Maths Pi Curriculum Sequence – Key Stage 3

KS2 National Curriculum prior learning	By the end of the term, students can:	Year 7 Term 1	Year 7 Term 2	Year 7 Term 3	Year 8 Term 1	Year 8 Term 2	Year 8 Term 3	Year 9 Term 1	Year 9 Term 2	Year 9 Term 3
Skills that have taught at KS2 such as addition, subtraction, multiplication and division are typically unsecure on arrival to the academy by the students following this scheme. Time is spent securing these skills, and then developing other skills such as understanding of algebra to ensure students are making effective progress. A scheme of learning has been devised that is personalising learning for each individual student.	Define the key tier 3 **vocabulary**:	Place Value; Digit; Tens; Hundreds; Thousands; Millions; Rounding; Approximate; Inequality; Multiple; Factor; Prime; Root; Highest Common Factor; Lowest Common Multiple; Negative; Positive; Directed; Temperature; Order; Cube; Root; Powers; Brackets; Fractions; Functions; Addition; Subtraction; Division; Multiplication; Remainder; Inverse; Indices; Variable; Simplify; Term; Expression; Equation; Formula; Solve; Operation; Axis; Interpret; Values; Construct; Coordinate; Quadrant; Sequence; Position; Generate; Square	Fraction; Numerator; Denominator; Simplify; Equivalent; Greater than; Less than; Equal to; Decimal; Percentage; Proportion; Divide; Multiply; Pictogram; Frequency; Key; Axis; Bar; Data; Table; Tally; Mode; Median; Range; Compare; Probability; Likely; Unlikely; Possible; Impossible; Certain; Evens; Triangle; Scalene; Isosceles; Equilateral; Parallel; Square; Rectangle; Parallelogram; Pentagon; Hexagon; Octogen; Regular; Irregular; Rotational; Reflectional; Symmetry; Edge; Face; Vertex/Vertices; Cube; Cuboid; Net; Centi; Milli; Kilo; Measures; Length; Capacity; Volume; Mass; Convert; Perimeter; Area; Compound	Ratio; Share; Equivalent; Simplify; Multiplicative; Multiply; Divide; Share; Direct; Proportion; Multiplier; Centimetre; Millimetre; Angle; Measure; Protractor; Degrees; Notation; Acute; Obtuse; Reflex; Line; Point; Vertically opposite; Triangle; Quadrilateral; Scale; Interpret; Equal steps; Reflection; Mirror line; Coordinate; Axis; Parallel; Translate; Rotation; Centre; Direction; Clockwise; Anticlockwise	Place Value; Digit; Million; Thousand; Hundred; Ten; Tenths; Hundredths; Thousandths; Rounding; Approximating; Indices; Power; Decimal; Directed; Operations; Negative; Positive; Addition; Subtraction; Multiply; Divide; Factor; Multiple; Prime; Factorisation; Decomposition; Index; Base; Square; Cube; Root; Algebraic; Expand; Factor; Like; Term; Variable; Unknown; Substitute; Replace; Order; Formula; Equation; Inequalities; Notation; Solve; Inverse; Balance; Frequency; Tally; Bar Chart; Pictogram; Key; Compound; Dual; Interpret; Mean; Median; Mode; Range; Graphical	Fraction; Numerator; Denominator; Equivalence; Simplify; Mixed Number; Improper Fraction; Addition; Subtraction; Multiplication; Division; Integer; Reciprocal; Decimal; Place value; Percentage; Proportion; Operation; Order; Convention; Calculator; Function; Evaluate; Power; Order; Operations; Likely; Unlikely; Impossible; Evens; Certain; Probability; Relative; Experiment; Frequency; Estimate; Predict; Bias; Ratio; Simplify; Direct; Related Calculation; Indirect; Unitary; Recipe	Angle; Point; Triangle; Quadrilateral; Isosceles; Equal; Parallel; Perpendicular; Right angle; Scalene; Equilateral; Parallelogram; Rhombus; Kite; Trapezium; Regular; Irregular; Symmetry; Circumference; Diameter; Radius; Centi; Milli; Kilo; Measures; Length; Capacity; Volume; Mass; Convert; Area; Rectangle; formula; Perimeter; Composite; Net; Face; Cube; Cuboid; Volume; Dimensions; Pattern; Sequence; Rule; nth Term; Substitute; Term; Position; Coordinate; X axis; Y axis; Quadrant; Horizontal; Vertical; Graph; Reflect; Mirror line; Parallel; Rotate; Centre; Clockwise; Anti-clockwise; Angle; Translate; Vector; Enlarge; Similar; Scale Factor	Negative; Positive; Directed; Calculation; Multiplication; Division; Addition; Subtraction; Round; Significant; inequality; error interval; Decimal; Operation; Indices; Square; Cube; Root; BIDMAS; Bracket; Multiple; Factor; Prime; Highest Common Factor; Lowest Common Multiple; Decomposition; Standard Form; Place Value; Algebraic; Expand; Like; Term; Variables; Equation; Unknown; Linear; Integer; Solution Set; Substitute; Expression; Centi; Milli; Kilo; Capacity; Volume; Mass; Convert; speed; Distance; Time; Bisect; Compass; Perpendicular; Arc; Equidistant	Area; Formula; Base; Height; Perpendicular; Triangle; Parallelogram; Trapezium; Circle; Diameter; Radius; Chord; Diameter; Circumference; Cross Section; Surface Area; Net; Cube; Cuboid; Prism; Triangular; Pythagoras Theorem; Square; Root; Hypotenuse; Right-Angled; Trigonometry; Sine; Cosine; Tangent; Adjacent; Opposite; Two-Way; Construct; Compare; Scatter; Bi Variable; Distribution; Trend; Correlation; Outlier; Mean; Median; Mode; Range; Judgement; Interpret; Proportion; Direct; Related Calculation; Multiply; Divide; Indirect; Unitary; Recipe; scale; Ratio; Simplify; Fraction; Numerator; Denominator; Probability; Likely; Unlikely; Impossible; Evens; Certain; Mutually Exclusive; Venn; Intersection; Frequency; Decimal; Estimate; Bias	Angle; Polygon; Isosceles; Equilateral; Rhombus; Parallelogram; Parallel; Transversal; Alternate; Corresponding; Equivalent; Fraction; Numerator; Denominator; Decimal; Percentage; Simplify; Inequality; Add; Subtract; Multiply; Divide; Mixed Number; Improper; Proportion; Multiplier; Equivalence; Increase; Decrease; Pattern; Sequence; Rule; nth Term; Substitute; Term; Position; Coordinate; Plot; Horizontal; Vertical; Variables; Midpoint; quadratic; expand; simplify; axis; curve; approximate; reciprocal; exponential.

