Year 8 Learning outcomes by unit

Step 2 (Developing)

Unit 1 – Number 2a Calculations

By the end of this unit, you should be able to:

- identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.
- multiply one-digit numbers with up to two decimal places by whole numbers;
- use written division methods in cases where the answer has up to two decimal places.
- solve problems which require answers to be rounded to specified degrees of accuracy.

Unit 2 – Algebra 2a Generalising

By the end of this unit, you should be able to:

- set up and solve one-step equations with integer coefficients.
- generate terms of a sequence from a term-to-term or a position to term rule
- begin to generalise their results in words.

Unit 3 – Geometry 2a Shape and Angles

By the end of this unit, you should be able to:

- compare and classify geometric shapes based on their properties and sizes.
- draw 2-D shapes using given dimensions and angles.
- describe and build simple 3-D shapes, including making nets.
- find unknown angles in any triangles, quadrilaterals, and regular polygons.
- derive and apply formulae to undertake calculations and solve problems involving perimeter and area of rectangles.
- recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.
- apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles.
- illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

Unit 4 – Statistical diagrams

By the end of this unit, you should be able to:

- interpret and construct pie charts and line graphs and use them to solve problems [S1]
- calculate the mean and interpret the mean as an average [S3]
- calculate the range and interpret the range as a measure of spread
- describe, interpret and compare two simple datasets of a single variable through: appropriate graphical representations, and by considering the mean or median or mode and range of the datasets.
- plot and interpret scatter diagrams - describe mathematical relations between the two variables in less obvious cases.

Unit 5 – Number 2b Fractions, decimals, and percentages

By the end of this unit, you should be able to:

- compare and order fractions, including fractions > 1.
- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
- multiply simple pairs of proper fractions, writing the answer in its simplest form.
- divide proper fractions by whole numbers.
- associate a fraction with division and calculate decimal fraction equivalents
- example, 0.375] for a simple fraction.
- recall and use equivalences between simple fractions, decimals, and percentages, including in different contexts.
- recognise the relationship between fractions, decimals and percentages and can express them as equivalent quantities (e.g. one piece of cake that has been cut into 5 equal slices can be expressed as a fifth or 0.2 or 20% of the whole cake).
- can calculate using fractions, decimals or percentages both as numbers and operators.

Unit 6 – Algebra 1b Functions

By the end of this unit, you should be able to:

- use simple function machines to deal with inputs and outputs, recognising basic inverse functions.
- model situations or procedures by translating them into simple algebraic formulas.
- understand and solve problems involving exchange rate
- understand and solve problems involving unit costs.

Unit 7 – Geometry 2b Transformations

By the end of this unit, you should be able to:

- draw 2-D shapes using given dimensions and angles;
- describe and build simple 3-D shapes, including making nets;

Unit 8 – Statistics 2b Summary Statistics

By the end of this unit, you should be able to:

- carry out a statistical investigation
- calculate the mean as an average for simple sets of discrete data (e.g. find the mean mass of three parcels weighing 5 kg, 3 kg and 10 kg).
- calculate the mean and interpret the mean as an average.
- calculate the range and interpret the range as a measure of spread.
- summarise data using the mean, mode as “representative or typical” values and the range as a measure of spread.
- describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, ungrouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range).

Unit 9 – Number 2c - Ratio

By the end of this unit, you should be able to:

- Use ratio notation, including reduction to simplest form.
- Relate the language of ratios and the associated calculations to the arithmetic of fractions.
- Divide a given quantity into two parts in a given part:part ratio; express the division of a quantity into two parts as a ratio.

Unit 10 – Geometry 2c - Measures

By the end of this unit, you should be able to:

- use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal.
- convert between miles and kilometres.
- recognise that shapes with the same areas can have different perimeters and vice versa.
- recognise when it is possible to use formulae for area and volume of shapes.
- calculate the area of parallelograms and triangles.
- calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units (for example, mm^3 and km^3.
- solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places.

Unit 11 – Probability 2

By the end of this unit, you should be able to:

- mark events and/or probabilities on a probability scale of 0 to 1.
- find and justify probabilities by considering equally likely outcomes for single events.
- list all possible outcomes for three events such as from a menu.
- investigate more complicated game.

