• find the length of 1 unknown side of a shape given the perimeter
	2	Calculating the side length of a rectangle given the perimeter	• find the length of 1 unknown side of a rectangle given the perimeter
			• find possible length combinations of 2 unknown sides of a rectangle given the perimeter

Learning Journey	Steps	Content	Details
	3	Solving one-step problems involving length	• solve a variety of one-step problems involving length and perimeter, including different units of length
			• sketch or construct a rectangle, triangle or parallelogram given the perimeter and/or area
Calculate area of simple 2D shapes			
Calculating area of rectangles	1	Using area models and the distributive law to find the area of a rectangle	• use area models and the distributive law to find the area of a rectangle
	2	Applying the formula for the area of a rectangle	• develop the formula for the area of a rectangle, A = l × w (also A = lw)
			• apply the formula for area of a rectangle to find the area of rectangles given 2 side lengths measured in the same or different units
			• apply the formula for area of a rectangle to find the area of composite rectilinear figures, such as an L-shape, U-shape
			• apply the formula to real life contexts
Calculating area of triangles	1	Calculating area of any triangle	• establish that the area of any triangle is Area of triangle = $\frac{1}{2}$ × base × perpendicular height, including triangles in which the perpendicular height meets the base within the length of the base and also triangles in which the perpendicular height (altitude) meets the base outside the length of the base
			• calculate the area of triangles where more dimensions than are necessary are given, using the relationship that the area is half the area of a rectangle with the same base and perpendicular height
Calculating area of parallelograms	1	Using the formula for the area of a parallelogram	• establish the formula to find the area of a parallelogram, A = bh, by investigating the relationship between parallelograms, rectangles and triangles
			• apply the formula to find the area of parallelograms in different orientations
			• apply the formula to find the area of parallelograms in different orientations which include more dimensions than are necessary to calculate the area
Calculate volume of prisms			
Calculating volume of prisms	1	Investigating the volumes of rectangular prisms	• describe the 'length', 'width' and 'height' of a rectangular prism as the 'dimensions' of the prism

Learning Journey	Steps	Content	Details
			• construct rectangular prisms using cubic-centimetre blocks or unit blocks and count the blocks to determine the volumes of the prisms
			• construct different rectangular prisms that have the same volume
			• explain that objects with the same volume may be different shapes
			• recognise that rectangular prisms with the same volume may have different dimensions
	2	Comparing volumes of rectangular prisms	• compare volumes of rectangular prisms
	3	Solve problems involving the volume of a rectangular prism	• apply the formulas $V = l \times w \times h$ and $V = b \times h$ to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems
	4	Calculating, estimating and comparing volumes of cubes and cuboids	• estimate, calculate and compare volumes of cubes and prisms using standard units including mm^3 and km^3
	5	Calculating the volumes of rectangular prisms using additive and multiplicative strategies	• describe rectangular prisms in terms of layers
			• use repeated addition to find the volumes of rectangular prisms
			• establish the relationship between the number of cubes in 1 layer, the number of layers, and the volume of a rectangular prism
			• explain that the volume of a rectangular prism can be found by finding the number of cubes in 1 layer and multiplying by the number of layers
			• record, using words, the method for finding the volumes of rectangular prisms
			• calculate the volumes of rectangular prisms in cubic centimetres and cubic metres including calculating the volume given the net for the shape
			• record calculations used to find the volumes of rectangular prisms

GM4-4: Interpret and use scales, timetables, and charts.			
Read scales & timetables in context			
Learning Journey	Steps	Content	Details
Reading scales & timetables to solve problems	1	Reading scales with metric units including decimals, eg 2.7 kg	• read scales from pictures of everyday measuring equipment with unlabelled half markings (cm, m, mm, g, kg, mL and L)
	2	Reading timetables to solve problems	• read timetables to solve problems
	3	Reading charts to solve problems	• read charts to solve problems

2.2 Shape

GM4-5: Identify classes of two- and three-dimensional shapes by their geometric properties.			
Classify 2D shapes by properties			
Learning Journey	Steps	Content	Details
Classifying triangles by their properties	1	Classifying types of triangles	• recognise and classify types of triangles on the basis of their properties (acute-angled, right-angled, obtuse-angled, equilateral, isosceles and scalene triangles)
			• understand clear definitions of triangles in terms of their sides and angles for equilateral, isosceles, scalene and right-angled triangles
			• recognise that a given triangle may belong to more than 1 class
	2	Sketching and labelling triangles from a worded or verbal description	• sketch and label triangles given lengths and angles of the triangle
			• determine whether the triangle exists according to its physical description
Classifying quadrilaterals by their properties	1	Classifying quadrilaterals using a variety of strategies	• classify two-dimensional figures in a hierarchy based on properties
			• interpret a hierarchy diagram of two-dimensional shapes and their properties
			• use Venn diagrams to record classifications
			• interpret classifications represented using Venn diagrams
	2	Investigating properties of special quadrilaterals: squares	• investigate the properties of squares
			• prove a quadrilateral is a square using properties
		Investigating properties of special quadrilaterals: rectangles	• investigate the properties of rectangles
			• prove a quadrilateral is a rectangle using properties
	3	Investigating properties of special quadrilaterals: rhombuses	• investigate the properties of rhombuses
			• prove a quadrilateral is a rhombus using properties
	4	Investigating properties of special quadrilaterals: parallelograms	• investigate the properties of parallelograms
			• prove a quadrilateral is a parallelogram using properties
	5	Reasoning about special quadrilaterals on the basis of their properties	• classify a set of quadrilaterals based on their properties
			• identify a given quadrilateral from its description
			• identify a given quadrilateral from a diagram

Learning Journey	Steps	Content	Details
		Describing special quadrilaterals	• describe a quadrilateral in sufficient detail for it to be sketched
Special triangles and quadrilaterals	1	Determining unknown sides and angles embedded in diagrams, using the properties of special triangles and quadrilaterals, giving reasons	• determine unknown sides and angles embedded in diagrams, using the properties of special triangles and quadrilaterals, giving reasons
Identify parts of a circle			
Identifying parts of a circle	1	Introducing parts of a circle: centre, radius, diameter and circumference	• identify and name parts of circles
			• create a circle by finding points that are all the same distance from a fixed point
	2	Identifying parts of a circle	• identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment
	3	Introducing circumference	• investigate the relationship between radius/diameter of a circle with its circumference
Identify & use angle properties			
Identifying & using adjacent angles	1	Introducing adjacent angles	• define adjacent angles as angles that share a common arm and a common vertex and recognise the larger angle created
			• recognise adjacent angles as additive and calculate the size of an unknown angle given the whole and its other parts and find the size of the whole given the size of the parts
		Investigating and identifying adjacent angles	• investigate features of adjacent angles
			• identify adjacent angles within a diagram
	2	Exploring adjacent angles that form a right angle	• explore the relationship between angles that form a right angle
	3	Exploring adjacent angles that form a straight angle	• explore the relationship between angles that form a straight angle
	4	Exploring adjacent angles that form an angle of revolution	• explore the relationship between angles that form an angle of revolution
Supplementary angles	1	Investigating and defining supplementary angles	• investigate, with and without digital technology, adjacent angles that form a straight angle and establish that they add to 180°
			• define supplementary angles and identify them in diagrams
	2	Calculating supplementary angles	• calculate the size of an unknown angle in a diagram and explain how this is done (using supplementary angles)
Complementary angles	1	Investigating and defining complementary angles	• investigate, with and without digital technology, adjacent angles that form a right angle and establish that they add to 90°

Learning Journey	Steps	Content	Details
			• define complementary angles and identify them in diagrams
	2	Calculating complementary angles	• calculate the size of an unknown angle in a diagram and explain how this is done (using complementary angles)
Calculating angles of revolution	1	Calculating angles that total 360° or a complete turn, using knowledge of a straight line	• calculate pairs of angles that total a complete turn, eg, x + 227° = 133°
			• calculate more than two angles that total a complete turn, eg, 115° + x + 157° = 360°
	2	Calculating where angles form a revolution	• calculate the size of an unknown angle in a diagram and explain how this is done (using knowledge of angles that add to 360°)
			• understand the ambiguity when labelling the reflex angle when 2 angles make up an angle of revolution
Exploring vertically opposite angles	1	Exploring vertical angles	• explore the relationship between angles formed when 2 straight lines intersect and identify these as 'vertical angles'
			• use the equality of vertical angles to find the size of unknown angles in diagrams
			• use the equality of vertical angles to find the size of unknown angles represented by variables in diagrams
	2	Identifying and naming right angles, straight angles, opposite angles and angles of complete revolution embedded in diagrams	• identify and name right angles, straight angles, vertical angles and angles of complete revolution embedded in diagrams
Applying geometric reasoning	1	Applying geometric reasoning for adjacent angle relationships	• apply theorems of complementary angles, supplementary angles, vertically opposite and adjacent angles, calculating unknown angles
			• apply theorems for adjacent angles represented by variables in multi-step problems, writing equations to solve for an unknown angle, checking the reasonableness of the answer
			• apply theorems of complementary angles, supplementary angles, vertically opposite and adjacent angles in multi-step problems, calculating unknown angles and stating all relationships used
Identifying parallel and perpendicular lines	1	Identifying perpendicular and parallel lines	• name and record perpendicular lines using the conventional notation
			• define parallel lines and identify them in pictures, designs, diagrams and the environment, using conventional notation to mark them

Learning Journey	Steps	Content	Details
			• name and record parallel lines using the conventional notation
Identify regular/irregular prisms			
Identifying regular and irregular prisms	1	Identifying regular and irregular prisms	• identify that a prism with a regular cross-sectional polygon is referred to as a regular prism
			• identify that a prism with an irregular cross-sectional polygon is referred to as an irregular prism

GM4-6: Relate three-dimensional models to two-dimensional representations, and vice versa.			
Connect prisms to nets			
Learning Journey	Steps	Content	Details
Connecting prisms to their nets	1	Connecting nets to cuboids & cubes (closed)	• choose the correct net of closed cuboids & cubes from the 3D sketch
			• choose the correct net of open cuboids & cubes from the 3D sketch
	2	Connecting nets to triangular prisms	• choose the net of triangular prisms from the 3D sketch
	3	Naming a right prism, given its net	• name a right prism, given its net
Connecting prisms & pyramids to nets	1	Connecting prisms and pyramids with their nets	• examine a diagram to determine whether it is or is not the net of a prism or pyramid
			• explain why a given net will not form a prism or pyramid
			• visualise and sketch nets for a given prism or pyramid
			• recognise whether a diagram is a net of a particular prism or pyramid
	2	Connecting nets of pyramids	• choose the net of pyramids from the 3D sketch
Connecting 3D objects to nets	1	Connecting three-dimensional shape with their nets	• examine a diagram to determine whether it is or is not the net of a closed three-dimensional shape
			• explain why a given net will not form a closed three-dimensional shape
			• visualise and sketch nets for given three-dimensional shapes
			• recognise whether a diagram is a net of a particular three-dimensional shapes
			• visualise and name prisms and pyramids, given diagrams of their nets
			• select the correct diagram of a net for a given three-dimensional shape (include other regular polyhedrons)
	2	Connecting nets of cones	• choose the net of cones from the 3D sketch

Learning Journey	Steps	Content	Details
Connect prisms to 2D views			
Connecting prisms & their 2D views	1	Drawing different views of prisms and solids made from connecting cubes	• draw (in two dimensions) prisms from different views, including top, side, front and back views
			• draw (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
	2	Drawing (in two dimensions) prisms from different views by connecting cubes, including top, side, front and back views	• draw from connecting cubes (in two dimensions) prisms from different views, including top, side, front and back views
	3	Drawing (in two dimensions) prisms from different views, including top, side, front and back views	• draw (in two dimensions) prisms from different views, including top, side, front and back views