	Recall the **knowledge**:	In Y7 they will start their learning journey by securing their understanding of place value and negative numbers. They will then develop the work they have done in Y6 on written calculations. They will then move onto developing an understanding of basic algebra, this will include references to functions machines, which pupils will be familiar with. Towards the end of the term this understanding will begin to be applied to graphs and sequences.	In the spring term, Y7 will revisit the work that they have done in previous years on fractions, decimals and percentages. This will be consolidated, before then developing these themes further. Later in the term they will look at different representations of data, calculating averages and probability, which will include references to the fraction, decimal, percentage work from earlier alongside re-visiting the numerical skills from the Autumn Term. The term finishes by looking at the properties of shape including area and perimeter - again allowing the practical applications of earlier taught skills	In the summer term, Y7 will use the skills they have developed numerically and with fractions, decimals and percentages and then apply this to proportion and ratio. They will also develop their understanding of shape properties by delving further into angle properties and solving problems relating to these. The summer term finishes by revisiting the work they have done in KS2 on transformations, allowing them to develop further.	In year 8, students will start by revisiting the work on place value from year 7. They will then develop further their understanding of negative numbers, extending into all calculations. Factors and multiples will be revisited with the aim of improving the efficiency of their calculations. Towards the end of the term, Year 8 will revisit algebra, consolidating their understanding from Year 7, before extending this to brackets, more complex formula and solving slightly more complex equations	In the spring term, year 8 build on the work on fractions that they did in year 7. They learn how to add and subtract more complex fractions, before moving into multiplication and division. Percentages are covered in greater depth, leading to an ability to be more flexible in their approach. Written calculations are developed further, moving into dealing with decimals.. In probability a more formal approach is developed. In this term, formal ratio is developed using the understanding from year 7.	In the summer term, angle facts are revisited and developed into a greater level of problem solving. Measures are also re-visited, although on this occasion the measures will be linked to ratio to further the understanding of students. Area is extended to area of a trapezium. Using this understanding volume is introduced with cuboids. Towards the end of the term, the topic of sequences and graphs is looked at - using the algebraic understanding developed through year 7 and year 8. Finally transformations are revisited, again with a focus on the formal language.	In year 9, students will revisit number, using the foundations already taught to look at using prime factor decompositions, error intervals and standard form. Algebra is then used in a variety of situations including geometry and use of formulas. Towards the end of the term, students look at measures, including being introducing to compound measures. They use their understanding of geometry to start to complete compass constructions	In the spring term, Year 9 will look revisit topics of area before looking at circles. In a similar way, they will look at volume and surface area, before looking into prisms. Their knowledge of shape will then be used to introduce Pythagoras and trigonometry. As part of the handling data section, students will be introduced to scatter graphs. They will then consolidate their understanding of ratio and proportion, before moving onto probability, where the use of Venn diagrams will be introduced.	In the summer term, students use their mathematical understanding to solve increasingly difficult problems with angles, with fractions and percentages. They consolidate their understanding of sequences and straight line graphs - extending this to look at graphical simultaneous equations. They then take this understanding and apply it to quadratic and other graphs.
