Year 9 Maths Learning Outcomes

Unit 1: Calculating

- Rules of indices.
- Convert between ordinary numbers and standard form.
- Complete standard form sums (add, subtract, multiply, divide).
- Upper and Lower bounds including error intervals.

Extended Learning:

- Simple upper and lower bound sums (+,-,x,/).
- Interpret standard form in a context incl. sums (e.g. weights of plants).
- Indices including negative powers.

Unit 2: Visualising and Constructing

- Construct line and angle bisectors.
- Solve loci problems using perpendicular/angle bisectors.
- Plans and elevations of shapes.

Extended Learning:

- Know how to construct the locus of points a fixed distance from a point (from a line).
- Identify when to use the locus of points a fixed distance from a point (from a line).

Unit 3: Algebraic Proficiency

- Expand brackets of the form $(x \pm a)(x \pm b)$ and $(x \pm a)2$.
- Factorise a quadratic expression of the form $x^2 + bx + c$.
- Create an algebraic expression/formulae to describe a given situation.

Extended Learning:

- Identify variables in a situation.
- Distinguish between situations that can be modelled by an expression or a formula.
- Create an expression or a formula to describe a situation.

Unit 4: Proportional Reasoning

- Know the difference between direct and inverse proportion.
- Know the features of graphs that represent a direct or inverse proportion situation.
- Know the features of expressions, or formulae, that represent a direct or inverse proportion situation.
- Distinguish between situations involving direct and inverse proportion.

- Solve simple problems involving inverse proportion.
- Solve simple problems involving rates of pay.
- Solve more complex ratio problems involving mixing or concentrations.
- Solve more complex problems involving unit pricing.
- Finding missing lengths in similar shapes when information is given as a ratio.
- Solve problems combining understanding of fractions and ratio.
- Convert between compound units of density and pressure.
- Solve simple problems involving density.
- Solve simple problems involving pressure.
- Solve problems involving speed.

Extended Learning:

- Identify direct/inverse proportion from a table.
- Know the definition of density (pressure, population density, speed).

Unit 5: Pattern Sniffing

- Recognise and use the Fibonacci sequence.
- Generate Fibonacci type sequences.
- Solve problems involving Fibonacci type sequences.
- Explore growing patterns and other problems involving quadratic sequences.
- Generate terms of a quadratic sequence from a written rule.
- Find the next terms of a quadratic sequence using first and second differences.
- Generate terms of a quadratic sequence from its nth term.

Extended Learning:

- Find the next three terms in any Fibonacci type sequence.
- Find the term in x2 for a quadratic sequence.
- Find the nth term of a sequence of the form ax2 + b.
- Find the nth term of a sequence of the form ax2 + bx + c.
- Find the nth term of a quadratic sequence in a picture.

Unit 6: Solving Equations and Inequalities 1

- Find the set of integers that are solutions to an inequality, including the use of set notation.
- Know how to show a range of values that solve an inequality on a number line.
- Solve a simple linear inequality in one variable with unknowns on one side.
- Solve a complex linear inequality in one variable with unknowns on one side.
- Solve a linear inequality in one variable with unknowns on both sides.
- Solve a linear inequality in one variable involving brackets.
- Solve a linear inequality in one variable involving negative terms.
- Solve problems by constructing and solving linear inequalities in one variable.

Extended Learning:

- Use a formal method to solve an inequality with unknowns on both sides.
- Use a formal method to solve an inequality involving brackets.

Unit 7: Calculating Space

- Know circle definitions and properties, including tangent, arc, sector and segment.
- Calculate the arc length of a sector, including calculating exactly with multiples of π.
- Calculate the area of a sector, including calculating exactly with multiples of π.
- Calculate the angle of a sector when the arc length and radius are known.
- Calculate the surface area of a right prism.
- Calculate the surface area of a cylinder, including calculating exactly with multiples of π.
- Know and use Pythagoras' theorem.
- Calculate the hypotenuse of a right-angled triangle using Pythagoras' theorem in two dimensional figures.