Step 3 (Securing)

Unit 1 – Number 3a Calculations

By the end of this unit, you should be able to:

- round numbers and measures to different degrees of accuracy, for example to the nearest whole number or to one decimal place
- use the four operations, including formal written methods, applied to integers and decimals, all both positive and negative..
- Understanding numbers in contextual calculations
- round numbers and measures to an appropriate degree of accuracy, for example to the nearest whole number or to one decimal place.
- use approximation, through rounding to the nearest whole number or to one decimal place, to estimate answers..

Unit 2 – Algebra 3a Generalising

By the end of this unit, you should be able to:

- find the position to term formula for given linear sequences and for linear sequences that arise from modelling real world situations.
- investigate and recognise special sequences such as triangular numbers, square numbers and Fibonacci numbers.

Unit 3 – Geometry 3a Shape and Angles

By the end of this unit, you should be able to:

- classify quadrilaterals by their geometric properties, and provide convincing arguments to support classification decisions.
- construct similar shapes by enlargement, with and without coordinate grids.
- use the properties of faces, surfaces, edges and vertices of cubes and cuboids to solve problems in 3-D.
- derive and use the sum of angles in a triangle.

Unit 4 – Statistics 3a Summary Statistics

By the end of this unit, you should be able to:

- calculate the mean as an average for simple sets of discrete data (e.g. find the mean mass of three parcels weighing 5 kg, 3 kg and 10 kg).
- calculate the mean and interpret the mean as an average.
- calculate the range and interpret the range as a measure of spread.
- summarise data using the mean, mode as “representative or typical” values and the range as a measure of spread.
- describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, ungrouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range).

Unit 5 – Number 3b Fractions, decimals, and percentages

By the end of this unit, you should be able to:

- define percentage as ‘number of parts per hundred’, and know their decimal and fraction equivalents.

- multiply proper and improper fractions, and mixed numbers.
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8).

Unit 6 – Algebra 3b Functions

By the end of this unit, you should be able to:

- use the rules of indices for positive whole number powers.
- model and interpret real life situations or procedures graphically.
- plot graphs of linear functions.

Unit 7 – Geometry 3b Transformations

By the end of this unit, you should be able to:

- construct similar shapes by enlargement, with and without coordinate grids.
- use the properties of faces, surfaces, edges and vertices of cubes and cuboids to solve problems in 3-D.

Unit 8 – Statistics3

By the end of this unit, you should be able to:

- Carry out a statistical investigation
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- calculate the mean as an average for simple sets of discrete data (e.g. find the mean mass of three parcels weighing 5 kg, 3 kg and 10 kg).
- calculate the mean and interpret the mean as an average.
- calculate the range and interpret the range as a measure of spread.
- summarise data using the mean, mode as “representative or typical” values and the range as a measure of spread.
- describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, ungrouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range).

Unit 9 – Number 3c - Ratio

By the end of this unit, you should be able to:

- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction.
- Solve problems involving direct proportion.
- Use compound units such as unit pricing to solve problems.

Unit 10 – Geometry 3c - Measures

By the end of this unit, you should be able to:

- draw and measure line segments and angles in geometric figures;
- calculate lengths represented by line segments in scale drawings given scale factors as ratios in the form 1 : n, and understand that the lengths are approximate.
- derive and apply formulae to undertake calculations and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes).

- derive and use the sum of angles in a triangle.
- undertake calculations and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes.

Unit 11 – Probability 3

By the end of this unit, you should be able to:

- record and describe the frequency of outcomes of simple probability experiments; try to explain their findings using their own ideas about randomness and possible outcomes; make and explain their own judgments about the fairness of situations; understand that the probability of an impossible event is 0, and of a certain event is 1, and begin to use the 0-1 probability scale.
- use systematic listing strategies to list all possible outcomes for four events such as tossing four coins.
- record outcomes of probability experiments in tables.
- use a two circle Venn diagram to calculate related probabilities.
- enumerate sets systematically making use of tables and grids
- investigate games.