Students will be secure with their understanding of basic number, and areable to practically apply their arithmetic skills to a variety of mathematical topics such as LCM, HCF, FDP, Algebra, Shape, Data, Statistics, Probability, Graphs and Angles.	Demonstrate excellence in these **skills**:	Place Value; Understanding negative numbers, using a calculator; written methods of calculation; Order of operations; Using algebraic notation; Using functions machines; Solve one and two step equations; Interpret real-life graphs; Plot coordinates in all 4 quadrants; Use sequences	Converting between Fractions, decimals and percentages. Calculating with fractions. Calculating with percentages. Understand different representations of data. Calculate averages. Understand shape properties. Calculate area and perimeter.	Understand and use ratio notation. Understand multiplicative relationships. Apply direct proportion to word problems involving real life. Accurately construct shapes. Use angle properties to solve problems. Transform shapes	Place Value, Negative numbers and their calculations, using algebraic notation, writing expressions, using formula, Solving Equations, represent data in a variety of ways, calculate averages.	Equivalent Fraction, converting between fractions, decimals and percentages, use all four operations with fractions, non calculator methods of percentages, Written methods of calculation - including with decimals, understanding probability, using ratio notation, calculating with ratio and proportion	Calculate missing angles, convert between different measures, Calculate the area and perimeter of different quadrilaterals, calculate volume of cuboids, Identify nth term. Plot graphs of linear functions, Transformations	Apply PFD to solve problems. Understanding Standard Form. Creating and solving equations. Using formulas. Understanding compound measures. Construct bisectors	Area of quadrilaterals. Area and circumference of circles. Volume and surface area of prisms. Pythagoras. Trigonometry. Use ratio and proportion. Use Venn diagrams with probability.	Understanding of angles. Understanding of fractions and percentages. Finding sequence rules. Plotting graphs of linear functions. Plotting graphs of non-linear functions

		*Error spotting and explaining Oracy – discussing different solutions. *Exploration of decimal place value *Uses of rounding *Clearly reason why adding zeros does not work *Identify misconceptions *Work backwards to find decimals or powers of 10 used to give a solution *Worded HCF and LCM *Link negative numbers to addition/subtraction *Given the start and end of a sequence across zero find the middle missing terms *Explore wider functions on a calculator (fractions, higher powers. etc) *What can we do when the number 5 is broken on the calculator? *Addition/subtraction with simple decimals *Given answers to addition and subtraction, multiplication find missing digits in the columns *Error spotting and explaining *Brackets as modifiers *Expanding towards more variables *Connecting function machines and equations with inverse operations *Misleading graphs *Using graphs in wider problems *Identifying missing coordinates that meet	*Give fraction examples to support statements about simplifying and equivalency *Error spotting and explaining * Oracy – discussing different solutions. *Reason why fraction numerator and denominators cannot be decimals *Error spotting focus on misconception of adding/subtracting denominators *Find missing numerators or denominators given an answer *Given an answer decide on an appropriate question that would have that answer *Compare fractions and decimals *Working in reverse *Reason mathematically when comparing percentages of amounts *Misleading graphs *Using graphs in wider problems *Probability in context *More polygons *Comparing shapes *Reason errors made due to place value misconceptions *Order values involving different measures *Make comparisons using different measures *Converting units within a problem	*Error spotting and explaining * Oracy – discussing different solutions. *Working in reverse *Fractional multiplier *Work backwards to find missing multipliers and direct proportion values *Recap on building graphs *Constructing complex diagrams with lengths and angles *Combining these angle facts *Spot the error of using protractor in the incorrect direction *Reason with isosceles triangles including understanding the notation and associated base angles *Reason whether angle facts are sometimes, always or never true *Repeated transformations	*Error spotting and explaining *Working in reverse *Leading towards other rounded place values *Reason why 5 in place value rounds up *Clearly reason why adding zeros does not work *Identify misconceptions *Work backwards to find decimals or powers of 10 used to give a solution *Missing value problems *Work backwards to find missing negatives in calculations *Combining powers *Effects of repeated root/square/cube operations *Incorporating simple powers *Reason when expressions cannot be simplified *Find missing signs or coefficients