Year 8 Maths Learning Outcomes

Unit 1: Numbers and the Number System

- Write a number as a product of its prime factors.
- Use prime factorisations to find the highest common factor of two numbers.
- Use prime factorisations to find the lowest common multiple of two numbers.
- Solve problems using highest common factors or lowest common multiples.
- Round numbers to a given number of significant figures.
- Use standard form to write large numbers.
- Use standard form to write small numbers.

Extended Learning:

- Determine two or more (three digit) numbers that have a specified highest common factor.
- Determine two or more numbers that have a specified lowest common multiple.

Unit 2: Calculating

- Subtract a number from a smaller number.
- Add a positive number to a negative number.
- Subtract a positive number from a negative number.
- Add a negative number.
- Subtract a negative number.
- Multiply a positive number by a negative number.
- Multiply a negative number by a negative number.
- Divide a negative number by a positive number.
- Divide a negative number by a positive number.
- Square and cube positive and negative numbers.
- Use a scientific calculator to calculate with negative numbers.
- Use a scientific calculator to calculate with fractions, both positive and negative.
- Understand how to use the order of operations including powers and roots.

Extended learning:

- Explain why two negative signs together change to an addition.
- Show examples of calculations that involve a negative number as the answer.

Unit 3: Visualising and Constructing

- Use the centre and scale factor to carry out an enlargement with a positive integer scale factor.
- Find the centre of enlargement.

- Find the scale factor of an enlargement.
- Use scale diagrams, including maps.
- Use the concept of scaling in diagrams.
- Interpret plans and elevations.
- Understand and use bearings.
- Construct scale diagrams involving bearings.
- Solve geometrical problems using bearings.

Extended Learning:

- Provide the plan and elevations of shapes made from some cubes. Challenge pupils to build the shape and place it in the correct orientation.
- Show examples of a sketch where the bearing of A from B is between 90° and 180°.

Unit 4: Understanding Risk 1

- Know and use the vocabulary of probability.
- Understand the use of the 0-1 scale to measure probability.
- List all the outcomes for an experiment, including the use of tables.
- Work out theoretical probabilities for events with equally likely outcomes.
- Know that the sum of probabilities for all outcomes is 1.
- Apply the fact that the sum of probabilities for all outcomes is 1.

Extended learning:

- Recognise when it is not possible to work out a theoretical probability for an event.
- Understand and use experimental probability.

Unit 5: Algebraic Proficiency (Tinkering)

- Use and interpret algebraic notation, including: $a^2 b$ in place of $a \times a \times b$, coefficients written as fractions rather than as decimals.
- Simplify an expression involving terms with combinations of variables.
- Factorise an algebraic expression by taking out common factors.
- Simplify expressions using the law of indices for multiplication.
- Simplify expressions using the law of indices for division.
- Simplify expressions using the law of indices for powers.
- Know and use the zero index.
- Substitute positive and negative numbers into formulae.
- Change the subject of a formula when one step is required.
- Change the subject of a formula when two steps are required.

Extended Learning:

- Calculate negative powers.
- Provide a proof for *$a^0 = 1$*.

Unit 6: Proportional Reasoning

- Express the division of a quantity into two parts as a ratio.
- Understand the connections between ratios and fractions.

- Find a relevant multiplier in a situation involving proportion.
- Solve ratio problems involving mixing.
- Solve ratio problems involving comparison.
- Solve ratio problems involving concentrations.
- Understand and use compound units.
- Convert between units of speed.
- Solve problems involving speed.
- Solve problems involving rates of pay.
- Solve problems involving unit pricing.

Extended Learning:

- Find a relevant multiplier in a situation involving proportion.
- Using a given situation identify the missing value in a ratio.
- Solve problems involving mass/density/volume.

Unit 7: Angles

- Solve missing angle problems involving alternate angles.
- Solve missing angle problems involving corresponding angles.
- Use knowledge of alternate and corresponding angles to calculate missing angles in geometrical diagrams.
- Establish the fact that angles in a triangle must total 180°.
- Establish the size of an interior angle in a regular polygon.
- Establish the size of an exterior angle in a regular polygon.
- Solve missing angle problems in polygons.

