

## Curriculum: Mathematics

### Year 7 Overview

#### Autumn 1- Sequences and Algebraic Thinking

Our Year 7 SOW begins with sequences as this is a topic which pupils will have some experience with and thus aims to build confidence in the first few lessons of high school. We then move onto algebraic principles for the rest of the half term to provide something new that makes high school maths feel different from primary and lays a foundation to make algebraic links to topics taught in the rest of the year.

- Explore and classify different types of sequences. Linear Geometric, Fibonacci, Quadratic.
- Continue linear and non-linear sequences and find missing values within sequences
- Calculate the input and output of one and two step function machines
- Switch between algebraic expressions given a function machines.
- Substitute values into an expression.
- Represent a sequence as an algebraic expression nth term.
- Generate a sequence given a nth term.
- Simplify expressions by collecting like terms.
- Understand the meaning of equality and equivalence.
- Solve one step equations with the four basic operations.

#### Autumn 2- Place Value and FDP

Autumn 2 aims to reinforce content which pupils may have some experience of from primary school but push learning onto higher level content such as standard form and rounding to significant figures.

- Write and recognise numbers up to one billion.
- Position integers and decimals on a number line.
- Work out intervals on a number line.
- Order integers and decimals.
- Multiply and divide by powers of ten.
- Round numbers to two significant figures.
- Write large and small numbers in standard form.
- Identify and create equivalent fractions.
- Convert between tenths hundredths and thousandths and their equivalent fractions.
- Represent percentages as fractions and decimals.
- Convert fluently between fractions decimals and percentages.

#### Spring 1- Four Operations

In this half term we look at formal and applied methods of the four standard calculations. This will build on knowledge of decimals learned in Au2 and also provide a link to area and shape. Teachers can also use this unit to make links between algebra and geometry to reinforce knowledge learned in Au1 with simplifying algebraic expressions This will be developed further in Sp2 when we look at directed number.

- Formal addition with integers and decimals.
- Formal subtraction with integers and decimals.
- Contextualised addition problems using money, bar charts, line graphs and time tables.
- Solve problems with frequency trees.
- Formal methods of multiplying integers and decimals.
- Formal methods of Dividing Integers and decimals.
- Area and perimeter of rectangles and triangles.

- Area and perimeter of parallelograms and trapezia.
- Solve problems involving mean.
- Find the range and median of a set of numbers.
- Order of Operation

### **Spring 2-Directed Number, Two Step Equations and Fraction**

**In Spring 2 we are able to build on topics covered earlier in the year by the development of working with directed numbers. Substitution can be revisited as well as calculations with decimals. Revisiting solving two step equations reinforces knowledge learned in Au1 while applying uses for directed number in algebra. Links can also be made when adding fractions and mixed numbers to perimeter and simplify algebraic expressions.**

- Order directed numbers and place on a number line.
- Add subtract multiply and divide with directed numbers.
- Perform calculations which cross zero.
- Evaluate algebraic expressions with directed number.
- Solve two step equations.
- Find fractions of amounts and a whole amount given a fraction.
- Convert between mixed numbers and fractions.
- Add and subtract fractions with the same denominator.
- Add and subtract fractions with different denominators.
- Add and subtract mixed numbers and improper fractions
- Add and subtract simple algebraic fractions.

### **Summer 1- Geometry**

**In Summer 1 we introduce properties of shape as a means to continue building a board and balanced maths curriculum. When discussing properties of angles and shapes algebraic and numeric skills from all previous half terms can be used to deepen the challenge and understanding of pupils. It also introduces pupils to the fundamentals of using mathematical equipment such as a protractor which many may not have previously mastered.**

- Use labelling conventions for line segments, angles and geometric figures.
- Recognise types of triangles and quadrilaterals.
- Know names and identify shapes up to decagons.
- Classify angles, draw and measure angles from  $0^\circ$  to  $360^\circ$ .
- Construct triangles using ASA and SAS.
- Find missing angles on a straight line and around a point using numerical and algebraic contexts.
- Understand and use vertically opposite angles.
- Know and apply the sum of angles in a triangle.
- Know and apply the sum of angles in a quadrilateral.
- Find and use the angle sum of any polygon.

### **Summer 2- Number, Sets and Probability**

**To finish the year pupils will work on some fundamentals of number and be introduced to Venn diagrams. Pupils will use Venn Diagrams to find HFCs and LCMs as well as organising data into a Venn diagram to work out probability. This is in preparation for further development of work with probability in year 8.**

- Find the HFC and LCM of given Numbers.
- Find the product of prime factors for a given number.
- Use factors to simplify calculations.
- Identify and represent sets.
- Interpret and create Venn diagrams.

- Use simple set notation to identify unions and intersections of sets.
- Use Venn diagrams to calculate HCFs and LCMs of bigger numbers.
- Understand the language of probability. (Probability scale)
- Generate sample space for single events
- Calculate probabilities of single events.
- Use the fact that probabilities add up to one to solve problems.
- Draw and interpret Pie Charts

## **Year 8 Overview**

### **Autumn 1-Ratio, Proportion and Fractions**

**Year 8 begins with a unit on multiplicative thinking and aims to show how ratio is linked to numerous other forms of maths. Links between direct proportion and graphs to convert currency and begin to explore the concept of gradient which will be explored further in Au2. In the second half of the half term links between ratios and fractions can be explored when multiplying and dividing fractions is covered.**

- Understand and use ratio notation and express ratio in its simplest form.
- Express ratios in the form 1:n or n:1.
- Divide values into a given ratio.
- Explore the relationship between ratios and fractions.
- Explore A:B B:C ratio problems.
- Solve direct proportion problems and show direct proportion graphs.
- Explore conversion graphs and convert between currencies.
- Use ratio and proportion in the context of similar shapes and scale drawings
- Multiply integers with fractions and fractions with fractions.
- Divide integers with fractions and fractions with fractions.
- Multiply and divide mixed numbers and improper fractions.
- Multiply and divide algebraic fractions.

### **Autumn 2- Straight Line Graphs, Representing Data and Probability.**

**Building on understanding of conversion graphs this unit further develops the understanding of graphs starting with sequences and their algebraic and graphical forms. This will develop into creating tables of values for the equation of a line and where links can be seen between the y values of a linear equation and sequences. In the second half of the half term we will review and build on pupils' understanding of probability which began at the end of year 7. This topic can be developed further now that pupils have an understanding of ratio which they can apply to this topic.**

- Form algebraic expressions from sequences. (nth term)
- Use nth term to generate terms and check whether terms are in a particular sequence.
- Review plotting coordinates in 4 quadrants
- Identify and draw lines parallel to the x and y axis. Identify the line  $y=x$
- Explore gradient and how this relates to  $y=mx$ . (- and +)
- Recognise and explore the impact of adding a constant term to  $y = mx + c$
- Link straight line graphs to sequences.
- Plot graphs of the form  $y = mx+c$ .
- Calculate probability from sample space, two way tables and Venn diagrams.
- Use the product rule to identify the total number of possible outcomes.

### **Spring 1- Form and Solve Equations, and Index Laws**

**The topics in this half term seek to build on the foundations of Algebra taught in Au1 and Sp2 of year 7 by introducing further algebraic notation and more complex equations.**

**Teachers will have the opportunity to make links between properties of shape and directed number covered earlier in KS3 as well as the revisiting multiplying and dividing algebraic terms first covered in year 7.**

- Identify formula, expressions, identities and equations.
- Expand single brackets and pairs of single brackets.
- Factorise into single brackets.
- Solve equations with brackets.
- Solve equations with unknowns on both sides of the equal sign.
- Form algebraic expressions and use these expressions to solve problems algebraically.
- Use index laws to multiply and divide indices with the same base.
- Explore powers of powers and changing the base of a power.
- Change a base of a power so that you can multiply and divide indices.