2.3 Position and orientation

GM4-7: Communicate and interpret locations and directions, using compass directions, distances, and grid references.			
Use intercardinal compass directions			
Learning Journey	Steps	Content	Details
Using intercardinal compass directions	1	Introducing intercardinal compass directions	• understand, locate and label the 4 intercardinal compass directions on a compass rose: north-east (NE), south-east (SE), south-west (SW) and north-west (NW)
			• connect the 4 intercardinal compass directions to features of the local area from their particular location
			• determine the direction of other cardinal and intercardinal compass directions when given one of the cardinal or intercardinal compass directions
	2	Describing locations on maps using cardinal and intercardinal compass directions	• use the cardinal and intercardinal compass directions to describe the location of one feature in relation to another on a map that has an arrow representing north
		Drawing routes on maps using cardinal and intercardinal compass directions	• draw a route on a map given a sequence of directions involving cardinal and intercardinal directions, and landmarks
			• use cardinal and intercardinal directions, and landmarks, to describe a route between 2 locations on a map
	3	Introducing compass bearings	• read angle (less than 180°) from north to give the 3-digit bearing
			• read angle (more than 180°) from north to give the 3-digit bearing
		Introducing compass bearings	• introduce compass bearings including using degrees, eg N25°W
			• convert a direction on a compass to a compass bearing and vice versa
			• use correct language and phrasing when communicating involving bearings
	4	Converting intercardinal directions to compass bearings and vice versa	• convert intercardinal to compass bearings eg: NE = N45°E
			• convert compass bearings to intercardinal eg: S45°E= SE
	5	Converting intercardinal directions to 3-digit bearings and vice versa	• convert intercardinal to 3 digit bearings eg: NE=045°
			• convert 3 digit bearings to intercardinal eg: 135° = SE
Use scale drawings on maps			
Using scale drawings on maps	1	Understanding and using scales on maps	• understand the scale on a map can be written as 1 cm represents 1 m or 1:100, knowing they are the same in this ratio expression

Learning Journey	Steps	Content	Details
			• use the scale on a map to convert the measurement to the real distance
	2	Using scales and directions	• give or interpret the location of a feature on a map using grid references, distances and directions from a landmark
			• follow instructions given by others using compass directions and grid references by interpreting a scaled map
Use the Cartesian coordinate system			
Using the Cartesian coordinate system	1	Introducing the coordinate plane	• recognise that the coordinate plane consists of a horizontal axis (x-axis) and a vertical axis (y-axis), creating 4 quadrants
			• recognise that the horizontal axis and the vertical axis meet at right angles
			• identify the point of intersection of the 2 axes as the origin, having coordinates (0, 0)
	2	Using the Cartesian coordinate system in the first quadrant only	• recognise that the axes are labelled x and y
			• locate and plot points on a Cartesian plane
	3	Recording the position of points on a coordinate plane using x and y coordinates	• record the position of points on a Cartesian plane using x and y coordinates
		Plotting points in the Cartesian coordinate system in the first quadrant only	• plot points on a coordinate plane using x and y coordinates
	4	Finding the missing coordinate of a figure in the first quadrant only	• find the missing coordinate of a figure with a Cartesian plane (first quadrant only)
		Plotting points from coordinates to create a shape, first quadrant only	• plot a sequence of coordinates to create a shape in the first quadrant
	5	Representing and solving problems using coordinates in the first quadrant of the coordinate plane	• interpret coordinate values in the context of the situation

2.4 Transformations

GM4-8: Use the invariant properties of figures and objects under transformations (reflection, rotation, translation, or enlargement).			
Perform a range of transformations			
Learning Journey	Steps	Content	Details
Using the language of transformations	1	Understanding the language around transformations such as 'object' and 'image'	• understand the language around transformations such as 'object' and 'image'
	2	Identifying 2D reflections on a grid or coordinate plane (first quadrant only)	• identify 2D shapes in diagrams and on coordinate planes
Performing reflections & identifying line symmetry	1	Plotting reflections of shapes and points on a coordinate plane	• plot reflections of shapes and points on a coordinate plane
	2	Recording the positions of reflected points using coordinates	• record the positions of reflected points using coordinates eg, (3,5)
	3	Plotting and stating the coordinates of the image of a given point on the Cartesian plane resulting from reflection in either the x-axis or y-axis	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from reflection in either the x-axis or y-axis
			• investigate and describe the relationship between the coordinates of P and P' following a reflection in the x- or y-axis
	4	Identifying line symmetry	• identify, draw and determine the total number of lines of symmetry on designs and shapes, including special triangles, quadrilaterals and polygons
			• compare symmetry in odd and even-sided regular polygons
			• complete symmetrical designs and shapes given their line of symmetry
			• explore line symmetry in circles
Perform rotations & identify rotational symmetry	1	Determining rotational symmetry (review concept and order of rotational symmetry)	• determine whether or not given shapes and designs have rotational symmetry
			• determine the order of rotational symmetry for given shapes and designs
			• explore rotational symmetry in circles
	2	Defining degree of rotational symmetry	• define the degree of rotational symmetry as the number of degrees that the shape must rotate around the centre of symmetry until it is identical to the original
			• determine the degree of rotational symmetry for given shapes and designs
			• understand the connection between 'order' of rotational symmetry and 'degree' of rotational symmetry

Learning Journey	Steps	Content	Details
	3	Performing rotations presented in degrees, in multiples of 90° without technology	• perform rotations of 90°, clockwise or anti-clockwise (also known as counterclockwise), without the use of digital technology
			• perform rotations of 180°, clockwise or anti-clockwise (also known as counterclockwise), without the use of digital technology
			• perform rotations of 270°, clockwise or anti-clockwise (also known as counterclockwise), without the use of digital technology
			• recognise the link between 90 clockwise and 270 anticlockwise will result in the same image
	4	Plotting and stating the coordinates of the image of a given point on the Cartesian plane resulting from rotation of multiples of 90° about the origin	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation of 90° about the origin
			• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation of 180° about the origin
			• investigate and describe the relationship between the coordinates of P and P' following a rotation of 180° about the origin
			• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation of 270° about the origin
	5	Plotting points rotated about the origin	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from a rotation about the origin using multiples of 90° in either direction (clockwise or anti-clockwise/counterclockwise)
Performing translations	1	Translating points on the coordinate plane in the first quadrant only	• follow two-step instructions to translate points or shapes on a Cartesian plane eg, 1 up 2 right
			• follow three step instructions to translate points or shapes on a Cartesian plane eg, 1 up 2 right, 1 up
		Investigating translations in the first quadrant	• identify the one-step transformation used to move a shape from 1 position to another
			• follow instructions to position a shape on a grid
			• identify the instructions required to translate a shape on a grid using suitable language such as left/right, up/down, number of squares moved
		Translating coordinates in the first quadrant	• record the new position of a coordinate after translation

Learning Journey	Steps	Content	Details
			• describe the translation of coordinates
	2	Describing the translation and movement of points and shapes on the Cartesian coordinate plane	• describe the translation and movement of a point or shape on the Cartesian coordinate plane using specific language such as: left/right/up/down
	3	Plotting translations of points on the Cartesian plane	• plot and state the coordinates of the image of a point on the Cartesian plane resulting from 1 or more translations
	4	Performing successive translations	• perform up to 3 consecutive translations, recognising which 1 translation would have the same result
	5	Investigating tessellations (tiling) using transformations	• determine, through investigation using a variety of tools, polygons or combinations of polygons (refer to congruent shapes) that tile a plane and describe the transformation(s) required
Performing enlargements & identify scale factors	1	Enlarging a given shape using the scale factor on the lengths of the sides of the shape	• enlarge a given shape using the scale factor on the lengths of the sides of the shape
	2	Solving problems involving the increase/decrease in an amount or measurement according to a scale factor	• solve problems by applying basic scale factors on the dimensions of a shape such as: - altering the size of a garment/textile item - working with simplified building plans or drawings - adapting a plan for a prototype into a full scale model - enlarging/reducing an artist's picture to fit into a given frame
	3	Investigating coordinates of enlargements and reductions	• investigate the coordinates of vertices of figures that have been enlarged by a given scale factor
			• investigate the coordinates of vertices of figures that have been reduced by a given scale factor
	4	Drawing 2D shapes with a scale factor up to 5	• draw 2D shapes with a scale factor up to 5
			• expressing enlargements of a 2D shape using the term scale factor
	5	Calculating scale factors of similar shapes	• calculate scale factors of similar shapes

3 Statistics

3.1 Statistical investigation

S4-1: Plan and conduct investigations using the statistical enquiry cycle: determining appropriate variables and data collection methods; gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends; comparing distributions visually; communicating findings, using appropriate displays.			
Setup statistical investigations			
Learning Journey	Steps	Content	Details
Setting up statistical investigations	1	Knowing the statistical investigation cycle	• know each section of the statistical investigation cycle
	2	Conducting a statistical investigation using discrete or continuous data	• ask and investigate statistical questions that may require sampling; demonstrate an understanding that sets of data may be samples of a larger population
			• distinguish between discrete data and continuous data
		Evaluating statistical questions	• recognise a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers
	3	Investigating variables and techniques for data gathering	• understand a 'variable' as something measurable or observable that will change over time or between individual observations; identify categorical or numerical (discrete or continuous) variables
			• understand the difference between census, sample and observation when collecting data; consider situations where data can be collected by observation, census or sampling
			• recognise possible bias in data collection processes, eg consider adequate sample size
			• explain the difference between a population and a sample selected from a population; identify appropriate and inappropriate sample sizes
	4	Conducting a statistical investigation using representative sampling	• investigate a question or assumption using category, numerical, interval or time-series data; recognise a statistical question as one that anticipates variability in the data
			• decide on variables and choices of measure
			• use a representative sample; consider an adequate sample size
	5	Recognising and explaining the difference between a 'population' and a 'sample' selected from a population when collecting data	• recognise and explain the difference between a 'population' and a 'sample' selected from a population when collecting data

Learning Journey	Steps	Content	Details
Calculate measures of middle & spread			
Calculate central tendency: mean, median, mode	1	Understanding the mean	• explore a set of values in data displays and in lists with the aim of summarising all of the values with a single number
			• calculate the mean for a small set of data that would produce a whole number
			• use the mean to describe the shape of the data set across its range of values, using charts, tables, and graphs (eg, 'The data values fall mainly into two groups on both sides of the mean.'; 'The set of data is not spread out evenly around the mean.')
			• decide if the mean is the best representative number for the centre of the data set; justify and discuss
		Calculating the mean	• calculate the mean for a small set of data
		Comparing means in sets of data	• compare means in sets of data; discuss variations in means
	2	Understanding the median	• explore a set of values in data displays and in lists with the aim of summarising all of the values with a single number
			• organise values in order and find the middle number (median)
			• decide if the median is the best representative number for the centre of data set; justify and discuss
		Use the median to describe shape	• use the median to describe the shape of the data set
	3	Calculating the median	• organise values in order and find the middle number (median)
		Comparing medians in sets of data	• compare medians in sets of data; discuss variations in medians
	4	Understanding the mode	• explore a set of values in data displays and in lists with the aim of summarising all of the values with a single number
			• organise values in order and find the value that is occurs the most
			• decide if the mode is the best representative number for centre of the data set; justify and discuss
		Calculating the mode	• organise values in order and find the value that is occurs the most
		Comparing modes in sets of data	• compare modes in sets of data; discuss variations in modes
Calculating the spread - range	1	Introducing the range	• calculate the range for a set of data represented as a list or in a data display

Learning Journey	Steps	Content	Details
			• compare ranges in sets of data; discuss variations in range
Display data on graphs			
Displaying data sets on a variety of graphs	1	Selecting appropriate data displays	• select an appropriate type of graph to represent a set of data
			• graph data using technology, and justify the choice of graph from types of graphs already studied
	2	Constructing ordered stem-and-leaf plots with whole numbers	• construct ordered stem-and-leaf plots with whole numbers only
		Explaining the importance of ordering and aligning data values when constructing stem-and-leaf graphs	• explain the importance of ordering and aligning data values when constructing stem-and-leaf graphs
	3	Constructing pie charts	• construct pie charts using proportional reasoning and represent sectors as percentages
			• use knowledge of protractors and angles to construct pie charts; include a suitable title, labels and key
			• ask and answer questions related to data in the pie chart; draw conclusions
	4	Representing bivariate data in a two-way table	• create a two-way table to organise data involving 2 categorical variables
			• ask and answer comparative and relational questions related to data in a two-way table
Interpret results & displays			
Interpreting results & displays	1	Summarising a set of data	• report the number of observations
			• describe the nature of the attribute being measured, how it was measured and the unit of measurement
			• give measure of centre and spread; describe overall pattern; describe major deviations from the pattern with reference to the context in which the data was gathered
			• relate the choice of measure of centre and variability to the shape of the data distribution and the context in which the data was gathered
	2	Reporting the number of observations in a data display	• report the number of observations in a dot plot
			• report the number of observations in a histogram
			• report the number of observations in a box-and-whisker plot
	3	Comparing measures of spread across data sets and data displays	• compare measures of spread for discrete data using the same displays
			• compare measures of spread for continuous data using the same displays