Extended Learning:

- Establish the size of an interior angle in a regular polygon.
- Know the total of the exterior angles in any polygons.
- Establish the size of an exterior angle in a regular polygon.

Unit 8: Exploring Fractions, Decimals and Percentages

- Identify if a fraction is terminating or recurring.
- Recall some decimal and fraction equivalents (e.g. tenths, fifths, eighths, thirds, quarters, etc).
- Write a terminating decimal as a fraction.
- Write a fraction in its lowest terms by cancelling common factors.
- Use a calculator to change any fraction to a decimal.
- Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100%.
- Use calculators to increase an amount by a percentage greater than 100%.
- Solve problems involving percentage change.
- Solve original value problems when working with percentages.

Extended Learning:

- Solve financial problems including simple interest.

- Solve problems that require exact calculation with fractions.

Unit 9: Pattern Sniffing and Solving Equations and Inequalities

- Generate terms of a sequence from a position-to-term rule.
- Find the nth term of an ascending linear sequence.
- Find the nth term of a descending linear sequence.
- Use the nth term of a sequence to deduce if a given number is in a sequence.
- Solve linear equations with the unknown on one side when calculating with negative numbers is required.
- Solve linear equations with the unknown on both sides when the solution is a whole number.
- Recognise that the point of intersection of two graphs corresponds to the solution of a connected equation.

Extended Learning:

- Solve linear equations with the unknown on both sides when the solution is a fraction.
- Solve linear equations with the unknown on both sides when the solution is a negative number.
- Solve linear equations with the unknown on both sides when the equation involves brackets.

Unit 10: Calculating Space

- Know circle definitions and properties, including centre, radius, chord, diameter, circumference.
- Calculate the circumference of a circle when radius or diameter is given.
- Calculate the perimeter of composite shapes that include sections of a circle.
- Calculate the area of a circle when radius or diameter is given.
- Calculate the area of composite shapes that include sections of a circle.
- Calculate the volume of a right prism.
- Calculate the volume of a cylinder.
- Compare lengths, areas and volumes using ratio notation.

Extended Learning:

- Calculate the perimeter of composite shapes that include sections of a circle.
- Calculate the area of composite shapes that include sections of a circle.

Unit 11: Algebraic Proficiency (Visualising)

- Know that graphs of functions of the form $y = mx + c$, $x \pm y = c$ and $ax \pm by = c$ are linear.
- Plot graphs of functions of the form $y = mx \pm c$.
- Plot graphs of functions of the form $ax \pm by = c$.
- Find the gradient of a straight line on a unit grid.
- Find the y-intercept of a straight line.
- Sketch linear graphs.
- Distinguish between a linear and quadratic graph.
- Plot graphs of quadratic functions of the form $y = x^2 \pm c$.
- Plot and interpret graphs of piece-wise linear functions in real contexts.

- Plot and interpret distance-time graphs (speed-time graphs) including approximate solutions to kinematic problems.

Extended Learning:

- Sketch a simple quadratic graph.
- Plot and interpret distance-time graphs (speed-time graphs) including approximate solutions to kinematic problems.

Unit 12: Understanding Risk 2

- List all elements in a combination of sets using a Venn diagram.
- List outcomes of an event systematically.
- Use a table to list all outcomes of an event.
- Use frequency trees to record outcomes of probability experiments.
- Construct theoretical possibility spaces for combined experiments with equally likely outcomes.
- Calculate probabilities using a possibility space.

Extended Learning:

- Use theoretical probability to calculate expected outcomes.
- Use experimental probability to calculate expected outcomes.

Unit 13: Presentation of Data and Measuring Data

- Construct and interpret a grouped frequency table for continuous data.
- Construct and interpret histograms for grouped data with equal class intervals.
- Plot a scatter diagram of bivariate data.
- Interpret a scatter diagram using understanding of correlation.
- Find the modal class of set of grouped data.
- Find the class containing the median of a set of data.
- Calculate an estimate of the mean from a grouped frequency table.
- Estimate the range from a grouped frequency table.

Extended Learning:

- Construct histograms for grouped data with equal class intervals.
- Interpret histograms for grouped data with equal class intervals.
- Analyse and compare sets of data, appreciating the limitations of different statistics (mean, median, mode, range).
- Choose appropriate statistics to describe a set of data.