Extended Learning:

- Calculate one of the shorter sides in a right-angled triangle using Pythagoras' theorem in two dimensional figures.
- Solve problems using Pythagoras' theorem in two dimensional figures.

Unit 8: Angles 1

- Apply angle facts to derive results about angles and sides
- Create a geometrical proof
- Know the conditions for triangles to be congruent
- Use the conditions for congruent triangles
- Use congruence in geometrical proofs
- Solve geometrical problems involving similarity
- Know the meaning of a Pythagorean triple

Extended Learning:

- Explain the connections between Pythagorean triples.

Unit 9: Algebraic Proficiency (Visualising)

- Identify and interpret gradients of linear functions algebraically.
- Identify and interpret intercepts of linear functions algebraically.
- Use the form y = mx + c to identify parallel lines.
- Find the equation of a line through one point with a given gradient.
- Find the equation of a line through two given points.
- Interpret the gradient of a straight-line graph as a rate of change.
- Plot graphs of quadratic functions.
- Plot graphs of cubic functions.
- Plot graphs of reciprocal functions.
- Recognise and sketch the graphs of quadratic functions.
- Interpret the graphs of quadratic functions.
- Recognise and sketch the graphs of cubic functions.
- Interpret the graphs of cubic functions.
- Recognise and sketch the graphs of reciprocal functions.
- Interpret the graphs of reciprocal functions.

Extended Learning:

- Sketch graphs of quadratic (cubic, reciprocal) functions.
- Plot and interpret graphs of non-standard functions in real contexts.
- Find approximate solutions to kinematic problems involving distance, speed and acceleration.
- Calculate the distance travelled from a distance, speed, time graph.

Unit 10: Solving Equations and Inequalities 2

- Understand that there are an infinite number of solutions to the equation $ax + by = c$ ($a \neq 0$, $b \neq 0$).
- Find approximate solutions to simultaneous equations using a graph.
- Solve two linear simultaneous equations in two variables in very simple cases (addition but no multiplication required).
- Solve two linear simultaneous equations in two variables in very simple cases (subtraction but no multiplication required).
- Solve two linear simultaneous equations in two variables in very simple cases (addition or subtraction but no multiplication required).
- Solve two linear simultaneous equations in two variables in simple cases (multiplication of one equation only required with addition).
- Solve two linear simultaneous equations in two variables in simple cases (multiplication of one equation only required with subtraction).
- Solve two linear simultaneous equations in two variables in simple cases (multiplication of one equation only required with addition or subtraction).
- Derive and solve two simultaneous equations.
- Solve problems involving two simultaneous equations and interpret the solution.

Extended Learning:

- Solve simultaneous equations using substitution.
- Solve simultaneous equations using a graph (with one quadratic).

Unit 11: Understanding Risk

- List outcomes of combined events using a tree diagram.
- Know and use the multiplication law of probability.
- Now and use the addition law of probability.
- Use a tree diagram to solve simple problems involving independent combined events.
- Use a tree diagram to solve complex problems involving independent combined events.
- Use a tree diagram to solve simple problems involving dependent combined events.
- Use a tree diagram to solve complex problems involving dependent combined events.
- Understand that relative frequency tends towards theoretical probability as sample size increases.

Extended Learning:

- Calculating probability of events that involve no replacement.

Unit 12: Presentation of Data

- Construct graphs of time series.
- Interpret graphs of time series.
- Construct and interpret compound bar charts.
- Construct and interpret frequency polygons.
- Construct and interpret stem and leaf diagrams.
- Interpret a scatter diagram using understanding of correlation.
- Construct a line of best fit on a scatter diagram and use the line of best fit to estimate values.
- Understand that correlation does not indicate causation.

Extended Learning:

- Revisit frequency polygons.
- Explore histograms.