Step 4 (Exceeding)

Unit 1 – Number 4a Calculations

By the end of this unit, you should be able to:

- state the multiplicative relationship between the numbers represented by any two digits in any number
- use prime factorisation
- use integer powers
- round numbers and measures to an appropriate degree of accuracy, for example to the nearest whole number or to one or two decimal places
- use approximation, through rounding to the nearest whole number or to one significant figure, to estimate answers
- relate percentages to decimals and fractions by showing their relative positions on a number line
- multiply and divide a whole number by a fraction, whether positive and negative
- interpret fractions and percentages as operators
- work interchangeably with terminating decimals their corresponding fractions and percentages (such as 3.5, 7/2, and 350% or 0.375, 3/8, and 37.5%)
- interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%
- Solve ratio problems where the part relationship is known rather than the total
- Solve problems involving direct proportion, including graphical and algebraic representations

Unit 2 – Algebra 4a Generalising

By the end of this unit, you should be able to:

- create and solve equations using brackets and where the unknown appears on both sides of the equation.
- simplify and manipulate algebraic expressions to maintain equivalence by expanding products of two or more binomials
- use the rules of indices for positive whole number powers.
- generate terms a quadratic sequence from a position to a term rule.
- calculate and interpret gradients and intercepts of graphs of linear equations in the standard form $y = mx + c$ numerically, graphically and algebraically
- recognise and generate lines that are parallel to a given line and pass through a given point.
- plot quadratic and cubic graphs and use then to estimate values of y for given values of x and vice versa.
- solve quadratic equations graphically.
- recognise and can sketch simple quadratic and cubic graphs.

- form and solve simple linear inequalities in one variable and represent the solution set on a number line.

Unit 3 – Geometry 4a Shape and Angles

By the end of this unit, you should be able to:

- understand implications of the accuracy of the measurements for the accuracy of the calculated lengths
- use Pythagoras' Theorem to solve problems involving right-angled triangles
- use conventional terms and notations, such as complementary to describe angles with a sum of 90˚ and supplementary to describe angles with a sum of 180˚
- derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- understand and use the relationship between parallel lines and alternate and corresponding angles. Use vertically opposite angles and other angle relationships to solve angle problems.
- use the sum of angles in a triangle to deduce the angle sum in any polygon, and to derive properties of regular polygons
- use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms and cylinders to solve problems in 3-D
- derive and apply formulae to undertake calculations and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)

Unit 4 – Statistics 4a Summary Statistics

By the end of this unit, you should be able to:

- describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range)
- construct and interpret frequency tables, bar charts, pie charts, and pictograms for larger sets of categorical data, and vertical line (or bar) charts for larger sets of ungrouped and grouped numerical data
- plot and interpret scatter diagrams - draw a line of best fit by eye and use it to make predictions. Discuss implications of outliers.
- interpolate and extrapolate from data and be aware of the limitations of these techniques

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By the end of this unit, you should be able to:

- define percentage as 'number of parts per hundred', and know their decimal and fraction equivalents.
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Unit 7 – Geometry 4b Transformations

By the end of this unit, you should be able to:

- construct similar shapes by enlargement, with and without coordinate grids.
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- define the population in a study and understand the difference between population and sample.
- Find quartiles from raw data and present data in a box plot
- describe, interpret and compare observed distributions of a single variable through: appropriate measures of central tendency (mean, mode, median) and spread (range, interquartile range)
- identify an outlier in simple cases and appreciate there may be errors in data from values (outliers) that do not 'fit'.
- Construct, interpret and compare box and whisker diagrams (boxplots)
- plot and interpret scatter diagrams - draw a line of best fit by eye and use it to make predictions. Discuss implications of outliers.
- interpolate and extrapolate from data and be aware of the limitations of these techniques

Unit 9 – Number 4c – Ratio

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- derive and use the sum of angles in a triangle.
- undertake calculations and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes.

Unit 11 – Probability 4

By the end of this unit, you should be able to:

- record and describe the frequency of outcomes of simple probability experiments; in the light of experience begin to refine their own ideas about causal connections between aspects of experiments that involve randomness and equally and unequally likely outcomes and the properties of data distributions; make better informed judgments about the fairness of situations; begin to allocate probabilities to particular outcomes by considering all possible outcomes
- understand why, when there are only two possible outcomes, the probabilities of the two possible outcomes sum to 1
- use a two circle Venn diagram to enumerate sets, and use this to calculate related probabilities.
- use simple set notation to describe simple sets of numbers and objects.
- generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities.