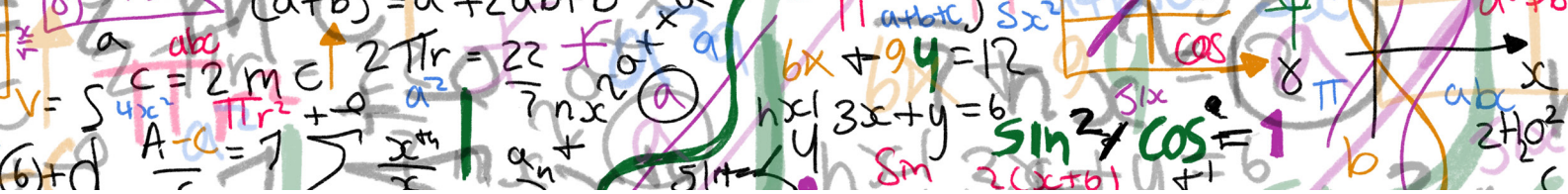


The Halifax Academy

# Maths

"It's not that I'm so smart, it's just that I stay with problems longer."

*Albert Einstein*

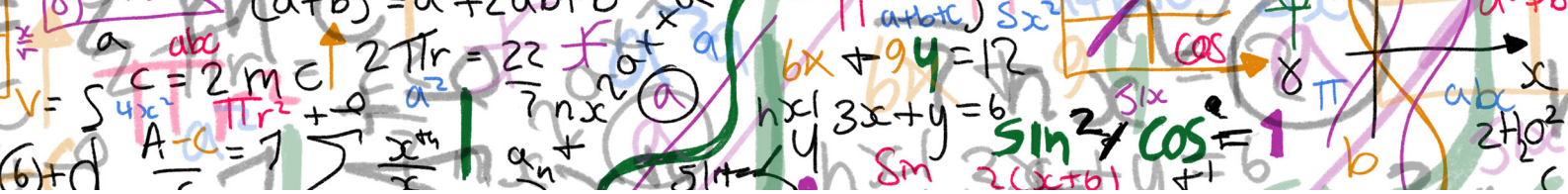
Our approach to maths combines close attention to the national curriculum with a focus on meeting our own goal of producing happy, confident and world-aware students, achieved through the three pillars of **Heart, Mind, Connect.**

We follow the recommendations of the National Centre for Excellence in the Teaching of Maths, using the 'Mastery Approach' to build a solid and long-term understanding with plenty of depth and detail. This approach underpins our entire teaching programme and is particularly well suited to our pupil demographic, leaving individuals with the skills and confidence not only to master everyday numeracy but to actually think like a mathematician and solve complex problems. To keep our teaching age-appropriate and always engaging, we use a staged lesson structure right across the different year groups, progressing naturally from physical and pictorial representations through to fully abstract calculations for older pupils. Methods like bar modelling, double number lines and manipulatives form an integral part of teaching here, and together they help to keep our lessons varied, interesting and effective.

We also encourage teamwork and good communication, asking pupils to evidence their workings, write and talk about maths, and provide supporting documents when it's relevant. These are great ways for us to use maths as a way of giving learners a range of transferable skills, which will help them in their later education and working lives. Enjoyment is crucial, of course, and we work hard to provide lessons that are fun and relatable, with cultural references to characters who our pupils are widely familiar with.

The way we teach maths helps to provide pupils with wider life skills and awareness too, which help them in every area of their lives. Our 'no fear' philosophy encourages them to experiment, take risks and embrace the threat of failure as an opportunity to learn and grow. We provide a supportive space in which pupils can safely learn how to struggle and persevere, and we consciously expose them to new challenges which help to build their overall resilience. To make sure our lessons are always inclusive we focus on mathematical fluency as well as adopting a metacognitive approach. This makes learning as easy and rewarding as possible, especially for those who might otherwise have difficulties. We also choose our examples of real-world maths and mathematicians very carefully, keeping them relevant to the everyday lives of our learners by engaging with topical themes and events like Black History Month.