Learning Journey	Steps	Content	Details
Representing stem and leaf graphs	1	Representing, reading and comparing data from 2 stem-and-leaf graphs side-by-side	• create separate side by side stem-and-leaf graphs
			• interpret separate side-by-side stem-and-leaf graphs and answer related questions
Interpreting pie charts	1	Interpreting pie charts	• interpret pie charts using proportional reasoning and percentages
			• find the whole from the parts and vice versa
			• ask and answer comparison questions; make conclusions; identify data values
Introducing box-and-whisker plots	1	Introducing and interpreting box-and-whisker plots	• become familiar with the structure of a box-and-whisker plot including minimum and maximum values, range, median, interquartile range, upper and lower quartiles
			• identify measures of centre, spread and variation in a box-and-whisker plot
Interpreting histograms	1	Reading and interpreting data in a histogram	• read and interpret data in a histogram
Comparing displays	1	Comparing different displays of the same data set	• interpret and compare different displays of the same data set to determine the most appropriate display for the data set
	2	Introducing the shape of data distribution	• understand that a set of data collected to answer a statistical question has a distribution
			• describe the centre, spread, and overall shape of a data distribution
Drawing conclusions to answer the question	1	Drawing conclusions based on the analysis of data displays using the mean, median and/or mode, and range	• draw conclusions based on the analysis of data displays using the mean, median and/or mode, and range
	2	Writing conclusions based on evidence given	• write a conclusion based on the given evidence of centre, spread and shape that links to the question of the investigation

3.2 Statistical literacy

S4-2: Evaluate statements made by others about the findings of statistical investigations and probability activities.			
Interpret secondary data			
Learning Journey	Steps	Content	Details
Interpreting secondary data	1	Interpreting secondary data	• interpret data representations found in digital media and in factual texts
			• interpret tables and graphs from the media and online sources
			• identify and describe conclusions that can be drawn from a particular representation of data
Looking for misleading information	1	Evaluating data collection for bias and misleading information	• identify sources of possible bias in representations of data in the media by discussing various influences on data collection and representation, eg who created or paid for the data collection, whether the representation is part of an advertisement
			• determine, through investigation, how well a set of data represents a population, on the basis of the method that was used to collect the data (Sample problem: Would the results of a survey of primary students about their favourite television shows represent the favourite shows of students in the entire school? Why or why not?).
			• discuss the messages that those who created a particular data representation might have wanted to convey
	2	Evaluating data displays for bias and misleading information	• critically evaluate data representations found in digital media and related claims
			• identify misleading representations of data in the media, eg broken axes, graphics that are not drawn to scale
			• explain how different scales used on graphs can influence conclusions drawn from the data
			• demonstrate, through investigation, an understanding of how data from charts, tables, and graphs can be used to make inferences and convincing arguments (eg, describe examples found in newspapers and magazines)

3.3 Probability

S4-3: Investigate situations that involve elements of chance by comparing experimental distributions with expectations from models of the possible outcomes, acknowledging variation and independence.			
Probability - theoretical/experimental			
Learning Journey	Steps	Content	Details
Using the language of probability	1	Understanding the language around chance	• understand that the term 'chance experiment' is used when referring to actions such as tossing a coin, rolling a dice or randomly selecting an object from a bag
			• understand that the term 'outcome' is used to describe a possible result of a chance experiment and list all of the possible outcomes for a single-step experiment
			• understand that the term 'sample space' is used to describe a list of all of the possible outcomes for a chance experiment
			• use the term 'probability' to describe the numerical value that represents the likelihood of an outcome of a chance experiment
			• arrange the likelihood of chance experiment outcomes in order from least likely to most likely (and vice versa)
	2	Understanding the difference between experiments, events, outcomes and the sample space in chance situations	• understand the difference between experiments, events, outcomes and the sample space in chance situations
	3	Identifying the sample space for a probability experiment involving 1 event	• identify the sample space for a probability experiment involving 1 event
		Applying probabilities to the outcomes of events	• use the term 'event' to describe either 1 outcome or a collection of outcomes in the sample space of a chance experiment
Calculating probabilities	1	Assigning numerical probabilities with their associated language	• assign language such as impossible, highly unlikely, unlikely, even chance, likely, highly likely and certain to the known probabilities of outcomes occurring
			• allocate words such as impossible, highly unlikely, unlikely, even chance, likely, highly likely and certain along a number line from 0 to 1 representing their respective probabilities
	2	Recognising that a probability of 0 is for events that are impossible and a probability of 1 for events that are certain to occur	• recognise that a probability of 0 is for events that are impossible and a probability of 1 for events that are certain to occur

Learning Journey	Steps	Content	Details
		Explaining the meaning of 0, 1/2 and 1 in a given chance situation, using the language of chance	• explain the meaning of 0, 1/2 and 1 in a given chance situation, using the language of chance
	3	Relating calculated probabilities with the language of chance and the likelihood number line	• relate calculated probabilities with the language of chance and the likelihood number line
		Describing events using the language involved with calculating probability	• describe events using the language involved with calculating probability
	4	Describing single-step chance experiments in which the outcomes are equally likely	• describe single-step chance experiments in which the outcomes are equally likely
			• use the terms 'chance experiment', 'outcome' and 'sample space' appropriately for experiments in which the outcomes are equally likely
	5	Describing single-step chance experiments in which the outcomes are equally and not equally likely	• describe single-step chance experiments in which the outcomes are equally and not equally likely
			• use the terms 'chance experiment', 'outcome' and 'sample space' appropriately for experiments in which the outcomes are equally and not equally likely
Using theoretical probability	1	Establishing that the sum of the probabilities of all of the possible outcomes of a single-step experiment is 1	• establish that the sum of the probabilities of all of the possible outcomes of a single-step experiment is 1
	2	Identifying the complementary event for a given event, and calculating the theoretical probability that a given event will not occur	• identify the complementary event for given event, and calculate the theoretical probability that a given event will not occur
	3	Establishing that the sum of the probability of an event and its complement is 1	• establish that the sum of the probability of an event and its complement is 1
	4	Using data presented in two-way tables to answer problems, including probability questions	• use data presented in a two-way table to answer problems, including probability questions
	5	Predicting the approximate relative frequency given the probability	• predict the approximate relative frequency given the probability, eg when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times
Using experimental probability	1	Defining experimental probability and theoretical probability	• define experimental probability and theoretical probability
			• understand that experimental probability will be more accurate (become closer to the theoretical probability) with more trials

Learning Journey	Steps	Content	Details
			• explain what happens to the observed probabilities as the number of trials increases
	2	Comparing and discussing the results of a chance experiment (experimental probability results) with the theoretical probability	• compare and discuss the results of a chance experiment (experimental probability results) with the theoretical probability
			• compare the expected frequencies of outcomes of chance experiments with observed frequencies, including where the outcomes are not equally likely

S4-4: Use simple fractions and percentages to describe probabilities.			
Use frac/dec & percentages in chance			
Learning Journey	Steps	Content	Details
Using frac/dec & percentages in probability	1	Applying probabilities to simple events by reasoning about equally likely outcomes	• apply probabilities to simple events by reasoning about equally likely outcomes
	2	Calculating the probability of an event of a single-step experiment using cards, dice, spinners, etc	• calculate the probability of an event of a single-step experiment using cards, dice, spinners, etc
	3	Describing probability of a single event using fractions, decimals and percentages	• list the outcomes for chance experiments where the outcomes are not equally likely to occur and assign experimental probabilities to the outcomes using fractions
			• use knowledge of equivalent fractions, decimals and percentages to assign probabilities to the likelihood of outcomes within concrete examples
			• explain real-life events in the context of probabilities
			• use the terminology 'theoretical probability' and/ or 'relative frequency' as the value given by the formula: number of times named outcome(s) did happen / total number of trials
	4	Formally expressing the theoretical probability of an event	• express the theoretical probability of an event, given a number of equally likely outcomes in the sample space, as P(event) = number of favourable outcomes ÷ total number of outcomes
			• interpret and use probabilities expressed as fractions, percentages or decimals
			• relate calculated probabilities with the language of chance and the likelihood number line

Learning Journey	Steps	Content	Details
			• solve probability problems involving single-step experiments using cards, dice, spinners, etc

Part II

Level 4 - Year 8 (Stage 7)

4 Number and Algebra

4.1 Number strategies and knowledge

NA4-1: Use a range of multiplicative strategies when operating on whole numbers.			
Use numeracy strategies to multiply			
Learning Journey	Steps	Content	Details
Using numeracy strategies to multiply	1	Using doubling/halving or tripling/thirding to solve multiplication problems with 1-2-digit numbers	• explain and justify the use of the strategy
			• mentally adjust a multiplication problem by doubling/tripling 1 number and halving/thirding the other, eg 3 x 27 = 9 x 9
	2	Using the multiply by 11 strategy with 3-digit numbers (without regrouping)	• multiply a 3-digit (or more) number by 11 eg: 621 x 11 = 6831
	3	Using the multiply by 11 strategy with 3-digit numbers (with regrouping)	• multiply a 3-digit (or more) number by 11 eg: 174 x 11 = 1914
Use strategies to multiply whole numbers			
Use mental & written strategies to multiply	1	Multiplying 3 or more numbers using a variety of strategies	• multiply 3 or more numbers and calculate the answer
	2	Multiplying by 12	• recall the multiplication facts for 12
			• solve multiplication problems with 12, including word problems
		Multiplying by 12 (up to 12x)	• recall the multiplication facts for 12
	3	Dividing by 12	• recall the division facts for 12
			• solve division problems with 12, including word problems
	4	Multiplying and dividing by 12	• recall the multiplication facts and related division facts for 12
			• solve multiplication and division problems with 12, including word problems
	5	Multiplying by 7s, 9s, 11s and 12s (up to 12x)	• recall the multiplication facts for 7s, 9s, 11s and 12s
Use strategies to divide whole numbers			
Using strategies to divide whole numbers	1	Understanding why a number is divisible by 2, 3, 4, 5, 6, 7, 8, 9, 10, but can not be divisible by 0	• understand why a number is divisible by 2, 3, 4, 5, 6, 7, 8, 9, 10, but can not be divisible by 0
Use the laws of multiplication			
Using the laws of multiplication	1	Applying the distributive law to aid in mental computation to expand expressions containing 2 terms within the grouping symbols	• apply the distributive law to aid in mental computation to expand expressions containing 2 terms within the grouping symbols

Learning Journey	Steps	Content	Details
	2	Applying the distributive law to aid in mental computation to expand expressions containing 3 or more terms within the grouping symbols	• apply the distributive law to aid in mental computation to expand expressions containing 3 or more terms within the grouping symbols
	3	Solving problems within a given context by applying the distributive law	• solve problems within a given context by applying the distributive law
	4	Understanding the commutative law of multiplication	• understand the commutative law of multiplication
		Applying the commutative law of multiplication to aid mental computation	• apply the commutative law to aid mental computation
	5	Understanding the associative law of multiplication	• understand the associative law of multiplication
		Applying the associative law of multiplication to aid in mental computation	• apply the associative law of multiplication to aid in mental computation
Find factors/multiples/primes up to 144			
Finding factors of numbers up to 144	1	Finding factors for whole numbers up to 144	• determine all 'factors' of a given whole number up to 144
			• determine the 'highest common factor' (HCF) of 2 whole numbers
			• determine whether a particular number is a factor of a given number using digital technologies
			• recognise that when a given number is divided by 1 of its factors, the result must be a whole number
	2	Finding factors for whole numbers up to at least 3-digits	• determine all 'factors' of a given whole number up to 144
			• determine the 'highest common factor' (HCF) of 2 whole numbers
			• determine whether a particular number is a factor of a given number using digital technologies
			• recognise that when a given number is divided by 1 of its factors, the result must be a whole number
	3	Using factors of a number to aid mental computation involving multiplication and division	• use factors of a number to aid mental computation involving multiplication and division
Finding multiples of numbers up to 144	1	Finding multiples up to 144	• determine 'multiples' of a given whole number
			• determine the 'lowest common multiple' (LCM) of 2 whole numbers
	2	Finding the lowest common multiple of 2 whole numbers less than or equal to 12	• find the lowest common multiple of 2 whole numbers less than or equal to 12

Learning Journey	Steps	Content	Details
Using prime factors for numbers up to 144	1	Using index notation to express prime factors	• use factor trees to express a number as a product of its prime factors, using index notation where appropriate
			• use the ladder method to express a number as a product of its prime factors, using index notation where appropriate
			• use methods other than factor trees or ladders to express a number as a product of its prime factors, using index notation where appropriate
			• recognise that if a given number is divisible by a composite number, then it is also divisible by the factors of that number
	2	Finding the highest common factor of large numbers by first expressing the numbers as products of prime factors	• find the highest common factor of large numbers by first expressing the numbers as products of prime factors
	3	Using prime factorisation of a whole number to express a number as a product of its prime factors (with exponents)	• factorise a whole number to determine its unique factorisation, expressing the result as a product of its prime factors with exponents
			• determine common factors and common multiples using the prime factorisation of numbers
			• use factor trees to determine the prime factors of a whole number
			• use factor ladders to determine the prime factors of a whole number
	4	Finding the greatest common divisor from prime factors (including use of exponents)	• determine the greatest common factor of 2 whole numbers using their prime factorisations (with exponents)
Use squares, cubes & roots			
Using squares, cubes & roots	1	Discussing why entering the square root of a negative number on a calculator returns an error message	• discuss why entering the square root of a negative number on a calculator returns an error message
	2	Finding square roots of large perfect square whole numbers from prime factors	• find square roots of large perfect square whole numbers from prime factors
	3	Estimating the square root of non-square numbers	• estimate the square root of a non-square number up to 100
			• estimate the square root of a non-square number up to 100 using a number line to estimate
		Determining between which 2 whole numbers lies the square root of a non-perfect square number up to 100	• determine mentally, between which 2 whole numbers lies the square root of a non-perfect square number up to 100

