Kettlethorpe High School

'Together, be the best we can be.'

Present

Achieving

Excelling

Mathematics Curriculum

Subject Quote	**"Mathematics knows no races or geographic boundaries; for mathematics, the cultural world is one country."** David Hilbert
Curriculum Summary	At Kettlethorpe High School, we have a whole-school holistic curriculum model which seeks to plan for, teach, and assess progress against our core mission for pupils, our vision and ethos, as well as our cross-curricular 'golden threads,' and our identified subject-specific knowledge and skills. Through our carefully planned curriculum maps, knowledge and skills are explicitly planned and taught in coherent and progressive steps. As pupils make progress through the curriculum, this is the main measure of success in **Mathematics**. **In Maths, our goal is to create successful independent mathematicians with a wider view of the world ready to make valuable contributions to the global community**. **In maths**, our curriculum commits to fulfilling the 7 whole-school curriculum principles ensuring that what we deliver, and pupils receive is: • Broad and Balanced • Engaging • Personalised • Transformational • Inclusive • Aspirational • Values-based
Links to Life and Future Destinations (Careers)	• To ensure that pupils gain the most appropriate mathematical qualification from which they can progress on their chosen pathway. This qualification might be functional skills, GCSE maths and further maths for some. • To ensure that our most able pupils are well-equipped and inspired to study maths at a higher level and are supported by the stretch of the further maths course content. We are committed to growing mathematicians of the future who choose to pursue careers and studies in maths, science, technology and engineering. • Most jobs and careers require competency in maths but there are some exciting careers which are more maths based such as financial services, engineering, data analyst, business, economics, statistician and management.

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HIGH SCHOOL

Mathematics – Curriculum Overview

- To develop mathematics as an essential tool of communication, using representations to describe, illustrate, interpret, predict, reason and prove.
- To build on knowledge and skills gained in KS2.
- Reflect on gaps in numeracy skills early in KS3; take a systematic and personalised approach to addressing this.
- To ensure that pupils are motivated and engaged so that they enjoy the subject.
- To develop independence and create ambitious, curious learners who take responsibility for their own destiny, through the use of Sparx maths.
- To ensure that pupils have a wide range of skills in their mathematical tool kit, which they are confident to apply when solving problems in mathematics and other curriculum areas such as geography, science, technology and engineering.
- To empower pupils to understand their financial situation and plan for their own healthy economic futures.

Mathematics Department Knowledge Expectations

Year 7					
Half term 1	**Half term 2**	**Half term 3**	**Half term 4**	**Half term 5**	**Half term 6**
Number Transformations	Expressions Fractions	Decimals Probability	Lines Angles	Ratio Proportion	Sequences Analysing data

Year 8					
Half term 1	**Half term 2**	**Half term 3**	**Half term 4**	**Half term 5**	**Half term 6**
Number Area and Volume	Expressions Percentages	Probability Ratio	Fractions Real life Graphs	Straight Line Graphs Lines and angles	Displaying Data Statistics

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Year 9		
Term 1	**Term 2**	**Term 3**
Integers	Solving quadratics	Ratio
Decimals	Standard form	Proportion
Expressions	Transformations	Pythagoras
Factors/Multiples	Fractions	Shapes/Angles
Expand/Factorise	FDP	Polygons
Indices/Roots	Probability	
Substitution		
Linear Equations		

Year 10		
Term 1	**Term 2**	**Term 3**
Percentages	Sequences	3D shapes
Compound measures	Linear graphs	Real life graphs
Average	Nonlinear graphs	Constructions/Loci and Bearings
Data graphs	Inequalities	
Pie Charts	Area/Perimeter	
Simultaneous Equations	Trigonometry	

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HIGH SCHOOL

Year 11		
Term 1	**Term 2**	**Term 3**
Statistics and Sampling Plans and Elevations Similarity and Congruency	Averages Vectors Revision Interventions Exam Technique	Revision Interventions Exam Technique

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Mathematics – Golden Threads Mapping