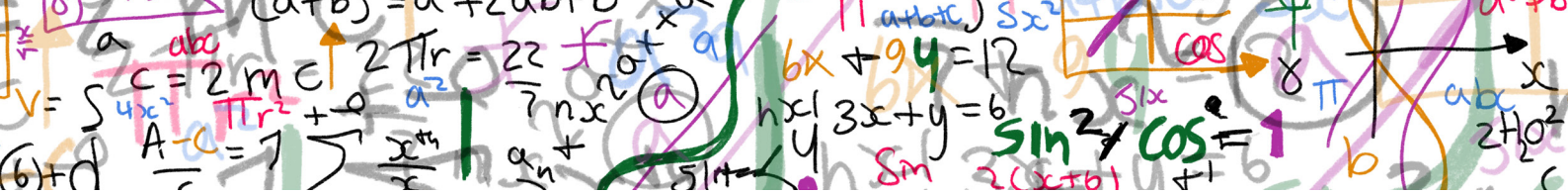
In terms of helping our pupils connect with the wider world, our lessons explore the many possible careers choices made available through maths, and we discuss everything from working in medicine and finance through to 3D design and architecture. The fact that many of our teaching staff join us from wide-ranging professional backgrounds helps with this, giving pupils an invaluable insight into the scope of opportunities maths can provide. Above all, we make sure that our love and enthusiasm for maths is passed on in the classroom, and that every individual is given the chance to develop problem-solving skills they can really be proud of, as well as learn to their full potential.



## Curriculum Overview - Maths

## EYFS Statutory Framework 2021 - Mathematical Development NC - Mathematics

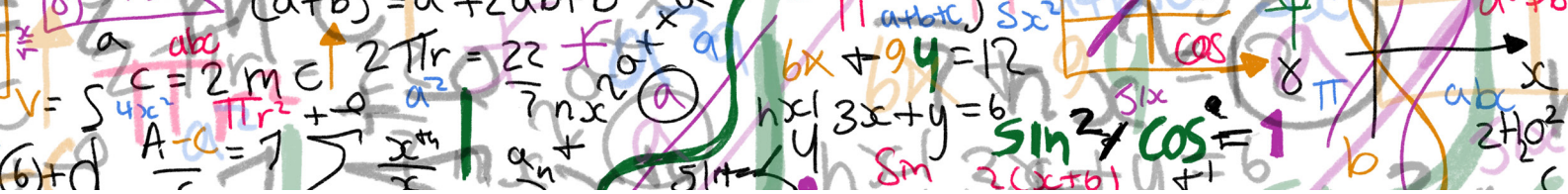
| | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New learning | **Early mathematical experiences**<br>Classifying, comparing, matching and ordering pattern and early number.<br><br>Recognise, describe, copy and extend colour and size patterns, count and represent the numbers 1 to 3, estimate and check by counting<br><br>**Numbers within 6**<br>Count up to six objects, one more or one fewer, order numbers 1 -6, conservation of numbers within six<br><br>**Addition and subtraction within 6**<br>Explore zero, explore addition and subtraction.<br><br>Measures and time.<br><br>Estimate, order, compare, discuss and explore capacity, weight and lengths.<br><br>Calendar and time.<br><br>Days of the week, seasons, sequence daily events. | **Shape and sorting**<br>Describe and sort 3-D shapes, describe position accurately.<br><br>**Numbers within 10**<br>Count up to ten objects, represent, order and explore numbers to ten, one more or fewer, one greater or less.<br><br>**Addition and subtraction within 10**<br>Explore addition as counting on and subtraction as taking away.<br><br>**Grouping and sharing**<br>Counting and sharing in equal groups, grouping into fives and tens.<br><br>Relationship between grouping and sharing.<br><br>**Number patterns within 15**<br>Count up to 15 objects and recognise different representations, order and explore number patterns to 15, one more or fewer | **Doubling and halving**<br>Solve problems, including doubling, halving and sharing, explore the relationship betweendoublingandhalving<br><br>**Shape and pattern**<br>Describe/sort shapes; recognise continueandcreatepatterns<br><br>**Securing addition and subtraction facts**<br>Commutativity; comparing two amounts, doubling and halving<br><br>**Number patterns with 20**<br>Count up to 10 and beyond with objects, represent, compare and explore numbers to 20, one more or fewer<br><br>**Money and measures**<br>Compare/describe coins capacities, volumes, weights and lengths<br><br>**Exploration of pattens within number**<br>Explore numbers and strategies, recognise and extend patterns, apply number, shape and measures knowledge, count forwards and backwards |



## Curriculum Overview - Maths

# Phase 1

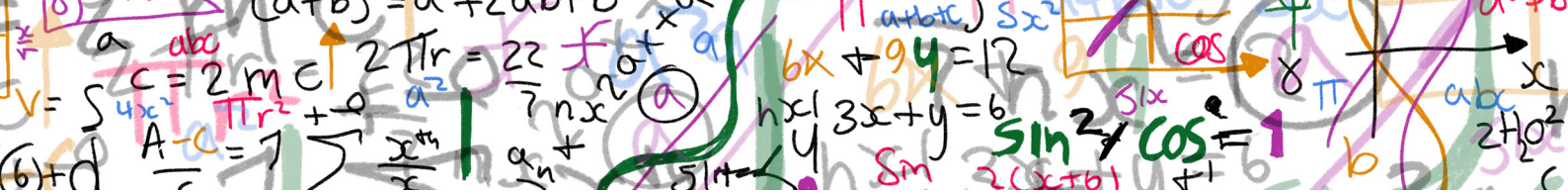
| EYFS | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Early mathematical experiences** Classify, match and compare objects based on one attribute. Group into sets and compare further. **Pattern, shape and early number** Describe and extend patterns. Estimate objects to 6 and check by counting. Represent and count numbers to 3. Find one more and one less. Concept of zero. Addition and subtraction within 6. **Measures** Estimate & compare, capacities, weights and lengths. Describe and sort 3D shapes. Describe position. | **Number** Count up to ten reliably and up to 15 with objects. Order up to 15. One more one less. Introduction to addition and subtraction as counting on and taking away. Sharing into equal groups, fives and tens and link to sharing. Explore the relationship between doubling and halving. **Measures** Days of the week and sequencing daily events. **Shape** Describe and sort 2-D and 3-D shapes, recognising and completing patterns. | **Number** Explore commutativity, addition & subtractions. Compare two amounts. Reliably count to 10 and explore numbers to 20. Estimate and count. Find one more and one fewer, leading to counting forwards and backwards. Further develop grouping and sharing. **Shape** Compare shapes. Recognise, continue & create patterns. **Measures** Recognise coins and values. Form combinations to 20p and change from 10p. Describe capacities. Estimate, compare and order lengths, volumes & weights. |
| **Year 1 Manipulation and making links** | **Term 1** | **Term 2** | **Term 3** |
| New Learning | **Number** Represent and explain addition & subtraction, using known facts and "make 10 strategies". Investigate repeating number patterns. **Geometry** Use and follow positional language. Identify, describe and classify common 2-D & 3-D shapes. | **Number** Model, explain and choose addition and subtraction strategies. Representations and comparisons of 2-digit numbers. Understand and compare differences. Link addition and subtraction to equations. Count in 2s, 5s and 10s. Identify 1/2 and 1/4 of shapes and quantities. **Measures** Read write and tell time in full and half hour increments, linking whole and half turns to time. Compare lengths and masses using cm & kg. | **Number** Read, write compare and order numbers to 100. Find 10 more or fewer. Confident use of number bonds to 20. Sharing into equal groups, connecting halving with fractions. Explore arrays. Addition and subtraction of 2 digit with 1-digit numbers. Addition and subtraction with regrouping. **Measures** Name units and explain their value. Represent values in different ways, find change within a pound. Explore litres and fractions of capacities. |
| Review | • One more and one less<br>• Doubling and halving<br>• Commutativity<br>• Identify, represent, compare and order numbers to 20<br>• Describe and sort 2-D and 3-D shapes | • Doubling and halving<br>• Apply 'Make Ten' strategy<br>• Describe and complete number patterns<br>• Sequencing daily activities | • Doubling<br>• Identify number patterns<br>• Coin recognition and values<br>• Compare lengths and capacities |