### **Spring 2- Percentages, Standard Form and Metric Measures**

**In Sp2 working with percentages and standard form follows nicely after equations and index laws as links can be made between forming and solving equations with percentage increase and decrease as well as reverse percentages. Work with index laws in Sp1 provides a good foundation for completing calculations in standard form.**

- Calculate fraction, decimal and percentages of an amount without a calculator.
- Use a calculator to find percentages of an amount. (decimal multipliers)
- Increase and decrease by a percent using a calculator. (multipliers)
- Find one number as a fraction or decimal of another.
- Calculate percentage change.
- Write large numbers in standard form.
- Write small numbers in standard form.
- Add and subtract numbers in standard form.
- Multiply and divide numbers in standard form.
- Convert metric units of length weight and capacity.
- Convert metric units of area and volume. \*

**Summer 1- Angles in Parallel Lines, Polygons, and Area of Compound Shapes. Building on work first covered in Su1 in year 7, this half term aims to continue to develop pupils' geometric knowledge by introducing pupils to more complex geometric shapes and processes. This can be further developed now that pupils have a greater knowledge of ratio, algebra and percentages.**

- Identify and calculate with supplementary, alternate and corresponding angles in parallel lines.
- Solve problems involving angles in parallel lines.
- Identify and calculate angles and sides with special quadrilaterals. (Parallelograms, Kites and Trapezia)
- Calculate the sum of the interior angles of any polygon.
- Understand and use the sum of the exterior angles of a polygon.
- Calculate missing interior angles of a polygon.
- Review the area rectangles triangle and parallelograms.
- Calculate the area of a trapezium.
- Calculate the area of compound shapes.
- Calculate the area and perimeter of a circle.
- Calculate the area and perimeter of parts of circles.
- Calculate the area of compound shapes including parts of circles.

### **Summer 2- Statistical Diagrams and Average**

**In an effort to ensure that every year covers the main areas of maths year 8 finishes with a unit on data collection and analysis. Teachers will be able to make use of the pupils'**

**knowledge of percentages ratio and probability covered earlier in the year to ensure pupils still continue to have a high level of mathematical challenge while exploring the use of statistical diagrams.**

- Identify different types of data.
- Design and criticise questionnaires.
- Draw and interpret pictograms, bar charts and vertical line charts.
- Draw and interpret multiple bar charts and line graphs.
- Draw and interpret pie charts.
- Draw and interpret scatter graphs.
- Identify trends, discuss outliers and the fact that correlation does not always imply causation.
- Choose the most appropriate diagram for a given set of data.
- Identify misleading graphs.
- Find and interpret the range.
- Understand and use the mean median and mode.
- Find the mean from an ungrouped frequency table.
- Find the mean from a grouped frequency table.

## **Year 9 Overview**

### **Autumn 1- Straight Line Graphs and Forming and Solving Equations and Inequalities**

**Year nine starts off with a unit on straight line graphs and algebraic equations so that pupils can both review a topic covered in year 8 Au2 and build on this prior knowledge to incorporate topics such as the equation of a straight line and more complex algebraic equations.**

- Use and identify equations parallel to the x and y axis,  $y=x$  and  $y=-x$ .
- Graph straight line graphs using tables of values.
- Calculate the gradient of a line. + and –
- Understand the influence a constant term has on a line.
- Graph a line given an equation in the form  $y= mx +c$ .
- Find the equation of a line given a graph.
- Interpret the gradients and intercepts of real life graphs.
- Solve two step equations and inequalities.
- Solve two step equations and inequalities with brackets and unknowns on both sides.
- Form and solve equations and inequalities in a variety of mathematical contexts.
- Rearrange equations.
- Form simple algebraic proofs.

### **Autumn 2- Volume and Surface Areas of 3D shapes, Constructions and Loci. Au2 continues to build on pupils' geometric skills learned in year7 and 8 with the introduction of 3D shapes. This allows teachers to review key geometric concepts taught earlier in KS3 in a more difficult 3D concept.**

- Names and properties of 2D and 3D shapes.
- Create nets of 3D shapes.
- Plans and elevations of 3D shapes.
- Surface area of cubes, cuboids and other prisms.
- Surface area of cylinders.
- Volume of cubes, cuboids and other prisms.
- Volume of cylinders.
- Volume of pyramids cones and spheres.
- Review measuring and drawing angles.
- Construct triangles given ASA, SAS and SSS.