Learning Journey	Steps	Content	Details
	4	Finding square roots of non-perfect squares using a calculator	• find the square roots of non-perfect squares using a calculator
		Finding square roots of non-perfect squares	• use a calculator to calculate approximations of square roots of positive integers and positive non-integers
			• mentally determine between which 2 whole numbers lies the square root of a non-perfect square number up to 100
			• estimate the square root of a non-perfect square number up to 100
			• understand why entering the square root of a negative number in a calculator returns an error message
Finding roots of higher powers	1	Finding cube roots of non-perfect cubes	• use a calculator to calculate approximations of cube roots of positive integers and positive non-integers
			• mentally determine between which 2 whole numbers lies the cube root of a non-perfect cube number up to 125
			• estimate the cube root of a non-perfect cube number up to 125
	2	Expressing roots of higher powers	• express higher powers and roots using words and symbols, e.g., 'fifth root of 32' and $5\sqrt{32}$
			• use the √ and x□ buttons on a calculator to find powers and roots
Use index notation & factorials			
Using index notation	1	Describing numbers written in 'exponent form' using terms such as 'base', 'power', 'exponent', 'to the power of', 'squared', 'cubed'	• describe numbers written in 'exponent form' using terms such as 'base', 'power', 'exponent', 'to the power of', 'squared', 'cubed'
			• use exponential notation to express powers of numbers (positive exponents only)
	2	Evaluating numbers expressed as powers of integers	• evaluate numbers expressed as powers of integers
		Evaluating expressions involving exponents without using a calculator	• evaluate expressions involving exponents without using a calculator
			• apply the order of operations to evaluate expressions involving exponents
	3	Evaluating expressions involving exponents using a calculator	• evaluate expressions involving exponents using a calculator
			• apply the order of operations to evaluate expressions involving exponents
			• use appropriate buttons on a calculator to calculate expressions involving exponents

Learning Journey	Steps	Content	Details
	4	Using properties of exponents to simplify equations with numerical bases	• use properties of exponents to simplify equations with numerical bases
		Writing numerical expressions involving whole-number exponents	• write numerical expressions involving whole-number exponents
	5	Investigating and generalising the effect of raising a negative number to an odd or even power on the sign of the result	• investigate and generalise the effect of raising a negative number to an odd or even power on the sign of the result
Applying index laws	1	Extending exponent laws to fractions	• extend exponent laws to fractions, ie $(a/b)^2=a^2/b^2$
	2	Applying index laws: Zero index (positive whole number bases)	• establish the meaning of the zero index for expressions with positive numerical bases
			• apply the zero index to simplify expressions involving the zero index and positive numerical bases
Introducing factorials	1	Introducing factorials and the associated notation	• understand what is meant by a factorial
			• identify the notation used for factorials, ie 5!
			• apply this knowledge to calculate factorials
			• simplify simple fractions with factorials

NA4-2: Understand addition and subtraction of fractions, decimals, and integers.			
Add & subtract fractions			
Learning Journey	Steps	Content	Details
Adding & subtracting fractions	1	Adding proper fractions with unlike denominators	• add proper fractions with unlike denominators
			• explain why there must be a common denominator in order to add fractions
	2	Subtracting proper fractions with unlike denominators	• subtract proper fractions with unlike denominators
			• explain why there must be a common denominator in order to subtract fractions
		Adding and subtracting proper fractions with unrelated denominators and answers less than 1 whole	• add and subtract proper fractions where the denominators are unrelated
			• model and represent strategies, including using diagrams and written representations
			• use knowledge of equivalence to simplify answers when adding and subtracting fractions
	3	Adding improper fractions with unlike denominators	• add improper fractions with unlike denominators

Learning Journey	Steps	Content	Details
			• add improper fractions with unlike denominators expressing answers as a mixed number
	4	Subtracting improper fractions with unlike denominators	• subtract improper fractions with unlike denominators
			• subtract improper fractions with unlike denominators expressing answers as a mixed number
Add & subtract with mixed numbers	1	Adding mixed numbers with unlike denominators	• add mixed numbers with unlike denominators
	2	Subtracting mixed numbers with unlike denominators	• subtract mixed numbers with unlike denominators
	3	Performing addition or subtraction with fractions where fractions can be in different forms	• perform addition or subtraction with fractions where fractions can be in different forms
	4	Demonstrating an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially, and symbolically	• demonstrate an understanding of adding and subtracting positive fractions and mixed numbers, with like and unlike denominators, concretely, pictorially and symbolically
			• interpret fractions and mixed numbers on a calculator display
	5	Subtracting a fraction from an integer	• subtract a fraction from a whole number using written methods
		Subtracting a fraction from an integer using calculator methods	• subtract a fraction from an integer using calculator methods
Add & subtract decimals			
Adding & subtracting decimals	1	Subtracting decimals up to 3 decimal places with the same number of decimal places using place value partitioning and models	• apply place value partitioning to subtract decimals and whole numbers eg, 6.4 – 5.2 as 6 – 5 and 4 tenths + 2 tenths
	2	Subtracting decimals with 3 decimal places using bridging to 10 and models	• apply bridging to 10 to subtract decimals and whole numbers eg, 3.8 – 0.5 as 3.8 – 0.2 – 0.3
	3	Subtracting decimals with 3 decimal places using rounding and compensating and models	• apply rounding and compensating to subtract decimals and whole numbers eg, 9.9 – 5.2 as 10 – 5.2 = 4.8, 4.8 – 0.1 = 4.7
Add & subtract integers			
Adding & subtracting integers	1	Understanding addition and subtraction of integers symbolically	• understand addition and subtraction of integers symbolically
	2	Solving problems in contexts involving addition and subtraction with integers	• solve problems in contexts involving addition and subtraction with integers
	3	Adding integers	• add integers

Learning Journey	Steps	Content	Details
	4	Subtracting integers	• subtract integers
Add rational numbers			
Adding rational numbers	1	Adding rational numbers	• add rational numbers
	2	Understanding subtraction of rational numbers as adding the additive inverse	• understand subtraction of rational numbers as adding the additive inverse

NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals.			
Calculate a fraction of a quantity			
Learning Journey	Steps	Content	Details
Calculating a fraction of a quantity	1	Multiplying improper fractions by a whole number greater than 1	• multiply improper fractions by a whole number greater than 1
		Multiplying improper fractions by a whole number greater than 1, expressing answer as a mixed number	• multiply improper fractions, expressing answer as a mixed number
	2	Multiplying mixed numbers by a whole number greater than 1	• multiply mixed numbers by a whole number greater than 1
	3	Calculating improper fractions and mixed numbers of quantities	• calculate improper fractions and mixed numbers of quantities using mental and written strategies
	4	Calculating the whole from the known value of a fraction using bar models (denominators 3–12)	• calculate the whole from the known value of a unit fraction using bar models, eg, 1/3 of ? = $60
			• calculate the whole from the known value of a proper fraction of amounts using bar models, eg 3/4 of ? = 36
Multiply/divide fractions & decimals			
Multiplying fractions	1	Multiplying 2 improper fractions	• multiply improper fractions using written methods
		Multiplying 2 improper fractions, expressing the answer as a mixed number	• multiply 2 improper fractions expressing the answer as a mixed number
	2	Multiplying 2 mixed numbers	• multiply mixed numbers using written methods
	3	Multiplying proper fractions, improper fractions, and mixed numbers using written methods	• multiply proper fractions, improper fractions, and mixed numbers using written methods
Dividing fractions	1	Dividing fractions by positive and negative integers	• divide proper fractions by whole numbers, eg 1/3 ÷ 2 = 1/6
			• divide fractions and mixed numbers using written methods
			• choose the appropriate equivalent form for mental computation

Learning Journey	Steps	Content	Details
	2	Using the inverse scale factor understand dividing fractions	• use the inverse scale factor to understand dividing fractions
Dividing decimals	1	Dividing decimals by 1000	• recognise that the digits move three places to the right
			• use zero as a place holder
			• use PV equipment to divide decimals by 1000
	2	Dividing decimals by 10, 100, 1000	• divide decimals by 10, 100, 1000
	3	Dividing fractions and decimals using a calculator	• divide fractions and decimals using a calculator
			• compare initial estimates with answers obtained by written methods and check by using a calculator
Calculate a percentage of a quantity			
Calculating a percentage of a quantity	1	Calculating with percentages	• find percentages of quantities
			• calculate percentages of quantities using mental, written and calculator methods and explain methods
			• choose an appropriate equivalent form for mental computation of percentages of quantities
			• express 1 quantity as a percentage of another, using mental, written and calculator methods
	2	Determining percentages of quantities (written and mental methods)	• determine percentages of quantities using written and mental strategies
	3	Determining percentages of quantities (calculator method)	• determine percentages of quantities using a calculator
	4	Understanding percentages greater than 1 whole	• demonstrate an understanding of percentages greater than 100%
		Calculating percentages of quantities greater than 100%	• calculate percentage amounts of quantities greater than 100%
	5	Solving real-life problems involving percentages	• solve a variety of real-life problems involving percentages, including percentage composition problems and problems involving money
Calculating discounts and best buys	1	Calculating the original price given the final price and the amount it has been increased by	• calculate the original price given the final price and the amount it has been increased by
	2	Calculating discounts starting with the final price	• calculate the original price given the final price and the percentage discount
	3	Calculating 'best buys' by comparing price per unit, or quantity per monetary unit, without the use of digital technology	• calculate 'best buys' by comparing price per unit, or quantity per monetary unit without the use of digital technology, eg 500 g for $4.50 compared with 300 g for $2.76
			• investigate 'unit pricing' used by retailers and use this to determine the best buy

Learning Journey	Steps	Content	Details
Calculating taxation: GST	1	Understanding taxation: Goods and Services Tax (GST) payable price – decimal answers included (New Zealand)	• calculate the GST payable on items given the pre-GST price (and 15% GST) with answers that include decimals
	2	Understanding taxation: Goods and Services Tax (GST) inclusive price (New Zealand)	• calculate the GST-inclusive price of items given the pre-GST price (and 15% GST) with answers that include decimals
	3	Understanding taxation: Goods and Services Tax (GST) calculating GST New Zealand	• calculate the GST component of the price of an item given the GST-inclusive price (and 15% GST)
			• calculate the pre-GST price of items given the GST-inclusive price (and 15% GST)
Compare quantities as a percentage			
Comparing quantities as a percentage	1	Expressing 1 quantity as a fraction of another (using digital technology)	• express 1 quantity as a fraction of another with the use of digital technology
			• choose appropriate units to compare 2 quantities as a fraction
	2	Expressing a smaller quantity/value as a percentage amount of another larger quantity/value	• express a smaller quantity/value as a percentage amount of another larger quantity/value in the same units
			• express a smaller quantity/value as a percentage amount of another larger quantity/value in different units
	3	Expressing a larger quantity/value as a percentage amount of another smaller quantity/value	• express a larger quantity/value as a percentage amount of another smaller quantity/value in the same units
			• express a larger quantity/value as a percentage amount of another smaller quantity/value in different units
	4	Comparing 2 quantities using percentages	• compare 2 quantities using percentages
Multiplying & dividing integers	1	Understanding the rules for multiplying signed numbers	• understand the rules for multiplying signed numbers
			• understand that if p and q are integers then $-(p/q) = (-p)/q = p/(-q)$ where $q \neq 0$
	2	Identifying that a multiplier of -1 simply changes the sign of each term within the grouping symbols for numerical examples	• identify that a multiplier of -1 simply changes the sign of each term within the grouping symbols for numerical examples
	3	Using the distributive law to show why a negative multiplied by a negative gives a positive answer	• use the distributive law to show why a negative multiplied by a negative gives a positive answer