# Phase 2

| Year 2<br>Manipulation and making links | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Number** Addition and subtraction with two 2-digit numbers, using number bonds as appropriate. Addition of up to 3-digit numbers. Explore patterns including odds and evens, 10s and 1s. Different representations of multiplication and division. Times tables of 2, 5, 10 by skip counting and doubling **Representing data** Represent and interpret pictograms, block diagrams, tables and tally charts. **Measures** Draw, measure and compare lengths in centimetres and meters, using <, > and = | **Number** Fractions as part of a whole, relating to division. Find equivalent fractions. Addition and subtraction using regrouping, "Make 10" and "Round and Adjust" **Measures** Add and subtract £ and p accurately, tell time in halves, quarters and 5-minute increments. Calculate durations in minutes and second. **Geometry** Compare and sort 2-D and 3-D shapes, faces on 3-D shapes. Use positional language to describe direction and rotation. | **Number** Extend addition and subtraction strategies to equations. Explain and use column method for addition and subtraction. Multiplication and division facts for 3 & 4, relating 4 to doubling the 2 times table. Recognise inverse relationships. **Measures** Read scales. Read and measure temperatures. Introduce millilitres and grams and estimate & order masses and capacities, using symbols. |
| Review | • Read, write, represent, partition, compare and order numbers to 100<br>• Commutativity | • Sequence daily events<br>• Recognise coins and notes<br>• Calculate change | |

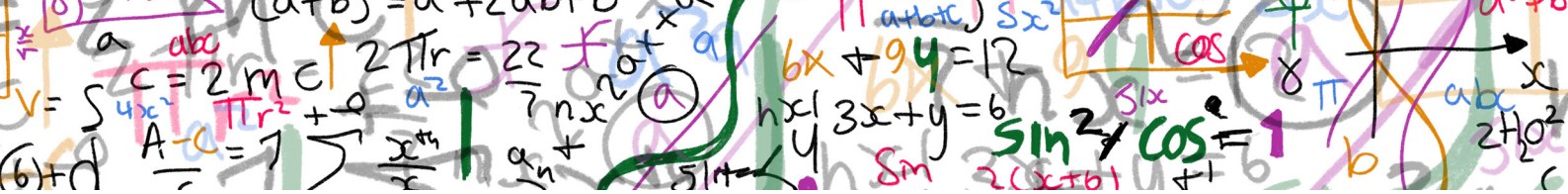
| Year 3<br>Building independence and autonomy | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Number** Find 100 more, 100 less. 3-digit place value. Round to the nearest 100, 1000. Calculate mentally and formally using a range of strategies. **Measures** Add and subtract lengths and calculate perimeter. **Data** Collect, present and interpret data in charts and tables. | **Number** Recall multiplication and division facts for 2, 3, 4, 5, 6, 8 and 10. Multiply and divide two-digit numbers by 2, 3, 4 & 5. Understand fractions as part of a whole set and as numbers. Compare, add and subtract fractions. Multiply and divide by 10 & 100. **Measures** Tell, record and order time in analogue and digital. Convert between analogue and digital. Calculate durations. | **Number** Order, compare and round numbers beyond 100. 100 more, 100 less. **Measures** Weigh and compare masses and capacities with mixed units. Read scales with different intervals. Identify angle types, parallel and perpendicular lines. Recognise quarter turns. Draw and measure 2-D shapes, including perimeter. Compare 3-D shapes. |
| Review | • Read, write, partition, order and compare numbers to 100, understanding place value<br>• Find 10 more or less<br>• Calculate mentally using known facts, round and adjust, near doubles, adding on to find the difference<br>• Measure, draw and compare lengths | • Multiplication and division facts for 2, 3, 4<br>• Part-whole relationships<br>• Commutativity and inverse relationships | • Find 10 and 100 more or less<br>• Mental addition and subtraction strategies<br>• Recall and use multiplication and division facts for 6- and 8-times table<br>• Estimate mass and capacity |



