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|  **Mathematics Curriculum Overview** |

***Intent of the Mathematics Curriculum:***

* ***To promote a love of learning***
* ***To develop opportunities for all students to succeed***
* ***To develop key concepts at KS3 allowing learners to successfully transition to GCSE***
* ***To develop problem solving skills and resilience***
* ***To ensure all children have access to an engaging and challenging curriculum***
* ***To highlight the uses of maths in real-life and future careers***
* ***To allow opportunities for pupils to assess/ be assessed against key objectives and provide clear next steps***
* ***To allow time for recall/ retrieval and subsequent improvement***

***The intent of our curriculum documentation is to outline the knowledge that all students are entitled to learn at a granular level. This ensures that we carefully plan how this will be taught and how it will be assessed.***

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| **Term** | **Year 9 Overview** | **Year 10 Overview** | **Year 11 Overview** |
| **Autumn** | **HT1** | **Place Value and Calculations** Students will learn/ recap knowledge on how to perform the 4 operations at different levels including with decimals and negative numbers. Students will also learn the correct order of operations and how we apply this to multi-step problems **Comparing and Estimating** Students will learn how to use the inequality symbols to describe numbers or a set of numbers including fractions and decimals. They will also learn how to convert between and order sets of fractions, decimals and percentages. Students will explore ways of approximating numbers and checking answers | **Integers, Decimals and Place Value** Students will further develop their calculation skills using calculator and non-calculator methods. They will consider positive and negative numbers and powers of 10, as well as ensuring they have a confident grasp of using the correct order of operations. Students will be extended to perform to four operations with decimals. Students will be encouraged to check answers by rounding or using inverse operations. Some students will be introduced to standard form.**Types of Numbers** Students will recall knowledge of square and cube numbers and their roots. Students will learn how to perform calculations on numbers in index form including applying the laws of indices. Some students will consider negative and fractional indices.Students will recall how to identify factors and multiples. They will be encouraged to use Venn diagrams to sort information. Prime factorisation will be introduced to students who have not covered this previously. Students will further develop the uses of prime factor decomposition.  | **Graphs** Students will recall how to draw, label and scale axis, plot and identify points. They will learn how to plot and draw straight line graphs in the form y=a, x=a y=x and y=-x as well as *y=mx+c* and *ax + by = c.* Student will learn about gradient and some students will discover parallel and perpendicular lines. Students will also consider linear graphs as a tool to solve equations. Students will consider how we can represent real life situations on graphs such as conversions and fuel bills. Students will also learn how to construct distance- time and velocity- time graphs and how to interpret information from them**Ratio and Proportion** Students will recall how to express the division of a quantity as a ratio and how to share in a given ratio. Students will learn how to use ratios to convert between unit of measure or currencies in real life context. Students will consider problems involving mixing, best buys, scaling up and conversions. Some students will be introduced to the concept of direct proportion, understand the relationship *y=kx*, and be able to recognise this in graph form.  |
| **HT2** | **Angles** Students will recall types of angles and basic angle facts including angles on a straight line and around a point. Students will further investigate angles in polygons. More able pupils will consider interior and exterior angles.**Algebraic Proficiency** We will ensure students understand the vocabulary and notation of algebra. Students will learn how to manipulate and simplify algebraic expressions. They will also learn how to substitute into expressions and formula | **Algebraic Proficiency** We will ensure students understand the vocabulary and notation of algebra. Students will further develop their skill of manipulation including applying the laws of indices to algebraic expressions. They will also learn how to substitute into expressions and formula.