NA4-4: Apply simple linear proportions, including ordering fractions.			
Order fractions/decimals/percentages			
Learning Journey	Steps	Content	Details
Order/compare proper fractions	1	Comparing and ordering proper fractions with different numerators and denominators (denominators of 2, 3, 4, 5, 6, 8, 10, 12 and 100)	• compare and order proper fractions using a benchmark fraction for support, eg half or quarter
			• record comparisons using >, < or =
			• recognise that comparisons are only valid when the 2 fractions refer to the same whole
	2	Comparing and ordering proper fractions with different numerators and denominators (denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 and 1000)	• compare and order proper fractions using a benchmark fraction for support, eg half or quarter
			• record comparisons using >, < or =
			• recognise that comparisons are only valid when the 2 fractions refer to the same whole
	3	Using common denominators to compare and order proper fractions with unrelated denominators	• find a common denominator to compare fractions
			• compare and order using <, >, =
	4	Comparing and ordering unrelated fractions	• compare and order proper fractions, using equivalence and common multiple knowledge
	5	Comparing and ordering unrelated fractions	• compare and order fractions, including mixed numbers, proper and improper fractions using equivalence and common multiple knowledge
			• use benchmarks eg 1/2, 1/3, 1/4, 3/4 to compare and order fractions
			• compare and order mixed numbers and improper fractions where the denominators are not always multiples of the same number
			• explore how finding a common numerator can be effective to compare and order fractions, eg comparing 3/7 and 6/11
		Finding a fraction between 2 fractions	• find a fraction between 2 fractions
Order/compare mixed & improper fractions	1	Comparing and ordering mixed numerals	• compare and order mixed numerals where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, >, ≤, ≥ symbols
	2	Comparing and ordering improper fractions	• compare and order improper fractions where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols

Learning Journey	Steps	Content	Details
	3	Comparing and ordering proper fractions, improper fractions, and mixed numbers	• compare and order proper fractions, improper fractions, and mixed numbers where the denominators are not always multiples of the same number
			• record comparisons using =, ≠, <, > ≤, ≥ symbols
Ordering & comparing decimals	1	Ordering repeating decimals	• order repeating decimals
	2	Ordering decimals, terminating and repeating	• order decimals, terminating and repeating
Ordering fractions, decimals & percentages	1	Comparing and ordering fractions, decimals and percentages	• compare and order a mix of fractions, decimals and percentages
	2	Ordering fractions, decimals and percentages	• order fractions, decimals and percentages
	3	Placing positive and negative fractions, decimals and mixed numbers on a number line in order to compare	• place positive and negative fractions, decimals and mixed numbers on a number line in order to compare
	4	Ordering fractions and decimals on a number line, including terminating and recurring decimals	• order fractions and decimals on a number line, including terminating and recurring decimals
	5	Using the number line as a model for ordering any real numbers	• use the number line as a model for ordering any real numbers
Order integers			
Ordering & comparing integers	1	Describing the direction and magnitude of integers	• describe the direction of an integer as positive/negative, forwards/backwards, up/down, left/right
			• describe/identify the magnitude of an integer as being the size of the number
			• describe the direction and magnitude of integers when applied to the number line
	2	Comparing the relative value of integers, including recording the comparison by using the symbols < and >	• compare the relative value of integers, including recording the comparison by using the symbols and < and > including negative integers
	3	Ordering integers	• order integers of any size in ascending and descending order including negative numbers
Order rational numbers			
Ordering rational numbers	1	Finding and placing rational numbers on a horizontal or vertical number line diagram	• find and place rational numbers on a horizontal or vertical number line diagram
Use ratios to solve problems			
Simplifying ratios	1	Simplifying ratios using highest common factors (ratio composed of 3 or more numbers)	• simplify ratios using highest common factors

Learning Journey	Steps	Content	Details
	2	Simplifying ratios with fractions involved	• simplify ratios containing one or more fraction parts using the HCF to re-write as a pair of fractions with a common denominator first
	3	Simplifying ratios with decimals involved	• simplify ratios containing one or more decimal parts multiplying both parts by a common power of 10 that removes the decimal. Write the resultant ratio in simplest form
Using ratios to solve problems	1	Applying the unitary method to ratio problems	• apply the unitary method to ratio problems
	2	Dividing a quantity into a given ratio	• divide a quantity into a given ratio
			• describe 'sharing' in a given ratio
			• express the division of a quantity into 2 parts as a ratio using original amounts
	3	Dividing an interval into a given ratio on a number line	• divide an interval into a given ratio on a number line
	4	Solving a variety of real-life problems involving ratio	• solve a variety of real-life problems involving ratio
	5	Exploring ratios with different units	• change ratio into same units and simplify
			• divide a quantity in a given ratio
			• apply the unitary method to ratio problems
			• solve a variety of real-life problems involving ratio

NA4-5: Know the equivalent decimal and percentage forms for everyday fractions.			
Calculate equivalent fractions			
Learning Journey	Steps	Content	Details
Calculating equivalent fractions	1	Generating equivalent fractions with denominators (denominators 1–100, 1000)	• generate equivalent fractions
	2	Expressing a fraction in its simplest form	• determine the highest common factor of a pair of integers
			• express a fraction in its simplest form
	3	Recognising and finding equivalent simple fractions with unrelated denominators using multiplicative thinking (denominators of 2, 3, 4, 5, 6, 8, 10, 12 and 100)	• develop mental strategies for generating equivalent fractions, such as multiplying or dividing the numerator and the denominator by the same number
			• explain or demonstrate why 2 fractions are or are not equivalent
			• use multiplication and division to make equivalent fractions with a given denominator

Learning Journey	Steps	Content	Details
	4	Using multiplicative strategies to recognise and find equivalent fractions greater than 1 with related denominators (denominators 2, 3, 4, 5, 6, 8, 10)	• develop mental strategies for generating equivalent fractions, such as multiplying or dividing the numerator and the denominator by the same number
			• explain or demonstrate why 2 fractions are or are not equivalent
			• use multiplication and division to make equivalent fractions with a given related denominator eg 1 and 1/2 = ?/16
			• work with proper fractions, mixed numerals and improper fractions
Converting between mixed & improper fractions	1	Converting between improper fractions and mixed numbers with denominators of any size	• express improper fractions as mixed numbers and vice versa
Convert fractions/decimals/percentages			
Converting fractions to decimals	1	Converting fractions to decimals up to 3 decimal places	• find an equivalent fraction with denominators of 10, 100 or 1000 to convert from fractions to decimals
	2	Converting simple fractions to decimals using place value models and short division	• convert simple fractions into decimals using short division and knowledge of tens, eg, 5/8 =5.0 ÷ 8 or 50 tenths divided by 8 = 0.625
	3	Converting fractions to terminating decimals using division	• convert fractions to terminating decimals using division
			• convert improper fractions to terminating decimals using division
			• convert mixed numbers to terminating decimals using division
		Converting fractions to recurring decimals using division	• convert fractions to recurring decimals using division
			• convert improper fractions to recurring decimals using division
			• convert mixed numbers to recurring decimals using division
	4	Converting fractions to decimals using a calculator	• convert fractions to decimals using a calculator
	5	Investigating terminating and recurring decimals	• use the notation for recurring (repeating) decimals, eg 0.33333... = 0.3, 0.345345345... = 0.345, 0.266666...= 0.26
			• convert fractions to terminating or recurring decimals as appropriate
			• recognise that calculators may show approximations to recurring decimals, and explain why, eg 2/3 displayed as 0.666666667
Converting decimals to fractions	1	Converting decimals to fraction up to 3 decimal places with models	• find an equivalent fraction with denominators of 10, 100 or 1000 to convert from decimals to fractions

Learning Journey	Steps	Content	Details
	2	Converting recurring decimals into fractions	• convert recurring decimals into fractions
Converting decimals to percentages	1	Converting decimals greater than 1 to percentages	• convert decimals greater than 1 with up to 2 decimal places to percentages
Converting percentages to decimals	1	Converting terminating percentages less than 100% into a decimal	• convert terminating percentages less than 100% into a decimal
	2	Converting terminating percentages greater than or equal to 100% into a decimal	• convert terminating percentages greater than or equal to 100% into a decimal
	3	Converting recurring percentages less than 100% into a decimal	• convert recurring percentages less than 100% into a decimal
	4	Converting recurring percentages greater than or equal to 100% into a decimal	• convert recurring percentages greater than or equal to 100% into a decimal
Converting fractions to percentages	1	Converting fractions to terminating percentages by manipulating the denominator to 100	• convert unit fractions to terminating percentages by manipulating the denominator to be 100
			• convert improper fractions to terminating percentages by manipulating the denominator to be 100
			• convert mixed numbers to terminating percentages by manipulating the denominator to be 100
	2	Converting fractions to percentages using a calculator	• convert fractions to percentages using a calculator
Converting percentages to fractions	1	Converting percentages greater than 100% to mixed numbers	• convert percentages greater than 100% to mixed numbers
	2	Converting percentages greater than 100% to improper fractions	• convert percentages greater than 100% to improper fractions
Connecting fractions, decimals & percentages	1	Representing equivalent fractions, decimals and percentages	• write percentages as fractions in their simplest form
			• write fractions with denominators that are factors of 100 as percentages by multiplying the numerator and denominator by a common value
			• write fractions with denominators that are not factors of 100 as percentages by writing as a decimal first, eg using short division, then x100 to write as a percentage
			• write percentages as decimals and vice versa
			• represent equivalent fractions, decimals and percentages

Learning Journey	Steps	Content	Details
			• select and justify the most appropriate representation of a quantity — fraction, decimal, percentage

NA4-6: Know the relative size and place value structure of positive and negative integers and decimals to three places.			
Round decimals			
Learning Journey	Steps	Content	Details
Rounding decimals	1	Rounding decimals to a specified number of decimal places (complex rounding)	• round decimals to a given number of decimal places when rounding decimals requires places to be filled with zeroes
	2	Understanding the importance of rounding decimal values at the end of the calculation, not during	• demonstrate the importance of rounding decimal values at the end of the calculation, not during
Use standard form			
Using standard form	1	Introducing scientific notation (also called standard form) for rational numbers	• compare integers written in scientific notation
			• refer to science context for the use of scientific notation
			• refer to the other name for scientific notation: standard form
	2	Interpreting and comparing numbers in standard form $a \times 10^n$ $1 \leq a < 10$, where n is a positive or negative integer or 0	• interpret and compare numbers in scientific notation $a \times 10^n$ $1 \leq a < 10$, where n is a positive or negative integer or 0

4.2 Equations and expressions

NA4-7: Form and solve simple linear equations.			
Form & solve linear equations			
Learning Journey	Steps	Content	Details
Forming linear equations	1	Matching 2-step equations to bar model representation	• match 2-step equations to bar model representation
	2	Writing expressions with numbers and variables	• write expressions with numbers and variables
Solving 1 step linear equations	1	Solving linear equations (integer, fraction or decimal coefficients) using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)	• solve linear equations (integer, fraction or decimal coefficients) using inverse operations involving 1 step of division with integer and non-integer solutions (pronumeral in numerator position)
	2	Solving linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer coefficients, integer and non-integer solutions
	3	Solving linear equations using inverse operations involving 1 step with mixed operations with positive integer and non-integer (decimal and fraction) solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with positive integer and non-integer (decimal and fraction) solutions
	4	Solving linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients, integer and non-integer solutions	• solve linear equations using inverse operations involving 1 step with mixed operations with integer and non-integer coefficients integer and non-integer solutions
Solving 2 step linear equations	1	Solving 2-step equations using bar models	• solve 2-step equations using bar models
	2	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral always in numerator position)
			• solve concretely, pictorially and symbolically, problems that can be represented by 2-step linear equations of the form $ax + b = c$, where a and b and c are integers
			• solve concretely, pictorially and symbolically, problems that can be represented by 2-step linear equations of the form $x/a + b = c$, $a > 0$, where a and b and c are integers

Learning Journey	Steps	Content	Details
	3	Solving linear equations using inverse operations involving 2 steps with mixed operations with positive integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with positive integer solutions (pronumeral always in numerator position)
	4	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer and non-integer solutions (pronumeral always in numerator position)
	5	Solving linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral in numerator or denominator position)	• solve linear equations using inverse operations involving 2 steps with mixed operations with integer solutions (pronumeral in numerator or denominator position)
Working with linear equations	1	Solving linear equations	• solve linear equations that may have non-integer solutions, using algebraic techniques that involve up to 3 steps in the solution process
			• check solutions to equations by substituting
			• represent solution on a number line
	2	Finding pairs of numbers that satisfy an equation with 2 unknowns	• find pairs of numbers that satisfy an equation with 2 unknowns
			• discuss the number of possibilities of different solutions
	3	Finding values of a pair of variables involving 2-step calculations using the four operations (positive whole numbers only)	• find values of a pair of variables involving 2-step calculations eg, $7x + 4 = y$