## Curriculum Overview - Maths

# Phase 2

| Year 4<br>Building independence and autonomy | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Number** 4-digit place value. Read, write, represent, order compare and round (to the nearest 1000). Reason to select appropriate addition and subtraction strategies, both mental and written. Use short multiplication and division.<br>**Data** Read, interpret, construct and compare bar charts and time graphs. | **Number** Multiplication facts for 7 & 9. Equivalent fractions and improper fractions, including addition and subtraction of common denominators. Decimal place value, ordering decimals and understanding equivalence with tenths, quarters & halves. Multiply and divide decimals by 10 & 100.<br>**Geometry** Reason with area of rectangles and other rectilinear shapes.<br>**Measures** Convert between units of time. | **Number** Know Roman numerals up to 100 and experience place value of other number systems. Number sequences and patterns.<br>**Geometry** Select and convert appropriate units of measurement. Describe & plot coordinates and describe translations as horizontal and vertical displacement Identify 3-D shapes from 2-D representations Identify lines of symmetry. Explore strategies to problem solve: trial and error, systematic approaches.... |
| Review | • Find 10, 100 or 1000 more or less<br>• Round numbers to the nearest 10, 100<br>• Read, interpret and construct pictograms | • Calculate perimeter<br>• Analogue to digital, 12- hour and 24-hour<br>• Multiply and divide by 10 and 100 | • Classify, compare and order angles<br>• Compare and classify 2-D shapes |



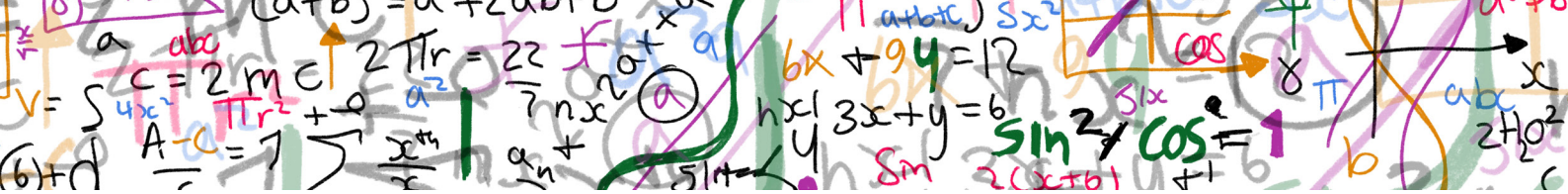
# Phase 3

| Year 5 Formalisation and consolidation | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Number** Read, write, order and compare numbers up to one million. Round them to the nearest power of 10. Use rounding to estimate Prioritise efficient calculation strategies. Read Roman numerals up to M Identify multiples and factors and investigate prime numbers. Illustrate and explain formal multiplication and division strategies such as short and long.<br>**Data** Complete, read and interpret data presented in line graphs.<br>**Shape & Measures** Read and interpret timetables including calculating intervals. Estimate area of nonrectilinear shapes. | **Number (FDP)** Read, write, order compare and round decimals to the nearest whole. Represent, identify, name, write, order and compare fractions (including improper and mixed numbers). Explore percentage, decimal, fractions equivalence. Calculate fractions of amounts. Add, subtract fractions with denominators that are multiples of the same number. Multiply fractions (and mixed numbers) by a whole number. Calculate intervals across zero.<br>**Geometry** Coordinates in all four quadrants. Describe reflections. Measure and draw angles with a protractor. Use angle facts to calculate missing angles. | **Number** Use mental and formal strategies to add, subtract & multiply decimals. Use cube numbers and notation Interpret remainders.<br>**Geometry** Further 2-D shape classification, reasoning about regular/irregular, properties of diagonals.<br>**Measures** Convert between all metric units of length mass and capacity and units of time. Estimate & convert units of volume. Use approximate imperial conversions.<br>**Data** Calculating the mean. |
| Review | • Multiply and divide by 10, 100 and 1000 (integers)<br>• Read Roman numerals up to 100<br>• Illustrate and explain the written method of column addition and subtraction<br>• Use a range of mental calculation strategies<br>• Investigate area and perimeter of rectilinear shapes | • Add fractions with common denominators<br>• Classify, compare and order angles<br>• Describe translations<br>• Plot coordinates in first quadrant | • Multiply and divide by 10, 100 and 1000 involving decimals<br>• Negative numbers and calculating intervals across zero<br>• 2-D representations of 3-D shapes.<br>• Classify 3-D shapes |