**Tables, chart and Graphs**Students will recall how to present data in simple charts and graphs such as bar charts and pictograms. Students will be introduced to Stem and leaf diagrams as a way of representing data. They will concentrate on the mode at this point and how to find the mode from different charts, graphs and tables. Other averages may be discussed but will be covered in more depth later in the year. | **Transformations and Vectors**Students extend their learning from Key Stage 3, exploring how shapes can be transformed, relating these to symmetry and properties of shapes when appropriate. There is an emphasis on describing as well as performing transformations as using the language promotes deeper thinking and understanding.Students will have met vectors to describe translations during Key Stage 3. This will be revisited and used as the basis for looking more formally at vectors, discovering the meaning of − 𝒂 compared to 𝒂 to make sense of operations such as addition, subtraction and multiplication of vectors. This will connect to exploring ‘journeys’ within shapes linking the notation 𝐴𝐵 with 𝒃 − 𝒂 etc.**Pythag and Trig** Students recall knowledge of square numbers and roots and investigate the relationship between the sides of a right-angled triangle. Some students may have accessed this content in year 9. Students will explore using the theorem in a variety of context including on a coordinate axes with some considering the applications in 3 dimensions. Trigonometry is introduced as a special case of similarity within right-angled triangles. Emphasis is placed throughout the steps on linking the trig functions to ratios, rather than just functions.  |
| **Spring** | **HT3** | **Numbers and the Number System**This topic extends students’ previous knowledge on types of numbers including factors, multiples and primes. Students will learn how to find common factors and multiples and more able students will consider prime factorisation. Pupils will also explore powers and roots. **Ratio and Proportional Reasoning** Students will be introduced to ratio notation and consider how to simplify ratios or convert into the form 1:n and n:1. Students will learn how we can share in a given ratio and understand the connection between ratios and fractions. Students will also solve best buy problems and problems involving similar shapes. | **Further Charts and Graphs** Students will learn how to create and interpret pie charts. Students will recall their angle facts/ skills in order to represent data on a pie chart. Lower ability pupils may use simple fractions initially. Students will also learn how to create and interpret scatter graphs identifying outliers and using a line of best fit to make predictions.**Fractions and Percentages** Students will initially concentrate on calculating with fractions developing their skills in this area before considering how we can convert between fractions and decimals and percentages. Students will then develop their percentage skills. Students will learn how to calculate percentages both with and without a calculator. Calculator methods are essential for repeated percentage change and which will be taught in year 11 but can be introduced here to some pupils. | **Probability**  Students build on their prior learning to calculate the probabilities of single and combined events. Students will be introduced to a variety of diagrams that support probability such as sample space, Venn and Two-way tables. Some students will look at tree diagrams considering how probabilities change with and without replacement. **Multiplicative Reasoning** Students will recall percentage skill and be introduced to repeat percentage problems, compound interest and reverse percentage problems. Students will consider compound measures of speed, density and pressure and some students will be able to convert between units of speed. Students will be introduced to direct and inverse proportion problems solving using algebraic or graphical representations.**Constructions, Loci and Bearings** Students will further develop skills to measure and draw accurately as well as using Isometric paper to draw 3D objects. They will consider how objects look from different viewpoints and draw front and side elevations and plans of shapes made from simple solids.Students will develop their knowledge of Loci from KS3. The learn how to construct lines and angles using a compass with a focus on constructing congruent triangles. Accurate drawing and use of scales will be vital, as is the use of parallel line angles rules covered at Key Stage 3. Students will also be introduced to bearings. With opportunities to reinforce their understanding of trigonometry and Pythagoras from earlier this year, applying their skills in another context as well as using mathematics to model real-life situations.  |
