Cornwallis Academy
Ambitions for All

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Year 7 Mathematics

Unit 1: Analysing and displaying data

Learning Objectives:

- To find the mode, median and range for set of data
- To find information from tables and diagrams
- To display data using tally charts, tables, bar charts and bar line charts
- Interpret simple charts for grouped data
- Find the modal class for grouped data
- Calculate the mean of a set of data
- Compare sets of data using their ranges and averages
- Understand and draw line graphs
- Understand and draw dual and compound bar charts

What previous knowledge is required?

- Primary: Read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts

How will this term's content help with future learning?

- **Year 7 Unit 4 Decimals and Measures:**
- Reading scales and using scale diagrams Year 7 Unit 6 Probability
- Drawing and using tally charts and frequency tables in probability experiments
- **Year 8 Unit 1 Statistics, Graphs and Charts:**
- Using two-way tables
- Calculating the mean from a frequency table
- Using tables for grouped data
- Comparing data using statistics
- Choose the most appropriate average to use
- Explaining why a graph or chart could be misleading

Common Misconceptions

- Thinking all data is numerical.
- Believing frequency means the value itself rather than how many times it occurs.
- Joining the tops of bars together on a bar chart.
- Assuming taller bars always mean larger values without checking the scale.
- Counting symbols in a pictogram without considering what each symbol represents.
- Thinking the largest slice in a pie chart automatically means "most" without considering proportions.
- Believing pie charts are suitable for all types of data.
- Finding the mean by adding the numbers but forgetting to divide.
- Dividing by the largest number instead of the number of data values when calculating the mean.
- Finding the median without first ordering the data.
- Choosing one middle value as the median when there is an even number of data points.
- Thinking the mode must always be a single value.
- Assuming every dataset has a mode.

- Calculating the range by subtracting the first and last numbers in a list rather than the smallest and largest values.
- Thinking the range is a type of average.
- Assuming the mean is always the best measure of average.
- Using line graphs for categorical data.
- Comparing datasets using only averages and ignoring the spread of the data.
- Ignoring graph scales, especially when axes do not start at zero.
- Assuming all graphs present data fairly and accurately.

National Curriculum / Specification

Which bit of the National Curriculum / Specification are you covering?
https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study#key-stage-3

Unit 1 – Analysing and Displaying Data: -

- Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Describe simple mathematical relationships between 2 variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs

Unit 2: Number Skills

Learning Objectives

- Use the priority of operations, including brackets
- Use multiplication facts up to 10 × 10 and the laws of arithmetic to do mental multiplication and division
- Multiply by multiples of 10, 100 and 1000
- Make an estimate to check an answer
- Use inverse operations to check an answer
- Use a written method to add and subtract whole numbers of any size
- Round whole numbers to the nearest 10 000, 100 000, 1 000 000.
- Use an estimate to check an answer to a multiplication
- Use a written method to multiply whole numbers
- Use a written method to divide whole numbers
- Use inverse operations to check an answer
- Round money to the nearest pound or penny
- Interpret the display on a calculator in different contexts
- Use a calculator to solve problems involving money and time
- Order positive and negative numbers
- Add and subtract positive and negative numbers

- Begin to multiply with negative numbers
- Find all the factor pairs for any whole number
- Identify common factors, the highest common factor and the lowest common multiple
- Recognise prime numbers
- Recognise square numbers
- Use a calculator to find squares and square roots
- Use the priority of operations, including powers
- Use index form for powers
- Do mental calculations with squares and square roots

What previous knowledge is required?

- **Primary**:
- Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning
- Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts
- Use a given additive or multiplicative calculation to derive or complete a related calculation, using arithmetic properties, inverse relationships, and place-value understanding

How will this term's content help with future learning?