4.3 Patterns and relationships

NA4-8: Generalise properties of multiplication and division with whole numbers.			
Identify linear patterns			
Learning Journey	Steps	Content	Details
Identifying linear patterns	1	Representing geometric patterns	• use objects to build a geometric pattern, record the results in a table of values, describe the pattern in words and algebraic symbols, and represent the relationship on a number grid
			• check pattern descriptions by substituting further values
			• replace written statements describing patterns with equations written in algebraic symbols
			• determine whether a particular pattern can be described using algebraic symbols
			• represent the pattern formed by plotting points from a table and suggest another set of points that might form the same pattern
			• explain why it is useful to describe the rule for a pattern in terms of the connection between the top row and the bottom row of the table
	2	Comparing types of pattern rules	• compare pattern rules that generate a pattern by adding or subtracting a constant, or multiplying or dividing by a constant (term-to-term rule) to get the next term, with pattern rules that use the term number to describe the general term (position-to-term rule), eg for 1, 3, 5, 7, 9, ..., the pattern rule is 'double the term number and subtract 1', which can be written algebraically as 2 x n – 1)
			• recognise that it's more efficient to use the term-to-term rule to find the next number in a sequence but to use the position-to-term rule for the 100th number in a sequence
Simplify algebraic expressions			
Simplifying algebraic expressions	1	Simplifying algebraic expressions that involve addition and subtraction involving laws of commutativity, associativity and grouping symbols	• extend and apply the laws and properties of arithmetic to algebraic terms and expressions
			• recognise like terms and add and subtract them to simplify algebraic expressions
			• recognise 'unlike' terms, identifying and classifying them
	2	Simplifying algebraic expressions that involve multiplication	• simplify algebraic expressions that involve multiplication

Learning Journey	Steps	Content	Details
			• recognise the equivalence of algebraic expressions involving multiplication, eg 3bc = 3cb
			• connect algebra with the commutative and associative properties of arithmetic to determine that a × b = b × a and (a × b) × c = a × (b × c)
	3	Simplifying algebraic expressions that involve division	• simplify algebraic expressions that involve division
			• recognise whether particular algebraic expressions involving division are equivalent or not
	4	Recognising the role of grouping symbols and the different meanings of expressions, such as 2a + 1 and 2(a + 1)	• recognise the role of grouping symbols and the different meanings of expressions, such as 2a + 1 and 2(a + 1)

NA4-9: Use graphs, tables, and rules to describe linear relationships found in number and spatial patterns.			
Use tables/graphs for linear patterns			
Learning Journey	Steps	Content	Details
Using tables to describe linear patterns	1	Interpreting and creating a table of values for number patterns involving 2 operations	• complete a table of values resulting from patterns involving 2 operations
			• describe the pattern in a variety of ways and record descriptions in words
			• interpret explanations written by peers and teachers that accurately describe shape and number patterns
			• use the rule to predict the next few terms and predict whether a particular value will be in the pattern
	2	Representing linear growing patterns	• represent linear growing patterns, using a variety of tools, eg concrete materials, paper and pencil, calculators, spreadsheets
			• make a table of values using the term number and the term
			• plot the coordinates on a graph
			• write a pattern rule using words
	3	Making predictions about linear growing patterns	• make predictions about linear growing patterns, through investigation with concrete materials
			• explain reasoning for predictions
	4	Developing and representing the general term of a linear growing pattern	• develop and represent the general term of a linear growing pattern, using algebraic expressions involving 1 operation, eg the general term for the sequence 4, 5, 6, 7, ... can be written algebraically as n + 3, where n represents the term number; the general term for the sequence 5, 10, 15, 20, ... can be written algebraically as 5n, where n represents the term number

Learning Journey	Steps	Content	Details
Using graphs to describe linear patterns	1	Graphing a linear relationship on the Cartesian plane using the gradient and y-intercept	• rearrange linear relationship into form y = mx + b
			• determine that b is the y-intercept
			• determine that m is the gradient in the form rise/run
			• plot linear relationships using the y-intercept and the gradient
	2	Interpreting linear growing patterns using graphs in any of the 4 quadrants	• determine the term number of a given term
			• record terms and term numbers in a table
			• describe the gradient and direction of the line and relate this to the number pattern

5 Geometry and Measurement

5.1 Measurement

GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time.			
Use metric units - length/mass/capacity			
Learning Journey	Steps	Content	Details
Using length units - km, m, cm, mm	1	Solving problems involving kilometres, up to 10 km (whole numbers only)	• solve problems using kilometres, eg, Tim and Peter walk 15 km together. Peter walks double the distance that Tim walks. How far does Peter walk?
Use units for time			
Large and small time intervals	1	Investigating very large timescales and intervals	• investigate very large timescales and intervals
		Using appropriate units of time to measure very small or very large time intervals	• use appropriate units of time to measure very small or very large time intervals
	2	Converting very large and very small time intervals into different units	• convert very large and very small time intervals into different units
	3	Solving problems involving the conversion of very large of very small time intervals into different units	• solve problems involving the conversion of very large of very small time intervals into different units
Converting units of time	1	Converting time given in hours and minutes to fractions of an hour, with and without a calculator	• understand that minutes converted to a fraction of an hour requires the minutes to be expressed as a fraction of 60, then simplified
			• convert time given in hours and minutes to fractions of an hour, without the use of a calculator
			• convert time given in hours and minutes to fractions of an hour, with the use of a calculator (using the a b/c button)
	2	Converting time given in minutes and seconds to fractions of a minute, with and without a calculator	• understand that seconds converted to a fraction of a minute requires the seconds to be expressed as a fraction of 60, then simplified
			• convert time given in minutes and seconds to fractions of an hour, without the use of a calculator
			• convert time given in minutes and seconds to fractions of an hour, with the use of a calculator (using the a b/c button)
	3	Converting common fractions of time to hours and minutes, with and without a calculator	• understand that to convert common fractions of an hour to minutes, you need to multiply the fraction by 60
			• convert common fractions of time to hours and/or minutes, without the use of a calculator

Learning Journey	Steps	Content	Details
			• convert common fractions of time to hours and/or minutes, with the use of a calculator
	4	Converting common fractions of time to minutes and seconds, with and without a calculator	• understand that to convert common fractions of minutes to seconds, you need to multiply the fraction by 60
			• convert common fractions of time to minutes and/or seconds, without the use of a calculator
			• convert common fractions of time to minutes and/or seconds, with the use of a calculator

GM4-2: Convert between metric units, using whole numbers and commonly used decimals.			
Convert units: length/mass/capacity/area			
Learning Journey	Steps	Content	Details
Converting between different metric units - length	1	Converting between common metric units of length up to 3 decimal places	• understand the meaning of metric prefixes, eg kilo-, centi- and milli-
			• convert between metres and kilometres
			• convert between millimetres, centimetres and metres to compare lengths and distances
			• relate the multiplicative relationship between centimetres and metres, metres and kilometres
			• explain and use the relationship between the size of a unit and the number of units needed to assist in determining whether multiplication or division is required when converting between units
	2	Ordering and comparing standard units of length including with decimal quantities	• order and compare standard units of length including with decimal quantities
			• convert between related standard units of length
	3	Converting between metric units of mass up to 3 decimal places using knowledge of multiplying and dividing by 10, 100 and 1000	• convert between measures of length, mass and capacity using a table
Converting between metric units of weight/mass	1	Comparing mixed metric units of mass up to 3 decimal places	• compare measures of length, mass and capacity
	2	Ordering mixed metric units of mass up to 3 decimal places	• order measures of length, mass and capacity
	3	Understanding decimal representation of metric measurements of mass	• connect measurements of mass with their decimal representations
			• recognise the equivalence of whole number and decimal representations, eg 3 kg 250 g = 3.25 kg

Learning Journey	Steps	Content	Details
			• record mass using decimal notation of up to 3 decimal places
			• refer to SI units of mass
	4	Converting between standard metric units of mass up to 2 decimal places	• understand the meaning of metric prefixes, eg kilo-, centi-, milli-
			• convert between grams and kilograms and vice versa
			• convert between kilograms and tonnes and vice versa
			• convert among grams, kilograms and tonnes
			• solve problems using different units of mass
	5	Comparing mixed metric units of mass up to 3 decimal places	• compare measures of length, mass and capacity
		Ordering mixed metric units of mass up to 3 decimal places	• order measures of length, mass and capacity
Converting between metric units of capacity/volume	1	Recognising the need for a formal unit larger than the cubic centimetre	• recognise the need for a formal unit larger than the cubic centimetre
	2	Constructing and using the cubic metre as a unit to measure larger volumes	• construct and use the cubic metre as a unit to measure larger volumes
			• explain why volume is measured in cubic metres in certain situations, eg wood bark, soil, concrete
			• recognise that a cubic metre can have dimensions other than a cube of side 1 metre
			• record volumes using the abbreviation for cubic metres (m^3)
Converting between units of area	1	Converting between related standard units of area	• convert between related standard units of area

GM4-3: Use side or edge lengths to find the perimeters and areas of rectangles, parallelograms, and triangles and the volumes of cuboids.			
Find perimeters of composite shapes			
Learning Journey	Steps	Content	Details
Calculating perimeters of composite shapes	1	Calculating the perimeters of composite rectilinear shapes	• explain that the perimeters of composite rectilinear shapes can be determined by calculating the sum of all the side lengths
			• calculate the lengths of any unknown side lengths using lengths of other sides
			• record calculations used to find the perimeters of composite rectilinear shapes
	2	Calculating the perimeter of rectilinear shapes on a grid (informal units)	• calculate the perimeter of rectilinear shapes by counting squares on a grid

Learning Journey	Steps	Content	Details
	3	Solving problems involving perimeters on a grid	• solve problems involving perimeter (informal units) eg, which shape has the longest perimeter, create a shape with the longest/shortest perimeter
	4	Calculating the perimeter of rectilinear shapes using a formula	• calculate the perimeters of rectilinear shapes using a formula
Calculate areas incl composite shapes			
Calculating area of rectangles	1	Recognising that rectangles with the same area may have different dimensions	• recognise that rectangles with the same area may have different dimensions
			• connect factors of a number with the whole-number dimensions of different rectangles with the same area
	2	Investigating and comparing the areas of rectangles that have the same perimeter	• investigate and compare the areas of rectangles that have the same perimeter, eg compare the areas of all possible rectangles with whole-number dimensions and a perimeter of 20 centimetres
	3	Finding the dimensions of rectangles and squares given their areas	• find the possible dimensions of rectangles and squares given their areas
		Applying measurement skills to solve problems involving the areas of rectangles (including squares) in everyday situations	• apply measurement skills to solve problems involving the areas of rectangles (including squares) in everyday situations, eg determine the area of a basketball court
			• measure the dimensions of a large rectangular piece of land in metres and calculate its area in hectares, eg the local park
Calculating area of triangles	2	Applying the formula for the area of a triangle	• use and apply the formula for the area of a triangle
			• establish the formula for the area of a triangle, $A = \frac{1}{2} \times b \times h$ (also $A = \frac{1}{2}$ bh)
			• apply the formula to find the areas of right-angled triangles
			• apply the formula to find the areas of triangles in which the perpendicular height meets the base within the length of the base
			• apply the formula to find the areas of triangles in which the perpendicular height meets the base outside the length of the base
		Applying the formula to find the areas of non right-angled triangles	• apply the formula to find the areas of triangles in which the perpendicular height meets the base within the length of the base
			• apply the formula to find the areas of triangles in which the perpendicular height meets the base outside the length of the base

Learning Journey	Steps	Content	Details
	1	Applying the formula to find the areas of right-angled triangles	• apply the formula to find the areas of right-angled triangles
	3	Solving real-life problems involving calculating the area of triangles	• solve real-life problems involving calculating the area of triangles
	4	Finding the dimensions of a right-angled triangle given its area	• find the dimensions of a right-angled triangle given its area and either its base or height by using the formula for the area of a triangle
	5	Finding the dimensions of a non right-angled triangle given its area	• find the dimensions of non right-angled triangles given its area and either its base or height using the formula for the area of a triangle
Calculating area of parallelograms	1	Finding the area of a parallelogram using a formula	• apply the formula to find the area of parallelograms in different orientations
			• apply the formula to find the area of parallelograms in different orientations which include more dimensions than are necessary to calculate the area
	2	Finding the dimensions of a parallelogram given its area	• find the dimensions of a parallelogram given its area and either its length or width by using the formula for the area of a parallelogram
			• find the dimensions of a parallelogram in different orientations given its area and either its length or width by using the formula for the area of a parallelogram
	3	Solving real-life problems involving calculating the area of parallelograms	• solve real-life problems involving calculating the area of parallelograms
Calculating area of composite shapes	1	Finding the area of composite shapes: using the formulas for rectangles and triangles	• find the areas of composite rectilinear shapes using additive and subtractive cases
			• explore multiple methods for composing and decomposing
	2	Calculating the area of composite shapes constructed from triangles and special quadrilaterals	• apply area formulas for a variety of composite shapes to calculate their area
	3	Exploring rectilinear shapes with the same area	• sort rectilinear shapes with the same area
			• draw rectilinear shapes with the same area
	4	Calculating the area and perimeter of rectilinear shapes	• calculate the area and perimeter of rectilinear shapes