SMSC				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Pupils engage with TT Rockstars competitions to compete as a class team.	Pupils engage with TT Rockstars competitions to compete as a class team.	Develop deeper thinking around the measures of likelihood, decision – making and the dangers of gambling.	Pupils learn how to convert units of speed and to make moral judgements about speed.	Pupils learn about bias and how to represent a population fairly.
Personal Development				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Pupils experience welcoming lessons in maths, through getting to know each other lessons such as "Handshakes". High ability pupils are entered in the UKMT maths challenge.	High ability pupils are entered in the UKMT maths challenge.	Year 9 take part in careers assemblies on Numeracy Day.	Year 10 visit Leeds university.Pupils visit Wakefield and Pontefract colleges and have the opportunity to opt for maths taster sessions. Pupils experience their first real attempt at a full PPE.	Pupils build resilience through their monthly assessments, emphasis being on improvements and reflection upon strengths and weaknesses. Some pupils are invited to cover a further maths course to help their transition to A level.
Numeracy				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Pupils build fluency with multiplications tables. They learn about the magnitude of numbers. They consolidate their written methods so that they can apply them to a range of contexts.	Pupils learn to categorise numbers by their special properties. They build on their knowledge of ratio and link ratio and division of decimals to best buys.	Pupils learn that the same value can be expressed in different ways, (equivalence). They continue to learn to compare quantities through ratio.	Pupils learn about calculating profit/loss and about calculating different types of interest.	Pupils learn to apply their knowledge of multiplicative relationships to mathematically similar shapes.

Cultural Capital				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Pupils learn about different currencies and how to convert them for their travel. They learn how to adapt recipes from different countries.	Pupils learn to use graphs which represent real life situations such as costings, conversion graphs for currency and units. They learn how to make judgements based on statistics.	Pupils discover Pythagoras' Theorem and how this area of maths originated from a Greek man.	Pupils learn about the Fibonacci sequence and how it manifests itself in many natural contexts.	Pupils learn about the real meaning of the words "random" and "bias". They learn about populations and samples.
Substantive Knowledge				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Pupils learn and recall multiplication tables. They develop understanding of place value and the importance of using the correct order of operations. They calculate with directed numbers. They work with the properties of numbers and learn about special numbers such as squares, cubes and their roots. Pupils learn the four transformations and apply this to shapes. They extend their knowledge of using a letter to represent an unknown, forming and simplifying expressions and develop their ability to	Pupils build on their prior knowledge by working with decimal calculations. They calculate more complex problems with direct numbers. They begin to use index notation for expressing repetitive multiplication. Prime numbers are used to find product of prime factors. Pupils learn how to find the area and perimeter of shapes using a variety of formulae, including those for formulae. They then extend to the concept of volume and surface area for 3D objects. Laws of indices are applied in an algebraic context, and this	Pupils learn the product rule for counting to help them find probabilities. They estimate by rounding off to a given degree of accuracy, then work with the opposite of that which is finding error intervals. Pupils revisit algebraic indices and apply to simplifying. Knowledge of indices leads to working with standard form. They learn to factorise expressions and solve quadratic equations. Pupils' knowledge is extended to fractional, negative and zero indices, including the concept of reciprocals. They substitute into formulae, expressions and	Pupils use multipliers for repeated proportional change. They find compound measures, speed, pressure and density. Pupils learn that averages can be further refined to quartiles which is applied to box plots and cumulative frequency diagrams. Data is compared. Pupils learn how to form solve equations simultaneously and are extended into those where the equations are not linear. They learn about quadratic and geometric sequences. Pupils begin to learn how to work with the equation y = mx + c to find parallel lines and determine	Pupils learn how to apply their proportional reasoning to calculations involving populations and sampling, working with scale factors to identify similarity. They appreciate the difference between similarity and congruence. The most able will form formal proofs of congruency. Higher attaining pupils estimate population sizes. Representations of 2D and 3D shapes are developed. Knowledge of averages is consolidated, then applied to larger data sets presented as frequency tables. Vector

manipulate. They extend their knowledge of how to manipulate fractions and decimals, later applying it to the concept of probability. They learn the formal notation of geometry and use it when finding missing angles. Pupils begin to formalise their presentation of ratio and use to work with multiplicative relationships. They build on their sequencing skills learning about how to follow rules. Finally, pupils learn about the different averages and the range and use to analyse data.	allows for more complex algebraic manipulation. Pupils make the leap from using function machines to solving equations by balancing. Pupils apply knowledge of fractions and decimals to percentages and related calculations. Year 8 meet the concept of experimental probability and begin to compare how that is different from theoretical probability. They learn how to draw and interpret graphs with real life contexts, then move to the abstract y = mx + c and its interpretations. Pupils 'knowledge of angles is extended to those in polygons and parallel lines. Pupils meet a variety of graphs and charts and use them to compare data.	functions. Geometric and other scenarios are represented as equations and solved to find missing values. Transformations are revisited, combined and extended into fractional enlargements, and vector arithmetic is introduced. Knowledge of fractions and decimals is applied to the conversion of recurring decimals to fractions as an introduction to formal proof. Pupils meet tree diagrams and Venn diagrams to help them solve more complex problems with probability. Sharing into a ratio given different starting points leads pupils into direct and inverse proportion. Pupils apply their square numbers and roots to Pythagoras' Theorem. Pupils angle properties knowledge extends into some of the simpler circle theorems which link to Pythagoras and the right-angled triangle.	whether a point lies on a line. Graph work is extended to cubic, reciprocal and circular graphs investigating their properties. Pupils learn that sometimes we need to describe a range of values using inequalities. They solve inequalities and represent the solution on number lines and graphs. The most able go on to solve quadratic inequalities by finding the roots of functions and apply this to cubic graphs also. Pupils begin to apply ratio and proportion to find missing sides in mathematically similar objects in 1D, 2D and 3D. Pupils find surface area and volume of 3D objects such as prisms, cones, spheres. Pupils are taught how to use the trigonometrical ratios to find angles and sides. Travel graphs are used, and pupils learn how to interpret the gradient in context. Compass skills are consolidated in order that they can construct loci. Ratio again	arithmetic is revisited and applied to find scalar multiples and resultant vectors. The most able pupils will form geometric proofs in the context of vectors.

			is used to work with maps, bearing and scale drawings.	
Life Skills				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Calculating with money Directed numbers and temperature Work in 12- and 24-hour clock Adapt recipes Convert currencies Language or probability Using data to make comparisons	Area, perimeter, volume and costing problems Equivalence of fractions, decimals, percentages Calculations with percentages, profit and loss, percentage of a quantity Find sale price and original price Make informed decisions and comparisons based on graphs and charts	Work systematically with combinations and product rule Round off to an appropriate degree of accuracy Substitute into any formula Solve a variety of problems by forming and solving equations in context Represent scenarios in different forms eg Venn diagrams and tree diagrams Pythagoras in context Direct/inverse proportion in context	Use multipliers for percentage increase/decrease Compound interest and financial literacy Growth and decay Construct loci Interpreting map scales Work with bearings	Estimating populations Break down complex problems into manageable steps Visualising 2D and 3D representations using plans and elevations Find averages from larger sets of data in tables

Literacy				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Reasoning tasks on rounding Describe transformations Reasoning task on substitution Reasoning task on expanding and simplifying Command words of algebra Problem solving with fractions Using the language of probability Angle reasoning Describe and compare proportions Describe term to term rule Compare sets of data using the range and an average	Underestimate or overestimate? Reasoning tasks around perimeter, area and volume Equivalence Opportunities for reasoning around the use of multipliers Experimental v theoretical probability Language of bias and random Interpretation of real- life graphs and describing what the graph tells us Angle reasoning of parallel lines and polygons Interpret and e=describe data from a variety of graphs and charts applying the language of averages and range Describe the reliability of interpolation and extrapolation	Form expressions and equations from contextual problems and statements Discuss the magnitude of values which are presented as standard form, opportunities to discuss cross curricular links Follow instructions to transform objects Describe transformations given the object and image The language and notation of Venn diagrams Share in a ratio when different starting points are given Evaluate a method given for finding the hypotenuse or a shorter side Angle reasoning problems	Form calculations for growth and decay problems Make comparisons for best investments Compare distributions using averages, quartiles and range or interquartile range Compare data from stem and leaf diagrams Compare data from cumulative frequency diagrams Comment on trends from time series graphs Describe how to tell if a number falls in a sequence Describe the journey represented by a travel graph Language of constructions	Use and write about the proportionality of samples and populations Write about different types of data Use the language of mathematical similarity Justify congruency Write about the advantages and disadvantages of different averages Write about the scalar multiples and its meaning in the context of vectors

	Describe correlation of bivariate data			
Digital Literacy (to engage confidently with technology, the various digital platforms, and the vast amount of online information which now exists)				
Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
SPARX Maths Recently trialling Maths Whizz as an intervention resource. Take part in engaging competitions on TT Rockstars. Pupils learn how to use calculators effectively.		SPARX Maths, Online revision resources, such as Corbett Maths and Maths Genie.	SPARX Maths, Online revision resources, such as Corbett Maths and Maths Genie.	SPARX Maths, Online revision resources, such as Corbett Maths and Maths Genie.