Curriculum Overview - Maths

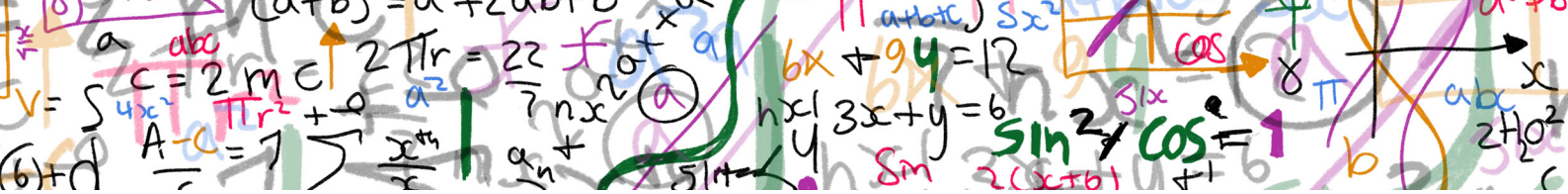
# Phase 4

| Year 9<br>Application and extension | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| Review | • Fractions decimals & percentage conversions<br>• Four operations with fractions<br>• °olving linear ˜equations<br>• Drawing graphs of the form y=mx+c or ax+by=c | • Review all angle facts (around a point, on a line, at intersections and parallel lines and transversals).<br>• Angles in triangles<br>• Ratio, including unit ratios<br>• Ratios and constants of proportionality | • F 5 Œ © K à = K ˜ ° · © à Œ ù = ˜ ï 2 · 5 © · K Œ Ò · ˜ © k · 5 = à =<br>• ¥ · 5 © · K Œ Ò · ˜ © Œ ù © S ù Œ K à =<br>• Å = · ˜ Ñ ˜ © 2 Œ = = ˜ Œ ° 2 5 K 5 Œ © K 5 |
| CEIAG | Careers in medicine (linking to probability) | Careers in surveyance and cartography (linking to Pythagoras ˜ Œ ° ˜ ¾ 5 à Ò · K 5 r) | Careers in science (linking to exponential growth and decay) |



# Phase 5

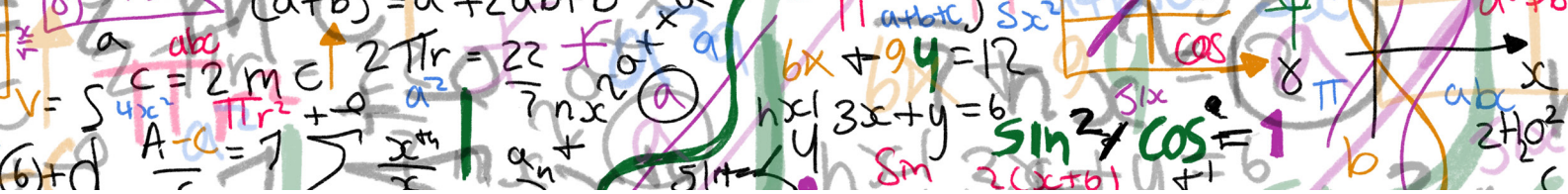
| Year 10 Application and extension | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| New Learning | **Number** Further powers and roots, leading to fractional and negative, operations on numbers in index form. Manipulate and calculate with standard form.<br><br>Understand surds and how to manipulate them including rationalisation. Understand the difference between rational and irrational numbers. Change recurring decimals into fractions and vice versa.<br><br>**Algebra** Finding nth terms of arithmetic and geometric sequences.<br><br>Find the nth term of a quadratic. Expand binomials and factorise quadratics including completing the square. Plot quadratic graphs and solve quadratics through a range of strategies, including graphical estimates. Simplify and manipulate algebraic fractions. Solve simultaneous equations graphically and algebraically, including where one is a quadratic. | **Number** Calculate proportional change including compound changes and using the language of growth and decay. Round to any degree of accuracy. Find lower and upper bounds of both discrete and continuous quantities, using appropriate inequality notation.<br><br>**Probability** Calculate combined probabilities using addition law for mutually exclusive and multiplication for (in)dependent events as appropriate. Use conditional probability. Represent combined probability problems using tree and Venn diagrams.<br><br>**Geometry** Undertake and combine all four transformations on the coordinate grid.<br><br>Find areas and perimeters of rectilinear shapes and find circumference and areas of circles and parts thereof. Calculate surface area and volumes of 3D solids including cones, spheres and composite solids. Construct plans and elevations of solids. Convert between units of area and volume. | **Geometry** Understand similarity, finding missing sides in similar shapes and calculating the relationship between lengths, areas & volumes.<br><br>Understand and use trigonometric ratios, linking them to similarity. Derive and use key exact trigonometric values. Use trigonometric relationships within non right-angled triangles. Apply Pythagoras' theorem to problems in three dimensions, including repeated use of the theorem. Identify right-angled triangles in three-dimensional shapes and use trigonometry to find missing sides and angles.<br><br>**Data** Understand different data types and data collection/ sampling strategies, including their relative merits. Use median and ranges to comment on distributions. Calculate estimates of statistical measures from grouped data. |