Learning Journey	Steps	Content	Details
Calculate volume of prisms			
Calculating volume of prisms	1	Constructing right rectangular prisms for a given volume	• use the formula for volume to identify appropriate dimensions that can be used to construct a right rectangular prism of a given volume
	2	Find the volume of composite rectangular prisms using additive strategies	• find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts

GM4-4: Interpret and use scales, timetables, and charts.			
Read scales & timetables in context			
Learning Journey	Steps	Content	Details
Reading scales & timetables to solve problems	1	Reading timetables to solve problems	• read timetables to solve problems (which includes multiple steps)
	2	Reading charts to solve problems	• read charts to solve problems (which includes multiple steps)

5.2 Shape

GM4-5: Identify classes of two- and three-dimensional shapes by their geometric properties.			
Classify 2D shapes by properties			
Learning Journey	Steps	Content	Details
Classifying quadrilaterals by their properties	1	Investigating properties of special quadrilaterals: trapeziums/trapezoids	• investigate the properties of trapeziums
			• prove a quadrilateral is a trapezium using properties
	2	Investigating properties of special quadrilaterals: kites	• investigate the properties of kites
			• prove a quadrilateral is a kite using properties
Identifying & using angle properties of triangles	1	Exploring and proving the interior angle sum of a triangle	• explore, through measurement, the sum of interior angles of a triangle
			• investigate the sum of the angles in a triangle using digital technology
			• calculate an unknown angle represented by a variable within a triangle, given the other 2 angles
	2	Exploring angles in equilateral triangles	• determine that all angles in an equilateral triangle of any size must be 60°
			• prove a triangle is equilateral using angle measurements
			• prove a triangle is not equilateral using angle measurements
	3	Exploring angles in isosceles triangles	• explore, through measurement, the relationship between the base angles of an isosceles triangle
			• determine an unknown base angle represented by a variable within an isosceles triangle given another base angle
			• calculate the non-base angle represented by a variable within an isosceles triangle given 1 of the base angles, the relationship between the base angles and the angle sum of the triangle
			• calculate the base angle represented by a variable within an isosceles triangle given the non-base angle, the relationship between the base angles and the angle sum of the triangle
Identify/use angle properties of quadrilaterals	1	Finding the interior angle sum of a quadrilateral	• explore the interior angle sum of a quadrilateral using concrete materials and digital technology
			• calculate an unknown angle/s represented by a variable/s within quadrilaterals, given the appropriate angles

Learning Journey	Steps	Content	Details
	2	Proving and applying the property that the opposite angles of cyclic quadrilaterals are supplementary	• prove 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
	3	Exploring interior angles of special quadrilaterals	• use knowledge of properties of shapes to understand the sum of the interior angles in any quadrilateral is 360 degrees
			• identify missing angles in various quadrilaterals (rectangle, square, rhombus, parallelogram, trapezium, kite)
Identifying angle properties of regular polygons	1	Exploring interior angles in regular polygons	• explore the relationship between partitioning a polygon into triangles and the sum of the interior angles of the polygon
			• identify patterns in a table of features related to polygons showing number of sides and number of triangles which can be formed
Use parallel line rules			
Identifying & using parallel line rules	1	Exploring special pairs of angles on parallel lines	• define, identify and draw transversals on sets of 2 or more parallel lines
			• explore, through measurement, the relationships between pairs of angles formed when a transversal is drawn on a pair of parallel lines
			• define and identify pairs of equal corresponding angles when 2 or more parallel lines are cut by a transversal
			• define and identify pairs of equal alternate angles when 2 or more parallel lines are cut by a transversal
			• define and identify pairs of supplementary cointerior angles when 2 or more parallel lines are cut by a transversal
	2	Applying geometric reasoning with corresponding angles on parallel lines	• apply geometric reasoning with corresponding angles on parallel lines
			• use corresponding angles on parallel lines to calculate unknown angles represented by variables
	3	Applying geometric reasoning with alternate angles on parallel lines	• apply geometric reasoning with alternate angles on parallel lines
			• use alternate angles on parallel lines to calculate unknown angles represented by variables
	4	Applying geometric reasoning with supplementary angles on parallel lines	• apply geometric reasoning with consecutive interior angles on parallel lines

Learning Journey	Steps	Content	Details
			• use consecutive interior angles on parallel lines to calculate unknown angles represented by variables
	5	Applying geometric reasoning with angles on parallel lines by choosing the appropriate angle relationship	• apply geometric reasoning with angles on parallel lines by choosing the appropriate angle relationship
			• choose and apply the appropriate angle property to calculate unknown angles on parallel lines represented by variables
Using angle relationships - parallel lines	1	Proving lines are parallel	• prove or disprove that a pair of lines are parallel using the relationships between corresponding angles, alternate angles, and supplementary angles
	2	Applying geometric reasoning with angles at a point and angles on parallel lines	• apply theorems of angles at a point and angles on parallel lines to solve numerical geometric problems involving up to 3 theorems/steps, giving a reason for each step of the solution

GM4-6: Relate three-dimensional models to two-dimensional representations, and vice versa.			
Connect prisms to 2D views/cross-section			
Learning Journey	Steps	Content	Details
Connecting prisms & their 2D views	1	Drawing (in two dimensions) solids formed from combinations of prisms by connecting cubes, from different views, including top, side, front and back views	• draw from connecting cubes (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
	2	Drawing different views of composite solids composed of prisms, pyramids and other solids	• draw (in two dimensions) prisms from different views, including top, side, front and back views
			• draw (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
	3	Drawing (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views	• draw (in two dimensions) solids formed from combinations of prisms, from different views, including top, side, front and back views
Identifying cross-sections of prisms	1	Identifying prisms from their cross-section	• identify the cross-sections of different prisms
	2	Drawing the cross-sections of prisms	• draw the cross-sections of prisms
	3	Constructing and draw various prisms from a given cross-sectional diagram	• construct and draw various prisms from a given cross-sectional diagram

5.3 Position and orientation

GM4-7: Communicate and interpret locations and directions, using compass directions, distances, and grid references.			
Use compass/true bearings			
Learning Journey	Steps	Content	Details
Using compass & true bearings	1	Introducing true bearings	• introduce true bearings including using degrees, eg 045°
			• convert between true bearings and compass bearings
			• interpret the language and phrasing of bearings, eg 'The bearing of Melbourne from Sydney is 230°'
	2	Converting between true bearings and compass bearings and vice versa	• convert between true bearings and compass bearings eg: 050T=N50E & 130T=S50E
			• convert between compass bearings and true bearings eg: N30W=330T & S10E=170T
Use scale drawings on maps			
Using scale drawings on maps	1	Solving problems using scale drawings	• solve problems using scale drawings of geometric figures including actual lengths from a scale drawing
	2	Understanding scale drawings with a bearing	• understand scale and bearings and use this knowledge to interpret maps and plans
Use the Cartesian coordinate system			
Using the Cartesian coordinate system	1	Locating points on the coordinate plane	• plot and label points, given coordinates, in all 4 quadrants of the coordinate plane
			• identify and label each quadrant on a coordinate plane
			• plot a sequence of coordinates to create a picture
			• identify and record the coordinates of given points in all 4 quadrants of the coordinate plane
			• recognise that the order of coordinates is important when locating points on the coordinate plane, e.g., (2, 3) is a location different from (3, 2)
	2	Relating Cartesian products and multiplication	• use rectangular displays or tree diagrams to find the total number of combinations possible when given 2 characteristics, eg find the total number of possible outfits given 3 pants and 2 t-shirts
			• relate multiplication to finding the total number of possible combinations

5.4 Transformations

GM4-8: Use the invariant properties of figures and objects under transformations (reflection, rotation, translation, or enlargement).			
Perform a range of transformations			
Learning Journey	Steps	Content	Details
Performing reflections	1	Plotting reflections of shapes and points on a coordinate plane	• plot reflections of shapes and points on a coordinate plane
	2	Plotting points reflected in the line y = x	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from reflection in the angle bisector of the axes that passes through the 1st and 3rd quadrant, ie the line y = x
	3	Plotting points reflected in any line on the Cartesian (number) plane	• plot and state the coordinates of the image of a given point on the Cartesian plane resulting from reflection in any line in the number plane
	4	Describing the effects of reflection on two-dimensional shapes using coordinates	• describe the effects of reflection on two-dimensional shapes using coordinates
			• determine the figure's new position in the coordinate system given a particular reflection
Performing rotations	1	Exploring the effects of rotations on two-dimensional shapes using coordinates	• determine the figure's new position in the coordinate system given a particular rotation
	2	Identifying line and rotational symmetries in pictures and diagrams	• identify if a picture or diagram has a line and/or rotational symmetry
	3	Describing, using conventional terms, regular polygons and other polygons that are reflectively and rotationally symmetric	• describe, using conventional terms, regular polygons and other polygons that are reflectively and rotationally symmetric to a given polygon
	4	Plotting rotations on the Cartesian plane	• plot and determine the coordinates for P' resulting from rotating P by a multiple of 90° about the origin
			• investigate and describe the relationship between the coordinates of P and P? following a rotation of 180° about the origin
			• recognise that a combination of translations and/or reflections can produce the same result as a single rotation and that a combination of rotations can produce the same result as a single translation and/or reflection

Learning Journey	Steps	Content	Details
Performing enlargements & identify scale factors	1	Solving problems involving the increase/decrease in an amount or measurement according to a scale factor	• solve problems by applying basic scale factors on the dimensions of a shape such as: - altering the size of a garment/textile item - working with simplified building plans or drawings - adapting a plan for a prototype into a full scale model - enlarging/reducing an artist's picture to fit into a given frame
	2	Comparing and contrasting the attributes of an object and its dilation(s) on a coordinate plane	• compare and contrast the attributes of an object and its dilation(s) on a coordinate plane
	3	Understanding the effect of negative scale factors	• know that a negative scale factor alters the orientation of the image under dilation in relation to the centre of dilation
		Enlarging with negative scale factors (scale factor <-1)	• apply a negative scale factor to enlarge a shape from a given centre of dilation, the centre being outside the shape
			• apply a negative scale factor to enlarge a shape from a given centre of dilation, the centre being inside the shape
			• apply a negative scale factor to enlarge a shape from a given centre of dilation, the centre being 1 of the corners of the shape
	4	Reducing with negative scale factors (-1 < scale factor < 0)	• apply a negative scale factor to reduce a shape from a given centre of dilation, the centre being outside the shape
			• apply a negative scale factor to reduce a shape from a given centre of dilation, the centre being inside the shape
			• apply a negative scale factor to reduce a shape from a given centre of dilation, the centre being 1 of the corners of the shape
	5	Investigating dilation on the coordinate plane with the centre of dilation at the origin	• investigate the effect on the coordinates of a shape which is dilated, scale factor >1
			• investigate the effect on the coordinates of a shape which is dilated, 0<scale factor <1
			• investigate the effect on the coordinates of a shape which is dilated, scale factor <-1
			• investigate the effect on the coordinates of a shape which is dilated, -1<scale factor <0

Learning Journey	Steps	Content	Details
Use a combination of transformations & in context	1	Plotting the transformations of shapes on the Cartesian plane	• plot the position of the image of a given shape on the Cartesian plane resulting from a one-step translation, reflection in the x-axis or y-axis, or rotation about the origin by a multiple of 90°
			• plot the position of the image of a given shape on the Cartesian plane resulting from a combination of translations, reflections in the x-axis or y-axis, and rotations about the origin by a multiple of 90°
			• explore and describe different combinations of transformations that produce the same image of a given shape
	2	Performing consecutive transformations	• perform up to 3 consecutive transformations (out of translation, reflection, rotation and dilation)
	3	Performing successive translations	• perform up to 3 consecutive translations, recognising which 1 translation would have the same result