Year 7 Unit 4 Decimals and measures:

- Reading scales
- Rounding to 1 decimal place
- Multiplying decimals by whole numbers
- Checking answers to decimal calculations using estimates and inverse operations
- Using written methods for multiplication and division involving decimals
- Using squares and square roots in area calculations

Year 7 Unit 11 Number:

- Using written methods to add and subtract more than two numbers (and decimals)
- Using mental calculation for multiplication
- Estimating answers to calculations
- Using a written method to divide decimal numbers by integers
- Calculating using squares, square roots, cubes and
- cube roots
- Using prime factorisation for finding HCF and LCM

Year 8 Unit 4 Decimals and ratios:

- Rounding decimals to 2 decimal places
- Ordering negative and positive decimals

Year 8 Unit 8 Percentages, decimals and fractions:

- Percentages, decimals and fractions
- Calculating with time

Year 9 Unit 4 Multiplicative reasoning:

- Finding an original amount using inverse operation

Common Misconceptions

- Thinking that a larger denominator means a larger fraction and believing equivalent or improper fractions have different values because they look different.
- Adding, subtracting, or simplifying fractions incorrectly by treating numerators and denominators in the same way.
- Confusing fractions, decimals, and percentages, and not recognising that they can represent the same value.
- Misunderstanding place value, particularly with decimals, leading to errors when comparing, adding, subtracting, or rounding numbers.
- Believing that multiplying always makes numbers bigger and dividing always makes numbers smaller.
- Confusing factors, multiples, prime numbers, and common number properties (e.g., thinking 1 is prime or that all prime numbers are odd).
- Misunderstanding negative numbers, including their order and the rules for calculations involving negatives.
- Applying calculation rules incorrectly, such as misunderstanding BIDMAS/PEMDAS or thinking squaring means doubling.
- Confusing mathematical vocabulary such as sum, product, difference, and quotient.
- Thinking percentages only apply to amounts out of 100 or misunderstanding what percentages represent.
- Believing estimates should be exact answers rather than sensible approximations.
- Assuming patterns and sequences continue in the same way without identifying the underlying rule.
- Believing calculator answers are always correct without checking whether the input or result is sensible.
- Misunderstanding special cases involving zero, such as whether zero is even or what happens when dividing by zero.

National Curriculum / Specification

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- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals

Unit 3: Expressions, Functions and Formulae

Learning Objectives

- Find outputs of simple functions written in words and using symbols
- Describe simple functions in words

- Use letters to represent unknowns in algebraic expressions
- Simplify linear algebraic expressions by collecting like terms
- Multiply and divide algebraic terms
- Use brackets with numbers and letters
- Write expressions from word descriptions using addition, subtraction, multiplication and division
- Write expressions to represent function machines
- Substitute positive whole numbers into simple formulae written in words
- Substitute positive whole numbers into formulae written with letters
- Write simple formulae in words
- Write simple formulae using letter symbols
- Identify formulae and functions
- Identify the unknowns in a formula and a function

What previous knowledge is required?

Primary:

- Use a given additive or multiplicative calculation to derive or complete a related calculation, using arithmetic properties, inverse relationships, and place-value understanding

Year 7 Unit 2 Number skills:

- Using inverse operations to check an answer

How will this term's content help with future learning?

Year 8 Unit 2 Expressions and equations:

- Simplifying algebraic expressions with powers
- Expanding brackets
- Factorising expressions
- Solving one-step and two-step equation
- Checking answers to equations by substituting

Year 9 Unit 2 Expressions and formulae

- Substituting into formulae and then solving equations to find unknown values

Common Misconceptions

- Confusing expressions, equations, and formulae, treating them as the same thing.
- Thinking that letters always stand for a single fixed value rather than representing different values in different contexts.
- Combining unlike terms incorrectly (e.g., believing $3a + 2b = 5ab$).
- Misunderstanding algebraic notation, such as thinking $3a$ means 3 + a rather than 3 × a.
- Substituting values incorrectly into expressions or formulae, especially when negative numbers or brackets are involved.
- Believing that variables must be represented by a specific letter (e.g., x) and becoming confused when other letters are used.
- Ignoring the order of operations when evaluating expressions.
- Thinking that an equation only has one possible solution or that the equals sign means "the answer comes next."

- Rearranging formulae incorrectly by not performing the same operation to both sides.
- Struggling to identify input–output relationships in functions and assuming there is no rule connecting the values.
- Confusing the independent and dependent variables in function machines, tables, and graphs.
- Believing that a formula is simply a calculation rather than a general rule that can be used repeatedly.