## Curriculum Overview - Maths

# Phase 5

| Year 10 Application and extension | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| Review | · Express repeated multiplication using index notation<br>· Efficient use of a calculator, when appropriate<br>· Recognise and describe arithmetic and geometric sequences<br>Apply the order of operations to numerical calculations and in algebraic situations | · Manipulate and calculate with fractions, decimals<br>· Find and calculate with probabilities<br>· Use different representations of probability, including sample space diagrams<br>· Link relative frequency with experimental probability and make predictions<br>· Find areas and perimeters of rectilinear shapes and find circumference and areas of circles<br>· Convert between units of length | • Recognise and use ratio notation, simplify ratios, compare ratios to fractions, decimals and percentages<br>• Share a quantity in a given ratio and solve simple ratio and proportion problems<br>• Find missing sides in right-angled triangles given the other two sides<br>• Model practical situations with right-angled triangles and so find missing lengths<br>• Identify whether a triangle is right-angled by considering the lengths of its sides<br>• Calculate the mean, median and mode and range of ungrouped data<br>• Make comparisons between sets of data using summary statistics |



# Phase 5

| Year 11 Application and extension | Term 1 | Term 2 | Term 3 |
|---|---|---|---|
| Application and extension of key skills | **Data** Understand methods of collating and presenting data including bar and pie charts and line graphs for time series, comparing and recognising trends. Understand when graphs are misleading. Plot bivariate data, recognising outliers and correlation. Draw and use lines of best fit.<br><br>Construct and interpret cumulative frequency graphs and box plots. Construct and interpret histograms with unequal class intervals.<br><br>**Geometry** Represent and calculate with two-dimensional vector as a column vector. Use vectors to prove geometric arguments. Use angle facts to find missing angles in increasingly complex situations, including justifying proofs.<br><br>Prove and use angle facts including circle theorems. Understand and use bearings.<br><br>**Algebra & Graphs** Form and solve inequalities in one or two variables. Use set notation or graphical representation to show solutions to inequalities. Solve quadratic inequalities.<br><br>Solve problems involving coordinates and midpoints. Plot straight line graphs, understanding input and output and properties of parallel and perpendicular lines. Rearrange simple formulae. Create graphs of real-life situations and of other polynomials, exponential functions.<br><br>Evaluate sine, cosine and tangents of angles greater than 90°. Sketch sine, cosine and tangent graphs and use them to solve simple trigonometrical equations. | **Geometry** Undertake constructions and understand conditions for congruency. Undertake standard constructions to identify the locus of points following a given rule.<br><br>**Higher course only**<br><br>**Further algebra and graphs** Create more complex equations, including from real-world situations. Simplify and manipulate more complex equations, rearranging formulae where the subject appears more than once. Understand and use function notation, finding inverse and composite functions. Sketch and identify transformations of graphs.<br><br>Understand the meaning of iteration, using iterative processes and recurrence formulae. Find approximate solutions to equations through:<br><br>· Trial and improvement/ decimal search<br><br>· Sign change methods<br><br>Calculating estimates of gradients of graphs using gradients of tangents. Interpret gradients of real-world graphs. Calculate estimates of areas under graphs. Interpret areas under real-world graphs.<br><br>**Reasoning and proof** Develop and critique mathematical arguments. Use algebraic reasoning to decide if expressions are equivalent. Construct algebraic proofs: such as to verify whether two straight lines are perpendicular. | **Consolidation and revision** |