- Explore and prove congruence of triangles.
- Construct angle bisector, perpendicular bisector, perpendicular from and point on a line and perpendicular from a point away from a line.
- Use constructions to solve problems with loci.

### **Spring 1- Fractions and Surds, Percentage Problems and Money**

**In an effort to keep each year balanced with the main strands of Maths Spring one revisits and further develops work with Number. Pupils will use number skills acquired in Years 7 and 8 to think more deeply about topics such as Surds Fractions and Percentages. Pupils will also be exposed to a range of real world applications of maths such as taxes bills and interest rates now that they are older and more aware of the wider world.**

- Rational v. irrational numbers. Working with properties of surds. (+, -, x, ÷, and simplify)
- Calculations with fractions and mixed numbers.
- Calculations with algebraic fractions.
- Increasing and decreasing amounts by percentages using multipliers.
- Express change as a percent.
- Solve reverse percentage problems.
- Solve repeated percentage change problems.
- Complete calculations of compound and simple interest
- Solve problems with bills and balance sheets.
- Solve problems with VAT and income tax.
- Solve problems with exchange rates.
- Solve problems with unit pricing and best buys.

### **Spring 2- Algebraic Angles, Transformations and Pythagoras**

**In Spring 2 pupils will apply algebraic and number skills learned earlier to the new topics of Pythagoras and angles in parallel lines. Pupils will also cover translation reflection and rotation as this has not been covered yet in the KS3 SOW. When covering translation, pupils will be introduced to vector notation ready for when this is covered later in KS4.**

- Review angles in parallel lines.
- Solve algebraic problems with angles and shapes.
- Rotation of a shape given a centre of rotation.
- Reflection of a shape given a line of symmetry.
- Translation of a shape give a vector.
- Describe the single or combined transformation of a shape. (Rotation, Reflection, Translation)
- Use Pythagoras theorem to find missing sides of right angled triangles.
- Use Pythagoras theorem to prove a triangle is a right angle triangle.
- Use Pythagoras theorem to find the distance between two coordinates.
- Use Pythagoras theorem in 3D shapes.

### **Summer 1- Enlargement, Proportion and Compound Measures**

**Summer 1 starts with the continuation of our transformation topic covering Enlargement. This provides a nice link between the learning of Sp2 and multiplicative relationships that we explore in Su1. Using scale factors to enlarge shapes flows nicely into the topics of proportion and compound measures that follow for the rest of the half term.**

- Enlarge a shape by a given positive scale factor.



- Enlarge a shape by a given fractional scale factor.
- Enlarge a shape given a scale factor and a centre of enlargement.
- Work out missing side lengths of similar shapes.
- Solve problems with direct proportion.
- Solve problems with inverse proportion.
- Represent direct and inverse proportion on a graph.
- Solve rates of flow problems.
- Solve ratio problems given parts and wholes.
- Solve ratio problems involving algebra
- Solve problems with speed distance and time.
- Solve problems with density mass and volume.

## Summer 2- Probability, Graphs of Quadratic Functions and Representing Inequalities

In the last half term of KS3 we look at probability which was covered earlier in KS3 and aim to develop this topic to include more complicated scenarios such as using tree diagrams to represent multi-event calculations using tree diagrams. Within this topic we can show the pupils a need for quadratic equations and then move onto working with quadratic equations and graphs. We also cover several other graphical representations to lay a good foundation for KS4.

- Single event probability, probability scale and probabilities must add up to one.
- Relative frequency
- Independent events.
- Tree diagrams with replacement.
- Tree diagrams without replacement.
- Explore graphs of quadratic equations. (why roots make the equation equal to zero)
- Make links between graph and factorised quadratic into double brackets.
- Explore graphs of simultaneous equations.
- Represent inequalities on a number line.