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- Use and interpret algebraic notation, including:
- ab in place of a × b
- 3y in place of y + y + y and 3 × y
- a^2 in place of a × a, a^3 in place of a × a × a; a^2b in place of a × a × b
- $\frac{a}{b}$ in place of a ÷ b
- coefficients written as fractions rather than as decimals
- brackets
- Substitute numerical values into formulae and expressions, including scientific formulae
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms

Decimal and Measures

Learning Objectives

- Measure and draw lines to the nearest millimetre
- Write decimals in order of size
- Round decimals to the nearest whole number and to 1 decimal place
- Round decimals to make estimates and approximations of calculations
- Multiply and divide by 10, 100 and 1000
- Convert measurements into the same units to compare them
- Solve simple problems involving units of measurement in the context of length, mass and capacity
- Convert between metric units of length, mass and capacity
- Use scale diagrams
- Read scales
- Write decimal measures as two related units of measure
- Interpret metric measures displayed on a calculator
- Multiply decimals by multiples of 10, 100 and 1000
- Multiply decimals mentally
- Check a result by considering whether it is of the right order of magnitude
- Understand where to position the decimal point by considering equivalent calculations
- Add and subtract decimals
- Multiply and divide decimals by single-digit whole numbers

- Divide numbers that give decimal answers
- Work out the perimeters of composite shapes and polygons
- Solve perimeter problems
- Find areas of irregular shapes by counting squares
- Calculate the areas of shapes made from rectangles
- Solve problems involving area
- Choose suitable units to measure length and area
- Use units of measure to solve problems
- Use metric and imperial units

What previous knowledge is required?

Primary:

- Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning
- Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts
- Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number)
- Knowing whether to multiply or divide to solve a problem, scale diagrams

Year 7 Unit 2 Number skills:

- Rounding money to the nearest pound or penny
- Using partitioning to multiply
- Multiplying whole numbers by multiples of 10, 100 and 1000
- Working with squares and square roots
- Using a calculator, calculating results accurately and then interpreting them appropriately
- Using inverse operations to check an answer
- Making an estimate to check an answer
- Using written methods for whole number multiplication and division

How will this term's content help with future learning?

Year 8 Unit 4 Decimals and ratio:

- Rounding decimals to 2 or 3 decimal places
- Ordering decimals of any size, including positive and negative decimals
- Multiplying and dividing by decimals
- Multiplying decimals with up to and including 2 decimal places
- Using ratios involving decimals

Year 7 Unit 12 Area and volume

- Working with rough metric equivalents of imperial measure

Common Misconceptions

Decimals

- Misunderstanding place value in decimals, leading to errors when comparing, ordering, rounding, or calculating with decimal numbers.
- Thinking that a decimal with more digits is always larger (e.g., believing 0.125 > 0.5).

- Ignoring place value alignment when adding or subtracting decimals.
- Believing that multiplying or dividing by 10, 100, or 1000 simply adds or removes zeros rather than shifting place value.

Measure

- Confusing units of measurement and using inappropriate units for a given context (e.g., measuring a room in centimetres).
- Converting between units incorrectly, particularly between metric units (mm, cm, m, km; g, kg; ml, l).
- Confusing perimeter and area or using the wrong formula for each.
- Thinking that changing the shape of an object changes its perimeter or area in the same way.
- Misreading scales on measuring instruments, including rulers, thermometers, weighing scales, and measuring cylinders.
- Confusing different measures such as length, area, volume, capacity, mass, and weight.
- Believing that larger numbers always represent larger measurements without considering the units used.
- Making errors when calculating or interpreting time, including reading analogue clocks and working with timetables or durations.

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Decimals and Measures

- Understand and use place value for decimals, measures and integers of any size
- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- Use standard units of mass, length, time, money and other measures, including with decimal quantities
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Derive and apply formulae to calculate and solve problems involving perimeter and area of triangles

Fractions and Percentages

Learning Objectives

- Use fraction notation to describe parts of a shape
- Compare simple fractions
- Use a diagram to compare two or more simple fractions
- Order fractions
- Identify equivalent fraction
- Simplify fractions by dividing numerator and denominator by common factors
- Change an improper fraction to a mixed number
- Add and subtract simple fractions
- Calculate simple fractions of quantities
- Work with equivalent fractions and decimals
- Write one quantity as a fraction of another

- Understand percentage as 'the number of parts per 100'
- Convert a percentage to a fraction or decimal
- Work with equivalent percentages, fractions and decimals
- Use different strategies to calculate with percentages
- Express one quantity as a percentage of another

What previous knowledge is required?