| **HT4** | **Calculating with Fractions, Percentages and decimals** Students will further develop skills taught in HT1 and apply the 4 operations to fractions. They will also learn how to find fractions of amounts and percentages of amounts. Students will also learn about percentage change. More able pupils will consider repeat percentage change, compound interest and reverse percentage problems.**Solving Equations and Inequalities** Students will start by revisiting their basic skills on algebraic notation and manipulation. Students will then explore ways of solving equations and inequalities. | **Equations and Inequalities** Students will start by revisiting their basic skills on algebraic manipulation and ways of solving equations and inequalities. Students will further develop their ability to solve a range of different types of equations and inequalities and show solution sets on number lines. Some students will also be introduced to simultaneous linear equations and quadratic equations.**Sequences** Students will further develop their ability to create and describe number and picture sequences. Students will be encouraged to use the Nth term as a method of generating and describing a sequence. Students will consider sequences with negative, fractional and decimal terms. Some students will consider quadratic sequences. | **Constructions, Loci and Bearings Continued** **Further Shape - Circles, Cylinders and Spheres** Some students will already have knowledge of calculating area and circumference of circles when stretched in year 10, for others this will be a new topic. Students will know or learn the formulas for area and circumference and consider how to apply them when calculating volume or surface area of cylinders. Students will also be introduced to the formula for the volume of a Sphere. |
| **Summer** | **HT5** | **Calculating Space** Students will further develop their knowledge of area and perimeter. Students will learn how to use and apply formula to calculate the areas of different shapes. Students will consider 3D shapes, investigating surface area and exploring volume. More able students will consider circles and use of pi. **Patterns** This topic extends students’ previous knowledge on number patterns. They will further explore both number and picture sequences and how we can use rules to describe or generate a sequence.  | **Angles** We will ensure students understand and use the correct notation for lines and angles. Students will learn about angles in parallel lines as well as further developing their knowledge of angles in polygons. **Statistics** Following from HT2/3 students will further develop their skills in statistical analysis. Students will consider how different types of data is collected, how data may be biased and no representative. Students will deepen their understanding of using the averages and range to analyse and compare data, including the advantages and disadvantages of the different methods. Students will consider different charts, tables and graphs including grouped data. | **Further Number - Fractions, Reciprocals, Indices and Standard Form** Students will further develop their abilities to calculate with fractions and be introduced to the concept of a reciprocal. Students will also recall laws of indices and further develop these skills before moving on to standard form. Standard Form will have been seen by some students in year 10 but will be a new concept for the majority of learners. **Further Algebra- Graphs and Equations** Here students will further develop algebra skills including expanding and factorising and extend their solving equation skills to include quadratics. Students then move on to the solution of simultaneous equations by both algebraic and graphical methods. Links will be made to graphs and forming the equations will be explored as well as solving them. Finally, students will develop their knowledge of linear and non-linear graphs recognising the different shapes. **Revision and GCSE Exams** |
| **HT 6** | **Outdoor Education and Enrichment** **Revision and EOY Assessments** **Measuring and Presenting Data** Students will recall the ways in which we find the averages of a set of data. They will consider how to present data in different charts and graphs as well as the advantages/disadvantages to using different methods to present data.**Probability** Students will develop their understanding of the meaning of probability and how we can describe probability using specific language and the probability scale. Students will consider different experiments and their outcomes. | **Outdoor Education** **Work Experience** **Revision and EOY Assessments** **Perimeter, Area and Volume** Students will further explore the ways in which we measure space. They will develop their skills of calculating perimeter, area and volume as well as solving problems. Some pupils will extend their skills to include circles.  |  |

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| **Assessment** | ***Baseline Assessments/Gap Analysis***On starting at The Heights Blackburn all learners complete a baseline assessment. Year 10 and 11 pupils are given a GCSE Baseline assessment whilst year 9 are assessed only on key number skills. These assessments are marked, graded and analysed by class teachers and inform setting, future planning, retrieval and any required interventions.***Knowledge Checks*** At the start of each new topic all learners complete a knowledge check. This allows class teachers to assess the needs of each learner in the class and plan their learning journey as appropriate. Knowledge checks assess key skills and any necessary prerequisite knowledge which will be needed during a topic.