6 Statistics

6.1 Statistical investigation

S4-1: Plan and conduct investigations using the statistical enquiry cycle: determining appropriate variables and data collection methods; gathering, sorting, and displaying multivariate category, measurement, and time-series data to detect patterns, variations, relationships, and trends; comparing distributions visually; communicating findings, using appropriate displays.			
Setup statistical investigations			
Learning Journey	Steps	Content	Details
Setting up statistical investigations	1	Knowing the statistical investigation cycle	• know each section of the statistical investigation cycle
	2	Classifying data/recognising variables as categorical (qualitative) or numerical (quantitative) - either discrete or continuous	• identify examples of categorical variables (eg, colour, gender) discrete numerical variables (eg number of students, shoe size) and continuous numerical variables (eg height, weight)
	3	Identifying qualitative and quantitative data	• identify qualitative and quantitative data
	4	Constructing appropriate survey questions and a related recording sheet in order to collect both numerical and categorical data about a matter of interest	• construct a recording sheet that allows efficient collection of the different types of data expected
			• decide whether a census or a sample is more appropriate to collect the data required to investigate the matter of interest
	5	Constructing appropriate survey questions	• decide what questions would be asked in a survey base from the question given
			• construct a statistical question given the data
Calculate measures of middle & spread			
Calculate the central tendency - mean, median, mode	1	Calculating the mean of a set of data using mean = sum of data values/number of data values	• calculate the mean of a set of data using mean = sum of data values/number of data values
			• recognise that the mean is often referred to as the 'average' in everyday language
			• identify that the bar notation represents the mean score for a set of data
	2	Investigating the effect of outliers on the mean, median, mode and range by considering a small set of data and calculating each measure, with and without the inclusion of an outlier	• investigate the effect of outliers on the mean, median, mode and range by considering a small set of data and calculating each measure, with and without the inclusion of an outlier
			• explain why it is more appropriate to use the median than the mean when the data contains 1 or more outliers

Learning Journey	Steps	Content	Details
			• determine situations when it is more appropriate to use the median or mode, rather than the mean, when analysing data, eg median for property prices, mode for shoe sizes
	3	Determining the median for sets of data without the use of digital technology	• determine the median for sets of data without the use of digital technology and containing an odd number of scores
			• determine the median for sets of data without the use of digital technology and containing an even number of scores
	4	Determining the mode for sets of data without the use of digital technology	• determine the mode for sets of data without the use of digital technology
	5	Recognising that a measure of centre for a numerical data set summarises all of its values with a single number	• recognise that a measure of centre for a numerical data set summarises all of its values with a single number
Calculating the spread - range, IQR	1	Determining the range for sets of data without the use of digital technology	• determine the range for sets of data without the use of digital technology
	2	Introducing the upper and lower quartiles	• identify the range and median in a set of data
			• use the range and median to identify the upper and lower quartiles; understand that the 25% of values sit beneath the lower quartile and 25% of values sit above the upper quartile
			• compare upper and lower quartiles in sets of data; relate data distribution shapes to the upper and lower quartiles
	3	Introducing interquartile range	• identify the range, median and upper and lower quartiles in a set of data
			• identify the interquartile range in a set of data; understand that 50% of the data values sit within the interquartile range
			• compare the interquartile range in sets of data; relate data distribution shapes to the interquartile range
	4	Recognising that a measure of variation describes how its values vary with a single number	• recognise that a measure of variation describes how its values vary with a single number
Calculating statistics to describe data	1	Determining the median, mode and range for sets of data using digital technology	• determine the median, mode and range for sets of data using digital technology

Learning Journey	Steps	Content	Details
	2	Calculating measures of location (mean, median and mode) and the range for data represented in a variety of statistical displays, including frequency distribution tables, frequency histograms, stem-and-leaf plots and dot plots	• calculate measures of location (mean, median and mode) and the range for data represented in a variety of statistical displays, including frequency distribution tables, frequency histograms, stem-and-leaf plots and dot plots
	3	Identifying and describing the mean, median and mode as 'measures of location' or 'measures of centre' and the range as a 'measure of spread'	• identify and describe the mean, median and mode as 'measures of location' or 'measures of centre' and the range as a 'measure of spread'
	4	Describing, in practical terms, the meaning of the mean, median, mode and/or range in the context of the data	• describe, in practical terms, the meaning of the mean, median, mode and/or range in the context of the data
	5	Recognising which statistical measures are appropriate for the data type, eg the mean, median and range are meaningless for categorical data	• recognise which statistical measures are appropriate for the data type
			• explain why one measure is the most appropriate
			• describe real-life situations where either mean, median or range would be the most appropriate statistical measure
Display data on graphs			
Constructing frequency histograms & polygons	1	Using a tally to organise data into a frequency distribution table	• use a tally to organise data into a frequency distribution table
	2	Constructing and interpreting frequency histograms and polygons	• construct and interpret frequency histograms and polygons
	3	Constructing histograms for continuous data	• construct histograms for continuous data
Constructing dot plots	1	Constructing dot plots	• construct dot plots
			• explain the importance of aligning data points when constructing dot plots
Constructing stem and leaf plots	1	Constructing ordered stem-and-leaf graphs with whole numbers and simple decimal values	• construct ordered stem-and-leaf graphs with whole numbers and simple decimal values
Constructing box and whisker plots	1	Constructing box-and-whisker plots	• find measures of centre, spread and variation for a set of data
			• display numerical data in a box-and-whisker plot
Interpret results & displays			
Interpreting bar graphs & histograms	1	Interpreting discrete data from a bar graph	• interpret discrete data from a bar graph

Learning Journey	Steps	Content	Details
	2	Interpreting continuous data from a histogram	• interpret continuous data from a histogram
	3	Interpreting a discrete data set from its histogram and polygon where grouping is required	• interpret a discrete data set from its histogram and polygon where grouping is required
Interpreting dot plots	1	Interpreting dot plots	• interpret dot plots
Interpreting stem and leaf graphs	1	Interpreting ordered stem-and-leaf graphs with whole numbers and simple decimal values	• interpret ordered stem-and-leaf graphs with whole numbers and simple decimal values
Interpreting line graphs	1	Interpreting line graphs	• interpret line graphs
Interpreting box-and-whisker plots	1	Analysing box-and-whisker plots	• identify that box-and-whisker plots consist of a box using 3 scores (lower quartile, median, upper quartile) and whiskers using the lowest (minimum) and highest (maximum) scores
			• read scores (minimum, lower quartile, median, upper quartile, maximum) from box-and-whisker plots drawn over number lines
			• calculate the range for a set of scores presented in a box-and-whisker plot
			• calculate the interquartile range (IQR) for a set of scores presented in a box-and-whisker plot
			• identify that the box contains 50% of all the scores for a set of data and the whiskers contain the other 50% of the data
Interpreting data in various displays	1	Interpreting a variety of graphs, including dot plots, stem-and-leaf graphs, strip graphs, pie graphs and line graphs	• interpret a variety of graphs, including dot plots, stem-and-leaf graphs, strip graphs, pie graphs and line graphs
			• calculate the percentage of the whole represented by different categories in a divided bar graph or pie graph
			• draw conclusions from data displayed in a graph, eg 'The graph shows that the majority of Year 8 students who play a musical instrument play a string instrument'
			• critique ways in which data is presented in pie graphs, line graphs, bar graphs and pictographs

Learning Journey	Steps	Content	Details
	2	Informally assessing the degree of visual overlap of 2 numerical data distributions with similar variabilities, measuring the difference between the centres by expressing it as a multiple of a measure of variability	• informally assess the degree of visual overlap of 2 numerical data distributions with similar variabilities, measuring the difference between the centres by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the 2 distributions of heights is noticeable
	3	Drawing conclusions based on the analysis of data displays using the mean, median and/or mode, and range	• draw conclusions based on the analysis of data displays using the mean, median and/or mode, and range
	4	Identifying skewed and symmetrical sets of data	• identify skewed and symmetrical sets of data
	5	Identifying any clusters, gaps and outliers in sets of data	• identify any clusters, gaps and outliers in sets of data
Drawing conclusions to answer the investigation	1	Drawing inferences about a population from a random sample	• draw inferences about a population from a random sample
Recognising sampling variation	1	Recognising that summary statistics may vary from sample to sample	• recognise that summary statistics may vary from sample to sample
	2	Suggesting reasons why different random samples drawn from the same population may have different summary statistics	• suggest reasons why different random samples drawn from the same population may have different summary statistics

6.2 Statistical literacy

S4-2: Evaluate statements made by others about the findings of statistical investigations and probability activities.			
Interpret secondary data			
Learning Journey	Steps	Content	Details
Interpreting secondary data	1	Identifying issues that may make it difficult to obtain representative data from either primary or secondary sources	• identify issues that may make it difficult to obtain representative data from either primary or secondary sources
			• discuss constraints that may limit the collection of data or result in unreliable data, eg lack of proximity to the location where data could be collected, lack of access to digital technologies, or cultural sensitivities that may influence the results
	2	Investigating and questioning the selection of data used to support a particular viewpoint, eg the selective use of data in product advertising	• investigate and question the selection of data used to support a particular viewpoint, eg the selective use of data in product advertising
	3	Identifying and investigating issues involving numerical data collected from primary and secondary sources	• identify and investigate issues involving numerical data collected from primary and secondary sources
			• identify the difference between data collected from primary and secondary sources, eg data collected in the classroom compared with data drawn from a media source
	4	Collecting and interpreting information from secondary sources, presented as tables and/or graphs, about a matter of interest	• collect and interpret information from secondary sources, presented as tables and/or graphs, about a matter of interest, eg sporting data, information about the relationship between wealth or education and the health of populations of different countries
			• interpret and use scales on graphs, including those where abbreviated measurements are used, eg '50' on a vertical axis representing thousands is interpreted as '50 000'
			• analyse a variety of data displays used in the print or digital media and in other school subject areas, eg share movement graphs, data displays showing sustainable food production
	5	Discussing ethical issues that may arise from collecting and representing data	• discuss ethical issues that may arise from collecting and representing data

Learning Journey	Steps	Content	Details
Looking for misleading information	1	Exploring issues involved in constructing and conducting surveys, such as sample size, bias, type of data required, and ethics	• discuss the effect of different sample sizes
			• describe, in practical terms, how a random sample may be selected in order to collect data about a matter of interest
			• detect and discuss bias, if any, in the selection of a sample
			• explore issues around the type of data collected in a survey
			• explore the ethics involved in constructing and conducting surveys

6.3 Probability

S4-3: Investigate situations that involve elements of chance by comparing experimental distributions with expectations from models of the possible outcomes, acknowledging variation and independence.			
Probability - theoretical/experimental			
Learning Journey	Steps	Content	Details
Understanding the language of probability	1	Understanding the terminology involved when calculating probabilities	• understand 'at least' to mean that the event occurs at least once
			• understand an exclusive 'or' to mean only one of the events can occur (A or B but not both)
			• understand an inclusive 'or' to mean each event can occur on its own or at the same time (A or B or both)
			• understand 'and' to mean both events must occur (A and B)
	2	Understanding the term 'complement' to describe events that are mutually exclusive and add to 1	• understand the term 'complement' to describe events that are mutually exclusive and add to 1
Understanding theoretical probability	1	Identifying the sample space for a probability experiment involving 2 independent events	• identify the sample space (where the combined sample space has 36 or fewer elements) for a probability experiment involving 2 independent events
	2	Determining the likelihood of winning simple games by considering the number of possible outcomes	• determine the likelihood of winning simple games by considering the number of possible outcomes, eg in a 'rock-paper-scissors' game
		Exploring the 'fairness' of simple games involving chance	• identify what can affect the fairness of games involving chance eg: bias, weighted, uneven outcomes etc
			• explore how to make an unfair game fair and vice versa
	3	Determining the theoretical probability of a series of events using tree diagrams	• determine the theoretical probability of a series of a events using a tree diagram (diagram given)
			• determine the theoretical probability of a series of a events using a tree diagram (diagram not given, needs to be constructed)
	4	Establishing that the sum of the probability of an event and its complement is 1	• establish that the sum of the probability of an event and its complement is 1
		Predicting the approximate relative frequency given the probability	• predict the approximate relative frequency given the probability, eg when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times

Learning Journey	Steps	Content	Details
	5	Identifying the complementary event for a given event, and calculating the theoretical probability that a given event will not occur	• identify the complementary event for given event, and calculate the theoretical probability that a given event will not occur
			• describe in words the complement of an event

S4-4: Use simple fractions and percentages to describe probabilities.			
Use frac/dec & percentages in chance			
Learning Journey	Steps	Content	Details
Using frac/dec & percentages in probability	1	Representing probabilities of outcomes of chance experiments using fractions	• represent probabilities of outcomes of chance experiments using fractions, eg for 1 throw of a standard six-sided die or for 1 spin of an eight-sector spinner
	2	Listing the outcomes for chance experiments where the outcomes are not equally likely to occur and assign probabilities to the outcomes using fractions	• list the outcomes for chance experiments where the outcomes are not equally likely to occur and assign probabilities to the outcomes using fractions
	3	Expressing probabilities as decimals, fractions and percentages	• express probabilities as decimals, fractions and percentages
	4	Interpreting probabilities expressed as fractions, percentages or decimals	• interpret probabilities expressed as fractions, percentages or decimals

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