## Year 10 Overview

- **Green** and **Black** for Foundation Groups
- **Black** and **Red** for Higher Groups (Review **Green** Topics)

## Autumn 1

### Equations and Inequalities

- *Form and solve one-step and two-step equations and inequalities*
- *Show and interpret solutions to inequalities on a number line*
- *Draw straight line graphs*
- Find solutions to equations using straight line graphs
- **Represent solutions to single and multiple inequalities on a graph**
- *Form and solve equations and inequalities with unknowns on both sides*
- **Solve quadratic equations by factorisation\***
- Understand that equations can have more than one solution
- **Solve quadratic inequalities in one variable**

### Simultaneous Equations

- Determine whether a given  $(x, y)$  is a solution to a pair of linear simultaneous equations
- *Use a given equation to derive related facts*
- Solve a pair of linear simultaneous equations by :
  - substituting a known variable

- substituting an expression (1) & (2)
- *using graphs*
- subtracting equations
- adding equations
- adjusting one equation
- adjusting both equations
- Form and solve pair of linear simultaneous equations from given information
- **Determine whether a given  $(x, y)$  is a solution to both a linear and quadratic equation**
- **Solve a pair of simultaneous equations (one linear, one quadratic) using graphs and algebraically**

## Autumn 2

### Congruence, Similarity and Enlargement

- *Enlarge a shape by a positive integer and fractional scale factor*
- **Enlarge a shape by a negative scale factor**
- Identify similar shapes
- *Work out missing sides and angles in a pair given similar shapes*
- *Use parallel line rules to work out missing angles*
- *Establish a pair of triangles are similar*
- Explore areas and volumes of similar shapes
- Understand the difference between congruence and similarity
- Understand and use conditions for congruent triangles
- Prove a pair of triangles are congruent

### Trigonometry

- Use sine, cosine and tangent to calculate missing sides and angles in right angled triangles
- *Calculate sides in right-angled triangles using Pythagoras' Theorem*
- Work with key angles in right-angled triangles - non calculator trig values
- **Use trigonometry in 3-D shapes**
- **Use the formula  $\frac{1}{2} ab \sin C$  to find the area of a triangle**
- **Calculate the area of a segment**
- **Understand and use the sine rule and cosine rule to calculate missing sides and angles**

## Spring 1

### Ratios & Fractions

- *Compare quantities using a ratio*
- *Link ratios and fractions and use to make comparisons*
- *Share in a ratio (given total or one part)*
- *Link ratios and graphs*
- *Solve problems with currency conversion*
- *Link ratios and scales*
- *Use and interpret ratios of the form  $1 : n$  and  $n : 1$*
- *Solve 'best buy' problems*
- Combine a set of ratios
- *Link ratio and algebra*

### Percentages & Interest

- *Convert and compare fractions, decimals and percentages*



- *Work out percentages of amounts (with and without a calculator)*
- *Increase and decrease by a given percentage*
- *Express one number as a percentage of another*
- *Calculate simple and compound interest/depreciation and solve problems involving growth and decay*
- *Reverse percentages*
- **Understand iterative processes**

## Probability

- *Find probabilities using equally likely outcomes*
- *Use the property that probabilities sum to 1*
- *Using experimental data to estimate probabilities*
- *Find probabilities from tables, Venn diagrams and frequency trees*
- *Construct and interpret sample spaces for more than one event*
- *Calculate probability with independent events*
- *Use tree diagrams for independent and dependent events*
- Product rule for counting
- **Construct and interpret conditional probabilities (Tree diagrams) - REVISION**
- **Construct and interpret conditional probabilities (Venn diagrams and two-way tables)**

## Spring 2

### Angles and Bearings

- *Use cardinal directions and related angles*
- *Draw and interpret scale diagrams*
- Bearings
- **Solve bearings problems using Pythagoras and trigonometry and the sine and cosine rules**

### Circles

- Calculate fractional parts, arc lengths and sectors of a circle
- **Circle theorems**
- Understand and use the volume and surface area of a cylinder, cone and sphere

### Vectors

- Understand vectors
- Use and read vector notation
- Draw and understand vectors multiplied by a scalar, addition and subtraction of vectors
- **Explore vector journeys incl. quadrilaterals**
- **Understand and prove parallel vectors and collinear points using vectors**

## Summer 1

### Collecting, representing and interpreting data

- Understand populations, samples, primary and secondary data
- Construct, interpret and criticise frequency tables, *two-way tables*, line and bar charts (including composite bar charts), *pie charts*
- **Construct and interpret histograms**
- *Find and interpret averages from a list and a table*
- **Construct and interpret cumulative frequency diagrams**

- **Construct and interpret box plots**
- Compare distributions using **(complex)** charts and measures
- *Construct and interpret scatter graphs, use line of best fit and extrapolation*

### Non-calculator methods

- *Four operations with integers and decimals*
- **Rational and irrational numbers (convert recurring decimals here)**
- **Understand and calculate with surds**
- *Rounding to decimal places, significant figures and Estimating*
- Understand and use limits of accuracy and
- **Upper and lower bounds**

### Summer 2

#### Types of numbers and sequences

- *Understand factors, multiples, primes and express a number as a product of its prime factors*
- *Find the HCF and LCM of a set of numbers*
- Describe and continue arithmetic and geometric sequences
- Explore other sequences **including those involving surds**
- *Find the rule for the  $n$ th term of a linear and a quadratic sequence*

#### Indices and Roots

- *Powers of ten and standard form*
- *The addition and subtraction rules for indices*
- Understand and use the power zero and negative indices
- Work with powers of powers
- **Understand and use fractional indices**
- *Calculate with numbers in standard form*

#### Manipulating Expressions

- *Simplify algebraic expressions*
- Use identities
- **Four operations with complex algebraic fractions**
- Form and solve equations and inequalities with fractions
- **Solve equations with algebraic fractions**
- Algebraic arguments and proof

## Year 11 Higher 2022-23

September			October			November			December				
Growth and decay	Direct and inverse proportion	Equation of a circle	Pi-calculus and area under a curve	Precalculus & area under a curve	Holiday	Gradients and rate of change	Numerical methods	Statistics recap and review	MOCK EXAMS	Holiday			
December		January		February			March			April			
Holiday		Trigonometry recap and extension	Further sketching graphs	Further equations and graphs	Wk22 w/b 20/1 w/e 4/2 ↕	REVISIT TOPICS IDENTIFIED THROUGH ANALYSIS OF MOCKS			Wk30 w/b 25/3 w/e 1/4 ↕	Holiday			
April		May		June			July						
Revision		Holiday		Revision			June examinations	Wk43 w/b 25/8 w/e 1/7 ↕	Wk44 w/b 2/7 w/e 8/7 ↕	Wk45 w/b 9/7 w/e 15/7 ↕	Wk46 w/b 15/7 w/e 22/7 ↕	Wk47 w/b 23/7 w/e 29/7 ↕	Wk48 w/b 30/7 w/e 5/8 ↕

## Year 11 Foundation 2022-23

September			October			November			December				
Ratio & proportion review	Growth and decay	Direct and inverse proportion	Wk7 w/b 15/10 w/e 22/10 ↕	Holiday		Algebra and graphs	Sketching graphs	Wk13 w/b 27/11 w/e 3/12 ↕	MOCK EXAMS	Holiday			
December		January		February			March			April			
Holiday		Geometry review	Statistical measures review	Wk22 w/b 20/1 w/e 4/2 ↕	REVISIT TOPICS IDENTIFIED THROUGH ANALYSIS OF MOCKS			Wk30 w/b 25/3 w/e 1/4 ↕	Holiday		Wk32 w/b 5/4 w/e 15/4 ↕		
April		May		June			July						
Revision		Holiday		Revision			June examinations	Wk43 w/b 25/8 w/e 1/7 ↕	Wk44 w/b 2/7 w/e 8/7 ↕	Wk45 w/b 9/7 w/e 15/7 ↕	Wk46 w/b 15/7 w/e 22/7 ↕	Wk47 w/b 23/7 w/e 29/7 ↕	Wk48 w/b 30/7 w/e 5/8 ↕