***Lesson by Lesson and Progress Checks***Class teachers use a range of assessment strategies in lesson to continually assess the needs of the learners. These include, Low stakes quizzes, Self and peer assessment, Use of mini-whiteboards, Live Marking, Yellow boxes (whole school feedback policy). As a department we are continually developing the use of MCQ to assess all students understanding and also to highlight common errors and misconceptions. MCQ for all units are saved on the Maths drive for all class teachers to access.At the Heights Blackburn we recognise the need for regular opportunities for retrieval practice. Pupils are challenge to retrieve prior knowledge applicable to each unit at the beginning of the unit. They are also challenged to recall work from previous lessons at the beginning of some lessons which will then be built on with new learning. As well as this our leaners complete a weekly retrieval grid each week which is made up of prior learning and key mathematical skills. The content of the grids in strategically planned for each year group with class teachers making small adjustments as necessary to meet the needs of the learners.The termly retrieval plans and pre planned retrieval grids are available on the Maths drive. Exemplar Questions for each unit ensure all learners are challenge with deep-thinking activities and beneficial mathematical teaching approaches such as variation. For Year 10 and 11 student these include GCSE past paper questions. Specific Exemplar questions for each unit are available on the maths drive.***End of Topic*** Pupils complete a Knowledge check at the beginning of each unit, and complete the knowledge check with additional ‘show me what you know’ questions at the end of each unit. They then have chance to reflect on their learning with designated improvement time. For year 10 and 11 a range of GCSE style questions are used here which link to specific GCSE grades. For year 9 we consider the different levels of knowledge and assess learners to see if they are Emerging, Developing, Secure or Advanced in each topic.***End of Term/Year*** Pupils complete three formal assessments a year, assessing their learning to that stage. These assessments are marked, graded and analysed by class teachers and inform future planning, retrieval and any required interventions. Years 10 and 11 are assessed using GCSE grades whilst for year 9 we assess learners to see if they are Emerging, Developing, Secure or Advanced in each topic The formal assessment plan can be found on the maths drive.  |
| **SEND Support** | Within Maths all Teachers use a wide range of Quality First Teaching Strategies on a daily basis to support individual learner needs during lessons. Teachers and TA’s are aware of SEND learners and their individual needs. SEND learners are supported using a range of manipulatives to aid the learning process. These include fraction strips/discs magnets, connecting cubes, counters, place value sliders, play money and mini clocks. Worksheets are forward faded and scafolded where required to give all students the opportunity of reaching the same outcomes.Maths TA’s are deployed in the classroom and will often work with our SEND learners in small groups or on a one to one basis. However, the class teacher will always ensure to spend time with SEND learners in every lesson, assessing their individual needs and adapting the lesson/teaching strategies as appropriate. In addition, intervention is provided by our school’s SEND team and our SEND learners are timetabled for additional one to one support to help in closing the gaps identified by the baseline analytical tool and other areas identified in assessments or by the classroom teacher.  |
| **Language & Reading**  | *What is the provision to talk, read and write like a specialist*Students will be exposed to a range of mathematical language. They will use this language throughout their lessons. Students will be introduced to key terminology and be challenged to use this at every opportunity. Learners will frequently be asked to explain there solution to a problem and the steps they took to find this.*Guided Reading* Guided reading is scheduled once per topic for all learners. As well as developing learners reading skills we also use this as an opportunity to link mathematical key words, Careers or PSHE within our mathematics curriculum. The guided reading activities are all pre-planned and link to what is currently being taught. \*Note-Guided reading documents can be found on the Maths Drive.  |
| **Opportunities to develop Literacy/ Numeracy** | We use a range of different activities/strategies to support literacy in maths such as; key word match ups, Knowledge Organisers, Talk like a specialist and the Frayer Model. There is a designated literacy area on the maths drive with tasks/activities that teachers are expected to use for each unit. |
| **Links to Careers** | Careers links are highlighted on the overview slide at the begging of each unit and discussed with learners. We also use guided reading as a tool to highlight the links between the Maths being taught and different careers. (Example – architects and other engineers use scale drawing and modelling or the applications of algebra and solving equations in business and finance). Activities used in Maths lessons link to different careers where appropriate (Example – When teaching area and perimeter we can use examples of farmers constructing a field or a painter and decorator charging a set amount per meter square.) Further instruction on specific ways to link to different careers is highlighted within the lesson planning documents. |
| **.Links to SMSC/SRE/British Values** | ***British Values***Democracy - Pupils are encouraged to speak openly within their lessons and express their views and opinions positively. We have class discussions where pupils are encouraged to discuss different strategies to solve a problem, and the advantages and disadvantages of using the different strategies.Rule of Law – Pupils are expected to listen and engage positively whilst others share ideas and answers. If pupils disagree with each-others answers or methods pupils are challenged to have academic discussions of their different point of views. Pupils are also challenged to follow the school rules in lesson.Respect and Tolerance – A positive learning environment where learners feel safe to share ideas and get things wrong is always encouraged in maths. Good working relationships and mutual respect for each other is key to ensuring their learning experience is productive and effective.Individual Liberty - Pupils are actively encouraged to make good life choices. All learners are given advice, guidance and career choices and teachers will link learning to pupils interests where appropriate. **Personal Development** Personal development skills are highlighted at the begging of each unit and discussed with learners. We also use guided reading as a tool to highlight the links between Maths skills and personal development. (Example – how a person with diabetes needs to use maths skills to sustain good health). Maths lessons also link to the social, health and economic skills where appropriate. (Example - when looking at percentages or multiplicative reasoning, interest rates and debt can be discussed or we may elude to the risks of gambling when teaching probability.)**SMSC**In Maths lessons pupils are encouraged to delve deeply into their understanding of Mathematics and how it relates to the world around them. Our Maths teaching actively encourages risk taking which enables pupils to explore and try new ideas without the fear of failure. This is fundamental to building pupils’ self-esteem within Mathematics. Throughout history, the study of Mathematics stems from intrigue and curiosity, with people’s desire to pose and solve problems relating to the real world or purely within mathematics itself. We aim for our students to appreciate this and use their own Maths to explore and question the way the world works and also to apply their reasoning to puzzles for their personal satisfaction.Spiritual* Developing deep thinking and questioning the way in which the world works promotes the spiritual growth of our students.
* We are sensitive to students’ individual needs, backgrounds and experience.
* We promote a sense of wonder in the exactness of mathematics in the exploration of concepts such as infinity and pi or sequences in nature.
* We encourage the students to appreciate the enormity of the world of Mathematics as it has developed through time.

Moral* Within the classroom, we encourage respect and reward good behaviour.
* We value listening to others views and opinions on problem solving.
* We promote discussion about mathematical understanding and challenge assumptions, supporting students to question information and data that they are presented with.
* We show the students that we are on a quest for truth by rigorous and logical argument whilst discouraging jumping to conclusions.
* We explore and evaluate the use of Statistics to inform or mislead us in our current data-obsessed society.
* Percentage work across Key Stage 3 and 4 is clearly linked to current financial topics such as loans, debts and investment returns.
* We ensure learners understand that it is acceptable to make mistakes as long as the correct methodology to obtain the otherwise correct answers is then learned and remembered.

Social* In classrooms, we look for opportunities for pupils to use mini-whiteboards to promote self-esteem and build self-confidence.
* We encourage collaborative learning in the classroom – in the form of listening and learning from each other as well as paired discussion / working partners.
* We help pupils develop their mathematical voice and powers of logic, reasoning and explanation by offering explanations to each other.
* We plan and seek out events and maths challenges for increased pupil involvement.

Cultural* We share the appreciation with that mathematics, its language, symbols and methods have developed from many different cultures around the world: e.g. Egyptian, Indian, Islamic, Greek and Russian roots.
* We refer to different Mathematicians contribution to the progression of the subject as we teach topics.
* We investigate and research cross cultural patterns – tessellation, Islamic tiling.
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