Mathematics– Year 7 and 8 Assessment

Aims of Assessment at KS3

- To build a toolbox of knowledge and skills which can be applied in KS4
- To ensure coverage of fluency, application and reasoning.
- To develop confidence in approaching multi-step problems.
- To assess a wide range of skills
- To provide feedback to support learning, progress and identify areas for improvement.
- To prepare pupils for the transition to GCSE expectations

Assessment

Low Stakes Testing

- Teachers aim to check prior knowledge before new learning episodes
- The SOW informs of prior coverage
- Mini whiteboard use is frequent and assesses understanding throughout lessons through Q and A
- Use Memory booster booklets to develop fluency
- Teachers sometimes try to ensure engagement with the use of games for AFL.
- Approximately every three weeks pupils complete a teacher marked, open book task on yellow paper. Teacher directs pupils to a follow up therapy task or extension task in the reflective purple zone

High Stakes Testing

- Early in the first term of year7, students sit a baseline test. They are given a percentage which is checked against their KS2 assessment data so that interventions can be targeted.
- All sets aim to check that the gaps in KS2 knowledge are being closed
- Each term, year 7 and 8 students are assessed using a non-calculator and a calculator paper. The two papers are spaced apart so that in the event of absence they are less likely to miss out on both papers.
- There are three levels of assessment, Pi (foundation), Theta (crossover) and Delta (higher). They are awarded a percentage which measures their rate of success within their level. The percentages are accumulated and averaged throughout the year.
- They are provided with an individualized PLC, containing details of strengths and weaknesses. There is a period of “therapy intervention” and then are retested to check progress using red and purple zone activities

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- Parents are provided with a copy of the PLC usually at consultation evening and advised of next steps for their child
- Students with SEN are given extra time, access to a pen reader or enlarged scripts where appropriate

Tracking

- Teachers track the progress of their students and review progress every term using the department tracker
- Class teacher should use this information to plan for wave one interventions in the classroom which are recorded in grab files
- Lead teachers use this information to monitor the performance of teaching groups across the bands, and also to check that pupils' needs are being met in their set

Mathematics– KS4 Assessment

Aims of Assessment at KS4
• To ensure that students are on the correct pathway for them to achieve their best outcomes within the foundation or higher tier. • To provide the balance between AO1, AO2 and AO3 topic areas. • To improve exam technique and ensure exam readiness by the end of year 11. • To identify gaps in knowledge to inform planning and wave 1 intervention. • To measure progress towards and beyond their target grade for the end of year 11.
Assessment
Low Stakes Testing • Use Memory booster booklets to develop fluency. • Use Walking Talking Mocks to build confidence and build exam technique. • Use Walking Talking Marks in plenaries to give opportunity to use mark schemes. • Use Top Ten Tests to improve exam technique, consolidation of procedural methods, understand mark allocation, inspire students to make progress through weekly retests. Data collected which allows personalised interventions. • Approximately every three weeks pupils complete a teacher marked, open book task on yellow paper. Teacher directs pupils to a follow up therapy task or extension task in the reflective purple zone **High Stakes Testing** • Year 9 are assessed termly. Each assessment point contains a non-calculator paper and a calculator paper. • The assessments take 45 minutes to allow extra time within the lesson for those who have access arrangements

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- Year 10 are assessed termly. The first two assessment points of the year consists of two 45 minute papers, one non-calculator and one calculator. During the third term, students experience their first full PPE. Opportunity to show progression is given in July, giving valuable data on which to base tier of entry.
- Year 11 sit a past exam paper in September, October and November. Each paper is followed up with a MAG grid, therapy and re-test on key questions . A revision list is provided before each paper to encourage independent preparation
- Year 11 sit a full PPE paper in December and March, measuring progress and confirming tier of entry.
- Students with SEND are given extra time, access to a pen reader or enlarged scripts where appropriate.

Tracking

- Teachers track the progress of their students and review progress every term
- Class teacher uses this information to plan for wave one interventions in the classroom , interventions are record in grab files
- Data will support KS4 leader in targeting students for small group interventions
- Use SISRA to monitor performance of groups against targets