Primary:

- Recognise when fractions can be simplified, and use common factors to simplify fractions
- Express fractions in a common denomination and use this to compare fractions that are similar in value
- Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy

Year 7 Unit 2 Number skills:

- Using factors and multiples

Year 7 Unit 4 Decimals and measures:

- Working with tenths, hundredths and thousandths

How will this term's content help with future learning?

Year 8 Unit 4 Decimals and ratio:

- Rounding decimals to 2 or 3 decimal places
- Ordering decimals of any size, including positive and negative decimals
- Multiplying and dividing by decimals
- Multiplying decimals with up to and including 2 decimal places
- Using ratios involving decimals

Year 7 Unit 12 Area and volume:

- Working with rough metric equivalents of imperial measures

Common Misconceptions

- Thinking that a larger denominator means a larger fraction and not understanding the relative size of fractions.
- Adding, subtracting, multiplying, or dividing fractions incorrectly by applying whole-number methods.
- Not recognising equivalent fractions and believing fractions with different numerators and denominators must have different values.
- Viewing improper fractions or mixed numbers as different types of numbers rather than equivalent representations.
- Struggling to convert between fractions, decimals, and percentages, and not recognising that they can represent the same value.
- Thinking percentages only apply to amounts out of 100 and not understanding them as proportions.
- Confusing finding a percentage of an amount with adding or subtracting that percentage.
- Believing that a larger percentage always represents a larger amount without considering the whole.
- Difficulty comparing fractions and percentages because they are represented in different forms.
- Not recognising when answers involving fractions or percentages are unreasonable or should be simplified.

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Fractions and Percentages

- Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative
- Interpret fractions and percentages as operators
- Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express 1 quantity as a percentage of another, compare 2 quantities using percentages, and work with percentages greater than 100%

Probability

Learning Objectives

- Use the language of probability
- Use a probability scale with words
- Understand the probability scale from 0 to 1
- Identify outcomes and equally likely outcomes
- Calculate probabilities
- Use a probability scale from 0 to 1
- Calculate more complex probabilities
- Calculate the probability of an event not happening
- Record data from a simple experiment
- Estimate probability based on experimental data
- Make conclusions based on the results of an experiment
- Use probability to estimate the expected number of times an outcome will occur
- Apply probabilities from experimental data in simple situations

What previous knowledge is required?

Year 7 Unit 1 Analysing and displaying data:

- Drawing and using tally charts and frequency tables

Year 7 Unit 3 Expressions, functions and formulae:

- Substituting into formula

Year 7 Unit 4 Decimals and measures:

- Understanding decimals between 0 and 1
- Subtracting decimals from 1

Year 7 Unit 5 Fractions and percentages:

- Understanding fractions from 0 to 1 (fractions) and percentages 0% to 100%
- Simplifying fractions
- Subtracting fractions from 1

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Year 9 Unit 9 Probability:

- Working out probabilities of mutually exclusive outcomes and events
- Calculating estimates of probability from experiments
- Working with sample space diagrams
- Calculating probabilities from two-way tables and Venn diagrams

Common Misconceptions

- Thinking that all outcomes are equally likely, even when the situation suggests otherwise.
- Confusing the probability of an event happening with the number of times it has already happened or not happened.
- Believing that previous outcomes affect future independent events (e.g., after several heads, a tail is "due").
- Misunderstanding the probability scale and not recognising that probabilities must be between 0 and 1 (or 0% and 100%).
- Confusing impossible, unlikely, even chance, likely, and certain events.
- Assuming a larger number of possible outcomes means a greater probability without considering the total number of outcomes.
- Struggling to calculate probabilities from tables, lists, spinners, dice, or other representations of sample spaces.
- Adding or multiplying probabilities incorrectly when considering multiple events.
- Confusing experimental probability with theoretical probability and expecting them to be the same.

National Curriculum / Specification

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- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale
- Understand that the probabilities of all possible outcomes sum to 1
- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities