

The Mathematics department's key stage 3 curriculum is designed to implement the Academy's vision of "Deepening Learning, Raising Aspiration", in line with the OAT curriculum strategy of "Teach, Develop, Change". Our curriculum is carefully designed to build resilience, aspiration and independence in our learners.

Purpose of Study

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Year
7

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 |
|--------|---|--|--------|--|---|--------|--|---|--------------------------|---|---------|---------------|
| Autumn | BASELINE TEST | NUMBER SKILLS Diversity | | | ANALYSING AND DISPLAYING DATA Diversity | | | EXPRESSIONS, FUNCTIONS AND FORMULAE | | DECIMALS AND MEASURES Diversity | | ASSESS |
| | | <ul style="list-style-type: none"> Mental maths Use of the four main operations Money and time Negative numbers Factors, multiples and primes Square numbers | | | <ul style="list-style-type: none"> Mode, median and range Displaying data Grouping data Averages and comparing data | | | <ul style="list-style-type: none"> Functions Simplifying expressions Writing expressions Substituting into formulae Writing formulae | | <ul style="list-style-type: none"> Decimals and rounding Length, mass and capacity Scales and measures Working with decimals, mental and written Perimeter Area Units of measure | | |
| Spring | FRACTIONS AND PERCENTAGES | | | PROBABILITY Diversity | | | | RATIO AND PROPORTION | | ASSESS AND ENRICH | | |
| | <ul style="list-style-type: none"> Comparing fractions Simplifying fractions Working with fractions Fractions and decimals Understanding percentages Percentages of amounts | | | <ul style="list-style-type: none"> The language of probability Calculating probability Experimental probability Expected outcomes | | | | <ul style="list-style-type: none"> Direct proportion Writing ratios Using ratios Ratios, proportions and fractions Proportions and percentages | | | | |
| Summer | LINES AND ANGLES | | | SEQUENCES AND GRAPHS | | | TRANSFORMATIONS | | ASSESS AND ENRICH | | | |
| | <ul style="list-style-type: none"> Measuring and drawing angles Lines, angles and triangles Drawing triangles accurately Calculating angles Angles in a triangle Quadrilaterals | | | <ul style="list-style-type: none"> Sequences Pattern sequences Coordinates and midpoints Extending sequences Straight-line graphs Position-to-term rules | | | <ul style="list-style-type: none"> Congruency and enlargements Symmetry Reflection Rotation Translations and combined transformations | | | | | |

Autumn Term

| Block 1 – Weeks 1 to 4 | Block 2 – Weeks 5 to 7 | Block 3 – Weeks 8 to 9 | Block 4 – Weeks 10 to 11 |
|---|---|--|--|
| <ol style="list-style-type: none"> 1. Know and use the priority of operations, including brackets. 2. Use multiplication and the laws of arithmetic to do mental/written multiplication and division. 3. Multiply by multiples of 10, 100, 1000. 4. Round whole numbers to the nearest 10000, 100000, 1000000. 5. Use estimation and inverse operations to check answers. 6. Round money to the nearest pound or penny. 7. Interpret a calculator display in different contexts. 8. Solve problems involving money and time. 9. Order positive and negative numbers. 10. Add and subtract positive and negative numbers. 11. Begin to multiply with negative numbers. 12. Find all the factor pairs for any whole number. 13. Identify common factors, the highest common factor and the lowest common multiple. 14. Recognise prime numbers. 15. Recognise square numbers. 16. Use a calculator to find squares and square roots. 17. Use the priority of operations including powers. 18. Use index form for powers. 19. Do mental calculations with squares and square roots. | <ol style="list-style-type: none"> 1. Find the mode of a set of data, numerical and non-numerical. 2. Find the median of a set of data (odd and even number of values). 3. Find the range of a set of data. 4. Read and draw pictograms, bar charts and bar-line charts. 5. Read and construct tally charts and frequency tables. 6. Find the mode and range from a chart or table. 7. Read and construct grouped tally charts and frequency tables. 8. Read and construct grouped bar charts for discrete and continuous data. 9. Find the modal class from a bar chart or frequency table. 10. Calculate the mode, median, mean and range of a set of values. 11. Compare two sets of data using an average and the range. | <ol style="list-style-type: none"> 1. Find outputs of simple functions written in words and using symbols. 2. Describe simple functions in words. 3. Simplify linear algebraic expressions by collecting like terms. 4. Use letters to represent unknowns in algebraic expressions. 5. Use brackets with numbers and letters. 6. Multiply and divide algebraic terms. 7. Write expressions from word descriptions using addition, subtraction, multiplication and division. 8. Write expressions to represent function machines. 9. Substitute positive integers into simple formulae written in words. 10. Substitute positive integers into formulae written with letters. 11. Write simple formulae in words. 12. Write simple formulae using letter symbols. 13. Identify formulae and functions. 14. Identify the unknowns in a formula and a function. | <ol style="list-style-type: none"> 1. Write decimals in order of size. 2. Round decimals to the nearest whole number, to one decimal place and make estimates and approximations of calculations. 3. Multiply decimals mentally and by multiples of 10, 100 and 1000. 4. Consider place value and decimals. 5. Add and subtract decimals. 6. Multiply and divide decimals by single-digit whole numbers and give decimal answers. 7. Measure and draw lines to the nearest millimetre. 8. Solve simple problems involving units of measurement in the context of length, mass and capacity. 9. Convert between metric units of length, mass and capacity. 10. Use and read scale diagrams, on a range of measuring equipment. 11. Interpret metric measures displayed on a calculator. 12. Check a result by considering whether it is of the right order of magnitude. 13. Work out the perimeters of composite shapes and polygons. 14. Find areas of irregular shapes by counting squares. 15. Calculate the areas of shapes made from rectangles. 16. Choose suitable units to estimate length and area. 17. Use metric and imperial units. |
| <p style="text-align: center;">Notes/Links/Interleaving</p> <p>Use of the four basic operations (+, -, x, ÷) Use of place value Order of operations, including brackets Alphabet order Simple formula Estimation Positive and negative integers</p> | | <p style="text-align: center;">Additional Higher Content</p> <p>To apply concepts to Problem Solving and reasoning questions. Use multi-step problems To be able to express results using a range of formal mathematical representations. To make more in depth conjectures about patterns and relationships. Look for proof or counter-examples</p> | |

| Spring Term | | | |
|--|--|---|--|
| Block 1 – Weeks 1 to 4 | Block 2 – Weeks 5 to 7 | Block 3 – Weeks 8 to 10 | |
| <ol style="list-style-type: none"> Use fraction notation to describe parts of a shape. Compare simple fractions. Use a diagram to compare two or more simple fractions. Order fractions Change an improper fraction to a mixed number. Identify equivalent fractions. Simplify fractions by dividing numerator and denominator by common factors. 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. | <ol style="list-style-type: none"> The language of probability. Use a probability scale with words. Understand and use the probability scale from 0 to 1. Identify outcomes and equally likely outcomes. Calculate probability based on equally likely outcomes. 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. | <ol style="list-style-type: none"> Use direct proportion in simple contexts. Use the unitary method to solve simple word problems involving direct proportion. Use ratio notation. Reduce a ratio to its simplest form. Reduce a three-part ratio to its simplest form by cancelling. Find equivalent ratios. Divide a quantity into two parts in a given ratio. Use ratios and measures. Use fractions to describe and compare proportions. Understand and use the relationship between fractions, ratio and proportion. Use percentages to describe proportions. Use percentages to compare simple proportions. Understand and use the relationship between percentages, ratio and proportion. | |
| <p style="text-align: center;">Notes/Links/Interleaving</p> <p>Use of the four basic operations (+, -, x, ÷) Use of place value Simple formula Estimation Positive and negative integers Common factors and HCF Fractions/decimals Tally charts/frequency tables Simplifying Equivalence Measures/units</p> | | <p style="text-align: center;">Additional Higher Content</p> <p>To apply concepts to Problem Solving and reasoning questions. Use multi-step problems. To be able to express results using a range of formal mathematical representations Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems. To make more in depth conjectures about patterns and relationships. Look for proof or counter-examples.</p> | |

| Summer Term | | |
|--|--|--|
| Block 1 – Weeks 1 to 3 | Block 2 – Weeks 4 to 6 | Block 3 – Weeks 7 to 9 |
| <ol style="list-style-type: none"> 1. Use a protractor to measure and draw angles. 2. Recognise acute, obtuse and reflex angles. 3. Estimate the size of angles. 4. Describe and label lines, angles and triangles. 5. Identify angle and side properties of triangles. 6. Use a ruler and protractor to draw triangles accurately. 7. Use the rules for angles on a straight line, angles around a point and vertically opposite angles. 8. Use the rule for the sum of angles in a triangle. 9. Calculate interior and exterior angles. 10. Identify and name types of quadrilaterals. 11. Use the rule for the sum of angles in a quadrilateral. | <ol style="list-style-type: none"> 1. Recognise, describe and continue number sequences. 2. Generate terms of a sequence using a one-step term-to-term rule. 3. Find missing terms in a sequence. 4. Find patterns and rules in sequences. 5. Describe how a pattern sequence grows. 6. Write and use number sequences to model real-life problems. 7. Generate and plot coordinates from a rule. 8. Solve problems and spot patterns in coordinates. 9. Find the midpoint of a line segment. 10. Continue and describe special sequences. 11. Use the term-to-term rule to work out more terms in a sequence. 12. Recognise an arithmetic sequence and a geometric sequence. 13. Recognise, name and plot straight line graphs parallel to the x- or y-axis. 14. Recognise, name and plot the graphs of $y = x$ and $y = -x$. 15. Plot straight line graphs using a table of values. 16. Draw graphs to represent relationships. 17. Generate terms of a sequence using a position-to-term rule. | <ol style="list-style-type: none"> 1. Identify congruent shapes. 2. Use the language of enlargement. 3. Enlarge shapes using given scale factors. 4. Work out the scale factor given an object and its image. 5. Recognise line and rotational symmetry in 2D shapes. 6. Solve problems using line symmetry. 7. Identify all the symmetries of 2D shapes. 8. Identify reflection symmetry in 3D shapes. 9. Recognise and carry out reflections in a mirror line. 10. Reflect a shape on a coordinate grid. 11. Describe a reflection on a coordinate grid. 12. Describe and carry out rotations on a coordinate grid. 13. Translate 2D shapes. 14. Transform 2D shapes by combinations of rotations, reflections and translations. |
| <p style="text-align: center;">Notes/Links/Interleaving</p> <p>Use of the four basic operations (+, -, x, ÷)</p> <p>Estimation</p> <p>Positive and negative integers</p> <p>Measures/units/Scales</p> <p>Shape</p> <p>Area</p> <p>Angles</p> <p>Pattern spotting</p> | <p style="text-align: center;">Additional Higher Content</p> <p>To apply concepts to Problem Solving and reasoning questions.</p> <p>Use multi-step problems.</p> <p>To be able to express results using a range of formal mathematical representations</p> <p>Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems.</p> <p>To make more in depth conjectures about patterns and relationships.</p> <p>Look for proof or counter-examples.</p> | |

Year
8

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 |
|--------|--|--------|--------|--|--------|--------|---|--|---|--------------------------|---------------|---------|
| Autumn | NUMBER | | | AREA AND VOLUME | | | STATISTICS, GRAPHS AND CHARTS | | EXPRESSIONS AND EQUATIONS | | ASSESS | |
| | <ul style="list-style-type: none"> Calculations Divisibility and division Calculating with negative integers Powers and roots Powers, roots and brackets Multiples and factors | | | <ul style="list-style-type: none"> Area of a triangle Area of a parallelogram and trapezium Volume of cubes and cuboids 2D representations of 3D solids Surface area of cubes and cuboids Measures | | | <ul style="list-style-type: none"> Pie charts Using tables Stem and leaf diagrams Comparing data Scatter graphs Misleading graphs | | <ul style="list-style-type: none"> Algebraic powers Expressions and brackets Factorising expressions One-step equations Two-step equations The balancing method | | | |
| Spring | REAL-LIFE GRAPHS | | | DECIMALS AND RATIO | | | | LINES AND ANGLES | | ASSESS AND ENRICH | | |
| | <ul style="list-style-type: none"> Conversion graphs Distance-time graphs Line graphs More line graphs Real-life graphs Curved graphs | | | <ul style="list-style-type: none"> Ordering decimals and rounding Place-value calculations Calculations with decimals Ratio and proportion with decimals | | | | <ul style="list-style-type: none"> Quadrilaterals Alternate angles and proof Angles in parallel lines Exterior and interior angles Solving geometric problems | | | | |
| Summer | CALCULATING WITH FRACTIONS | | | STRAIGHT-LINE GRAPHS | | | PERCENTAGES, FRACTIONS AND DECIMALS | | | ASSESS AND ENRICH | | |
| | <ul style="list-style-type: none"> Ordering fractions Adding and subtracting fractions Multiplying fractions Dividing fractions Calculating with mixed numbers | | | <ul style="list-style-type: none"> Direct proportion on graphs Gradients Equations of straight lines | | | <ul style="list-style-type: none"> Fractions and decimals Equivalent proportions Writing percentages Percentages of amounts | | | | | |

Autumn Term

| Block 1 – Weeks 1 to 4 | Block 2 – Weeks 4 to 7 | Block 3 – Weeks 7 to 9 | Block 4 – Weeks 9 to 11 |
|--|--|--|---|
| <ol style="list-style-type: none"> Use written methods to add and subtract more than two numbers (including decimals). Use mental calculation for multiplication. Estimate answers to calculations. Know and use divisibility rules. Use a written method to divide decimal numbers by integers. Add, subtract, multiply and divide positive and negative numbers, including larger numbers and decimals. Calculate using squares, square roots, cubes and cube roots. Give integers that a square root lies between. Calculate combinations of squares, square roots, cubes, cube roots and brackets. Use a calculator to check answers. Use index notation. Write a number as a product of its prime factors. Use prime factor decomposition to find the HCF and LCM. | <ol style="list-style-type: none"> Derive and use the formula for the area of a triangle. Calculate the area of compound shapes made from rectangles and triangles. Derive and use the formula for the area of a parallelogram. Use the formula for the area of a trapezium. Calculate the volume of cubes and cuboids. Calculate the volume of 3D solids made from cuboids. Sketch nets of 3D solids. Draw 3D solids on isometric paper. Draw plans and elevations of 3D solids. Calculate the surface area of cubes and cuboids. Convert between different measures for area, volume and capacity. Use tonnes and hectares. Know rough metric equivalents of imperial measures. | <ol style="list-style-type: none"> Interpret pie charts. Calculate angles and draw pie charts. Use two-way tables. Calculate the mean from a frequency table. Use tables for grouped data, find modal class and estimate range. Draw and interpret stem and leaf diagrams with different stem values. Find mode, median and range from stem and leaf diagrams. Compare two sets of data using averages and range. Compare two sets of data using the shape of a line graph or pie charts. Draw line graphs to compare two sets of data. Choose the most appropriate average to use. Draw scatter graphs. Describe types of correlation. Draw a line of best fit on a scatter graph. Interpret graphs and charts. Explain why a graph or chart could be misleading. | <ol style="list-style-type: none"> Understand and simplify algebraic powers. Write and use expressions involving powers. Expand brackets. Write and simplify algebraic expressions and formulae using brackets and division. Factorise expressions. Find the inverse of a simple function. Write and solve one-step equations using function machines Solve two-step equations using function machines. |

Notes/Links/Interleaving

Problem solving
 Measures/units
 Written and mental calculations with the basic functions
 Use of formula
 Prime numbers/factors/multiples
 Basic angle knowledge
 Knowledge of 2D shapes
 Expressions
 Formulae
 Drawing skills – charts, graphs, shape

Additional Higher Content

- Understand the significance of multiplying by both terms in a bracket - the expression in the bracket is one factor, the term in front of the bracket is another factor - and that factorisation is the inverse of this.
- Understand that writing and solving an equation is a powerful and efficient method for solving many problems involving an unknown quantity - 'using x for the unknown' is a useful problem solving strategy.

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations.
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples
- Understand the relationships between divisibility rules and relate to factors and multiples.
- Extend the 'rules' for calculations with negative numbers to very large numbers and decimal numbers.
- Know when the negative square root is an appropriate solution to a problem
- Generalise understanding that all areas are product of perpendicular lengths.
- Know that two cuboids can have the same volume but different surface area, but all cubes with the same volume have the same surface area.
- Understand that composite areas/volumes can be calculated by 'subtracting' a shape, as well as by splitting into two different shapes.
- Deepen understanding of correlation by considering examples where there is weak or no correlation, as well as examples where there is correlation that you might not expect (between two seemingly random quantities).
- Understand when a statistical diagram is appropriate/inappropriate to represent a set of data. Eg when to use a bar chart/stem and leaf and when to use a pie chart.
- Solve equations using the balancing method. Understand that powers of variables are written in the same way as powers of numbers, and that ab^2 means $a \times b^2$ and not $(ab)^2$
- Understand when to use brackets when writing an expression, and when the brackets are not needed.
- Understand that in an expression like $(u - 10)/3$, you treat the expression in the numerator as if it were written in brackets, when following the order of operations.

Spring Term

| Block 1 – Weeks 1 to 4 | Block 2 – Weeks 4 to 8 | Block 3 – Weeks 8 to 10 |
|--|--|---|
| <ol style="list-style-type: none"> 1. Use and interpret conversion graphs. 2. Plot conversion graphs from a table of data. 3. Interpret distance-time graphs. 4. Plot distance-time graphs from descriptive text. 5. Draw and use graphs to solve distance-time problems. 6. Plot line graphs from tables of data. 7. Interpret line graphs. 8. Draw and interpret line graphs and identify trends. 9. Draw and interpret non-linear graphs from a range of sources. 10. Draw and interpret curved graphs from a range of sources. | <ol style="list-style-type: none"> 11. Round decimals to two or three decimal places. 12. Round numbers to a given number of significant figures. 13. Round numbers to an appropriate degree of accuracy. 14. Order decimals of any size, including positive and negative decimals. 15. Multiply decimals with up to and including two decimal places. 16. Multiply any number by 0.1 and 0.01. 17. Divide by 0.1 and 0.01. 18. Multiply and divide by decimals. 19. Divide a quantity into three or more parts in a given ratio. 20. Use ratios involving decimals. 21. Use unit ratios. | <ol style="list-style-type: none"> 1. Classify quadrilaterals by their geometric properties. 2. Solve geometric problems using side and angle properties of special quadrilaterals. 3. Identify alternate angles on a diagram 4. Understand proofs of angle facts. 5. Identify corresponding angles. 6. Solve problems using properties of angles in parallel and intersecting lines. 7. Calculate the sum of the interior and exterior angles of a polygon. 8. Work out the sizes of interior and exterior angles of a polygon. 9. Solve problems involving angles by setting up equations. |

Notes/Links/Interleaving

Concept of time
 Place value knowledge of integers
 Measures/units
 Written and mental calculations with the basic functions
 Use of formula
 Basic ratio
 Rounding
 Basic angle knowledge
 Knowledge of the properties of 2D shapes
 Basic Expression
 Basic formulae
 Drawing skills – charts, graphs, shape

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations.
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples - Understand the difference between demonstration (that a theory works for some values) and proof (where it works for all values).
- Understand when it is more appropriate (and more accurate) to round to decimal places than significant figures (or vice versa).
- Understand the impact of rounding.
- Understand how to use unit ratios to make comparison.
- You can use graphs to solve problems, by finding patterns in data, or predicting midpoints or identifying trends, or times when rate of change is slower or faster - easier than from data.
- Understand that the properties of a quadrilateral allow you to name the quadrilateral, and conversely knowing the name of a quadrilateral means you know its side, angle and symmetry properties, and can use them to find missing lengths and angles in quadrilaterals.
- Understand that missing angles in parallel lines can be found using angle facts in different combinations, that often there is more than one way of solving the angle problem, and you may need to find angles that are not labelled on the diagram in order to work out the size of the angles you want.
- Understand that angles in parallel lines prove the angle properties of trapezium, rhombus, parallelogram (eg opposite angles equal) and extend to co-interior angles in these shapes.
- Understand when it is helpful/appropriate to write and solve an equation to solve angle problems (and when it is not).

Summer Term

| Block 1 – Weeks 1 to 3 | Block 2 – Weeks 4 to 7 | Block 3 – Weeks 8 to 10 |
|--|--|--|
| <ol style="list-style-type: none"> 1. Identify fractions more than $\frac{1}{2}$ or less than $\frac{1}{2}$. 2. Order fractions. 3. Add and subtract fractions with any size denominator. 4. Multiply integers and fractions by a fraction. 5. Use appropriate methods for multiplying fractions. 6. Divide integers and fractions by a fraction. 7. Use strategies for dividing fractions. 8. Find the reciprocal of a number. 9. Write a mixed number as an improper fraction. 10. Use the four operations with mixed numbers. | <ol style="list-style-type: none"> 1. Recognise when values are in direct proportion with or without a graph. 2. Plot graphs and reading values to solve problems. 3. Plot a straight-line graph and work out its gradient. 4. Plot the graphs of linear functions. 5. Write the equations of straight line graphs in the form $y = mx + c$. | <ol style="list-style-type: none"> 1. Recall equivalent fractions and decimals. 2. Recognise recurring and terminating decimals. 3. Order fractions by converting them to decimals or equivalent fractions. 4. Change time to decimal hours. 5. Recall equivalent fractions, decimals and percentages. 6. Use different methods to find equivalent fractions, decimals and percentages. 7. Use the equivalence of fractions, decimals and percentages to compare two proportions. 8. Express one number as a percentage of another when the units are different. 9. Work out an amount increased or decreased by a percentage. 10. Use a multiplier to calculate amounts increased or decreased by a percentage. 11. Use the unitary method to solve percentage problems. |

Notes/Links/Interleaving

Concept of time
 Place value knowledge of integers
 Measures/units
 Written and mental calculations with the basic functions
 Basic Fractions/decimals/percentages
 Use of formula
 Basic ratio and proportion
 Rounding
 Basic formulae
 One step equations

Additional Higher Content

- Understand how to express one measure as a percentage of another where the proportion involves large measures (e.g. the proportion of pence out of 1000s of pounds) and the units are not adjacent (e.g. the proportion of a measure given in mm out of a metre measure).
- Understand how to use a repeated multiplier to work out an amount that has undergone more than one percentage change.
- Understand how to use the unitary method to work out an original amount where there has been more than one percentage change (e.g. a decrease of a given percentage and then an increase of a given percentage; or a decrease of a given percentage and then another decrease of a given percentage).

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations.
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples - Understand the difference between demonstration (that a theory works for some values) and proof (where it works for all values).
- Understand the addition/ subtraction/multiplication of fractions with any size denominator, where one or more fraction is negative, or the answer is a negative fraction.
- Apply BIDMAS to fraction calculations, involving the multiplication/division of fractions and to mixed number calculations.
- Apply the inverse relationship of multiplication and division to fraction/mixed number calculations.
- Understand the four operations with mixed numbers, where one or more mixed number is negative, or the answer is a negative mixed number.
- Understand when one (or more) part of a graph shows quantities in direct proportion, but another part does not.
- Understand the relationship between two quantities in direct proportion (increasing or decreasing at the same rate) and the gradient of the graph when the quantities are plotted against each other.
- Identify reflective symmetry between related graphs with different equations.
- Understand what is the same and what is different about a terminating decimal with repeating numbers and a recurring decimal with the same repeating numbers.
- Know how to deal with proportions that involve decimals.
- Compare and interpret more than two proportions.

Year
9

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 |
|--------|---|--------|--|---|--------|--|---|--------|---|----------------------------------|---------------|---------|
| Autumn | INDICES AND STANDARD FORM | | EXPRESSIONS AND FORMULAE | | | DEALING WITH DATA Diversity | | | MULTIPLICATIVE REASONING Diversity | | ASSESS | |
| | <ul style="list-style-type: none"> Indices Calculations and estimates Standard form | | <ul style="list-style-type: none"> Solving equations Substituting into expressions Writing and using formulae Using and rearranging formulae Index laws and brackets Expanding double brackets | | | <ul style="list-style-type: none"> Planning a survey Collecting data Calculating averages Displaying and analysing data Presenting and comparing data | | | <ul style="list-style-type: none"> Enlargement Negative and fractional scale factors Percentage change Compound measures Direct and inverse proportion | | | |
| Spring | CONSTRUCTIONS | | | SEQUENCES, INEQUALITIES, EQUATIONS AND PROPORTION | | | CIRCLES, PYTHAGORAS AND PRISMS | | | ASSESS AND ENRICH | | |
| | <ul style="list-style-type: none"> Using scales Basic constructions Constructing triangles Using accurate scale diagrams | | | <ul style="list-style-type: none"> nth term of arithmetic sequences Non-linear sequences Inequalities Solving equations Proportion | | | <ul style="list-style-type: none"> Circumference of a circle Area of a circle Pythagoras' theorem Prisms and cylinders Errors and bounds | | | | | |
| Summer | GRAPHS | | | PROBABILITY | | | COMPARING SHAPE | | | ASSESSMENT AND ENRICHMENT | | |
| | <ul style="list-style-type: none"> Using $y = mx + c$ Straight-line graphs Simultaneous equations Graphs of quadratic functions Non-linear graphs | | | <ul style="list-style-type: none"> Mutually exclusive events Experimental and theoretical probability Sample space diagrams Two-way tables Venn diagrams | | | <ul style="list-style-type: none"> Ratios in triangles The tangent ratio The sine ratio The cosine ratio Using trigonometry to find angles | | | | | |

Autumn Term

| Block 1 – Weeks 1 to 3 | Block 2 – Weeks 3 to 6 | Block 3 – Weeks 6 to 9 | Block 4 – Weeks 9 to 11 |
|---|--|--|---|
| <ol style="list-style-type: none"> Calculate combinations of indices and brackets, including square brackets. Use index laws to simplify expressions. Calculate combinations of powers, roots, fractions and brackets. Estimate answers to calculations. Understand numbers written in index form that are raised to a power. Understand negative and zero indices. Use powers of 10 and their prefixes. Write large and small numbers using standard form. Enter and read standard form numbers on a calculator. Order numbers written in standard form. | <ol style="list-style-type: none"> Write and solve equations with fractions. Write and solve equations with the unknown on both sides. Use the priority of operations when substituting into algebraic expressions. Substitute values into expressions involving powers and roots. Write and use formulae. Substitute into formulae and then solve equations to find unknown values. Change the subject of a formula. Use the rules for indices for multiplying and dividing. Simplify expressions involving brackets. Factorise an expression by taking out an algebraic common factor. Multiply out double brackets and collect like terms. | <ol style="list-style-type: none"> Identify sources of primary and secondary data. Choose a suitable sample size and what data to collect. Identify factors that may affect data collection and plan to reduce bias. Design and use data collection sheets and tables. Design a good questionnaire. Find the median from a frequency table. Estimate the mean from a large set of grouped data. Construct and use a line of best fit to estimate missing values. Identify and suggest reasons for outliers in data. Identify further lines of enquiry. Draw line graphs to represent grouped data. Draw back-to-back stem and leaf diagrams. Write a report to show survey results. | <ol style="list-style-type: none"> Enlarge 2D shapes using a positive whole number scale factors and centre of enlargement. Find the centre of enlargement by drawing lines on a grid. "Understand that the scale factor is the ratio of corresponding lengths." Enlarge 2D shapes using a negative whole number scale factors. Enlarge 2D shapes using a fractional scale factor. Find an original value using inverse operations. Calculate percentage change. Solve problems using compound measures. Solve problems using constant rates and related formulae. Solve best-buy problems. Solve problems involving inverse proportion. |

Notes/Links/Interleaving

Number and algebra indices, Number skills-(fractions, whole numbers, decimals, percentages)
 Order of operations (BIDMAS), Calculator use, LCM, Tally charts, Mode/median/mean and range,
 2D shapes, money, drawing and construction

Additional Higher Content

- Understand that a combined enlargement, involving positive and/or negative integers and/or fractional scale factors (like a combined transformation), can be described as a single enlargement or single transformation.
- Understand there is more than one method for finding an original amount, given a final amount and the percentage increase or decrease (ie inverse operations, or unitary method). Make decisions about the most efficient method to use.
- Understand that solving problems involving the comparison of compound measures or constant rates may require changing units.
- Understand how to distinguish between situations where quantities are in direct, inverse or not proportional at all.
- Apply understanding of inverse proportion to compound measures.

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations - choose appropriate graphs to represent data.
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples - Understand the difference between demonstration (that a theory works for some values) and proof (where it works for all values).
- Understand when to insert square brackets and when to insert round brackets in a calculation.
- Understand how the rules of indices can be extended to negative powers of products.
- Understand how to calculate numbers in standard form, e.g. add or subtract two numbers in standard form, or multiply or divide two numbers in standard form.
- For a real life (linear) graph, understand the relationship between the formula connecting the variables and the equation of the line, and interpret the gradient in a real life context.
- x to the power $-n = 1/x$ to the power n .
- Any number or letter to a negative power can be written as a reciprocal but if the original number is $-1 < x < 1$ then the final answer is not a fraction.
- When you raise a number in index form to a power, you multiply the powers.
- A quadratic expression has a squared term as its highest power.
- Understand that scale factors for enlargement are not always integer values, and centres of enlargement do not always have integer coordinates.
- Describe enlargements that involve negative and fractional scale factors (by finding the centre of enlargement).

Spring Term

Block 1 – Weeks 1 to 4

1. Use scales on maps and diagrams.
2. Draw diagrams to scale.
3. Make accurate constructions using drawing equipment.
4. Construct accurate triangles.
5. Construct accurate nets of solids involving triangles.
6. Construct and draw accurate scale diagrams.
7. Use scale diagrams to solve problems.

Block 2 – Weeks 4 to 7

1. Use the nth term to generate an arithmetic sequence.
2. Find and use the nth term of an arithmetic sequence.
3. Recognise and continue geometric sequences.
4. Recognise and continue quadratic sequences.
5. Represent inequalities on a number line.
6. Find integer values that satisfy an inequality.
7. Construct and solve equations including fractions or powers.
8. "Write formulae connecting variables in direct or inverse proportion."
9. Use algebra to solve problems involving direct or inverse proportion.

Block 3 – Weeks 7 to 10

1. Calculate the circumference of a circle.
2. Estimate calculations involving pi (π).
3. Solve problems involving the circumference of a circle.
4. Calculate the area of a circle.
5. Solve problems involving the area of a circle.
6. Find the length of an unknown side of a right-angled triangle.
7. Solve problems involving right-angled triangles.
8. Calculate the volume and surface area of a right prism.
9. Calculate the volume and surface area of a cylinder.
10. Convert between m^3 , cm^3 and mm^3 .
11. Find the lower and upper bounds for a measurement.
12. Calculate percentage error intervals.

Notes/Links/Interleaving

Number skills-(fractions, whole numbers, decimals, percentages), formulae, ratio
 Order of operations (BIDMAS), Calculator use, 2D/3D shape, drawing and construction, measure and units, sequences

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples - Understand the difference between demonstration (that a theory works for some values) and proof (where it works for all values).
- Understand why the construction methods for perpendicular and angle bisectors work, by considering properties of intersecting circles and rhombus, and that a circle is the locus of all points equidistant from a fixed point (without using the term locus).
- Construct accurate angles of 45, 30, 60 based on known constructions of perpendicular bisector, angle bisector and equilateral triangle.
- A sequence may contain more than one sequence. For example in a fractions sequence the numerators may follow one sequence and the denominators another. Or in a pattern sequence, black dots may follow one sequence and white dots another. You can find the nth terms for each sequence and combine them.
- Discover/understand the relationship between the 2nd difference of a quadratic sequence and the coefficient of n squared in the nth term. Use this to find the nth term of sequences of the form $n^2 + b$ and $n^2 + b$.
- You can solve linear inequalities by doing the same to both sides, but if you multiply or divide both sides by a negative number, this changes the direction of the inequality sign.
- A quantity can be directly proportional to the square or cube of another quantity. Try to relate direct proportion (linear, square and cubic) to relationships and formulae they have already met in mathematics. NB circles not covered till next chapter.
- Understand that pi is not a number - it is a ratio of the circumference to the diameter for any circle.
- Solve problems involving arcs of circles.
- Understand the effect of estimating pi (including to nearest integer, 1.d.p. and as a fraction 22/7).
- Solve problems involving sectors of circles.
- Understand how to use Pythagoras's Theorem to show that a triangle is NOT a right angled triangle.
- Understand when a decimal value is not appropriate for an error bound or interval, and how this can change the inequality signs.

Summer Term

| Block 1 – Weeks 1 to 4 | Block 2 – Weeks 4 to 7 | Block 3 – Weeks 7 to 10 |
|---|---|--|
| <ol style="list-style-type: none"> 1. Draw a graph from its equation, without working out points. 2. Write the equation of a line parallel to another line. 3. Compare graph lines using their equations. 4. Draw graphs with equations like $ax + by = c$. 5. Rearrange equations of graphs into $y = mx + c$. 6. Rearrange equations of graphs into $y = mx + c$. 7. Solve problems using simultaneous equations. 8. Draw graphs with quadratic equations in the form $y = x^2$. 9. Interpret graphs of quadratic functions. 10. Draw and interpret graphs showing inverse proportion. 11. Draw and interpret non-linear graphs. | <ol style="list-style-type: none"> 1. Identify mutually exclusive outcomes and events. 2. Work out the probabilities of mutually exclusive outcomes and events. 3. Calculate estimates of probability from experiments. 4. Decide whether a dice or spinner is unbiased. 5. List all the possible outcomes of one or two events in a sample space diagram. 6. Decide if a game is fair 7. Show all the possible outcomes of two events in a two-way table. 8. Calculate probabilities from two-way tables. 9. Draw Venn diagrams. 10. Calculate probabilities from Venn diagrams. | <ol style="list-style-type: none"> 1. Use congruent shapes to solve problems about triangles and other polygons. 2. Work out whether shapes are similar, congruent or neither. 3. Solve problems involving similar triangles. 4. Use conventions for naming the sides of a right-angled triangle. 5. Work out the tangent ratio of any angle. 6. Use the tangent ratio to work out an unknown side of a right-angled triangle. 7. Work out the sine ratio of any angle. 8. Use the sine ratio to work out an unknown side of a right-angled triangle. 9. Work out the cosine ratio of any angle. 10. Use the cosine ratio to work out an unknown side of a right-angled triangle. 11. Use the trigonometric ratios to work out an unknown angle in a right-angled triangle. |

Notes/Links/Interleaving

Number skills-(fractions, whole numbers, decimals, percentages), formulae, ratio, Calculator use, 2D/3D shape, measure and units, sequences, linear equations, angles, basic probability

Additional Higher Content

- Use congruent shapes to solve problems about shapes other than triangles and quadrilaterals.
- Identify where shapes are similar, congruent or neither, when descriptions only (NO DIAGRAMS) are given.
- Solve problems involving similar shapes, other than triangles.
- Understand how to use the tangent ratio and Pythagoras to find lengths of all sides of a right angled triangle.
- Understand that given an angle and the opposite side in a right-angled triangle, it is possible to use tan to find the adjacent side and then Pythagoras to find the hypotenuse. However, it is more efficient to use the sine ratio.
- Use the tangent or sine ratio to find lengths in shapes made up of right angled triangles.
- Understand bearings and use trigonometry to solve bearing problems (distances ONLY; NOT angles).
- Identify right-angled triangles in cubes and cuboids.
- Use trigonometry to find missing lengths and angles in cubes and cuboids

Additional Higher Content

- To apply a selection of concepts to Problem Solving and reasoning questions.
- Use multi-step problems
- To be able to express results using a range of formal mathematical representations - choose appropriate graphs to represent data.
- To make more in depth conjectures about patterns and relationships.
- Look for proof or counter-examples - Understand the difference between demonstration (that a theory works for some values) and proof (where it works for all values).
- Write the equation of a line perpendicular to another line.
- Understand the relationship between the gradients of perpendicular lines.
- Find the equation of a line between two points.
- Understand that simultaneous equations may not both be linear, eg could be linear/quadratic, and therefore could have more than one solution.
- Draw cubic graphs, recognise their features and distinguish between them and linear or quadratic graphs.
- Understand that 'A' and 'not A' are mutually exclusive and so $P(A) + P(\text{not } A) = 1$, which leads to $P(\text{not } A) = 1 - P(A)$.
- Understand the importance of knowing whether events are mutually exclusive before attempting to work out $P(A \text{ or } B)$.
- Understand that you can calculate theoretical probabilities from a two way table of possible outcomes, which is equivalent to a sample space diagram, and that you can calculate estimates of probabilities (Experimental probabilities) from two-way tables of survey or experimental results.
- Understand that Venn diagrams represent sets of data that are not mutually exclusive, and allow us to calculate probability of $P(A \text{ and } B)$ when A and B are not mutually exclusive. Begin to understand that when A and B are not mutually exclusive, $P(A) + P(B)$ counts the intersection of A and B twice.