to make mathematical statements equivalent *Link collecting like terms to perimeter of shapes *Work backwards to find what was expanded *Use visual representations to expand brackets *Repeated variable problems *Substitution of more complex values *Order of operations reasoning *Substitution to check solutions *Using equations in context problems *More complex data sets *Calculate averages	*Give fraction examples to support statements about simplifying and equivalency *Reason why fraction numerator and denominators cannot be decimals *Error spotting - focus on misconception of adding/subtracting denominators *Find missing numerators or denominators given an answer *Given an answer decide on an appropriate question that would have that answer *Error spotting and reasoning *Compare fractions and decimals *Working in reverse *Oracy *Reason mathematically when comparing percentages of amounts *Link place value to decimal calculations *Find missing digits in a column method or short division methods. *Broken calculator problems *Interpreting calculator displays within context *Exploring more complex calculator functions *Explain clear reasons for why probabilities are placed on scale *Exploring real world probabilities *Explaining the effects of bias *Use equivalent fractions to work out which events are more likely to occur	*Reason with isosceles triangles including understanding the notation and associated base angles *Reason whether angle facts are sometimes, always or never true *Reason errors made due to place value misconceptions *Order values involving different measures *Make comparisons using different measures *Error spotting and explaining *Volume of compound cubes/cuboids *Use clear reasoning to comment on other student's solutions *Explaining why 2n looks like the two times tables *Demonstrate what values lie in two sequences using nth terms *Generating simple quadratic terms *Identifying missing coordinates that meet criteria (e.g. vertices of shapes) *Oracy *Given coordinates find line equations that go through the coordinate *Describing transformations *Describe transformations given no axes * Perform two consecutive translations and explore the overall translation * Perform two consecutive	*Error spotting and explaining *Larger or smaller values *Working in reverse *Repeated operations *Calculator use *Missing value problems *Work backwards to find missing negatives in calculations *Explore what values round to a number *Reason why 5 in place value rounds up *Reason with over and under estimates *Check calculator errors using estimations *Link place value to decimal calculations *Find missing digits in a column method or short division methods. *Explore the effect of multiplying a square number by a square number *Calculate with increasingly large powers (4/5 etc) *Begin to identify patterns when powers progress/regress *Work with increasingly more challenging combinations of operations *work with increasingly larger or smaller values *Estimating square roots *Rewrite base numbers and indices to create equivalent calculations *Work with increasing more challenging values and combinations *Work with HCF and LCM with increasingly	*Error spotting and explaining *Working in reverse in trapeziums *Compound areas and perimeters *Rearranging to find missing dimensions of circles *Compound volume/surface area *Exploring cylinder volume *Volume and surface area in context *Use clear reasoning to comment on other student's solutions *Working in reverse *Contextual problems including the tree problem *Constructing scale drawings after identifying lengths/angles *Working in reverse with a known diagonal *Understanding how much information is required to use the trigonometric ratios *Considering likelihoods for conditional probability *Create a description based on a two-way table *Correlation vs causation *Reverse average problems *Calculate averages from graphs such as bar charts *Use bar modelling, fractions and written methods to share into ratio *Identify values that are in direct proportions *Find fractional multipliers between values in direct proportion	*Error spotting and explaining *Identifying further methods to improve accuracy of diagrams *Reason with isosceles triangles including understanding the notation and associated base angles *Reason whether angle facts are sometimes, always or never true *Reason with parallel line angles *Given descriptions of angles on parallel lines (no diagrams) *Reason with parallel line angles to prove angles in a triangle add to 180. *Use known equivalent FDP to identify more equivalences *Compare equivalent FDP within a wider problem *Explaining how to tell when a fraction is fully simplified where prime numbers are involved. *Work with decimals within a fraction (e.g. the numerator) *Work with writing one number as a fraction of another within a larger problem *Using BIDMAS within fraction calculations *Using fractions in combination with integers in larger problems. *Fluent with the language difference, product and sum *Reason mathematically when comparing percentages of

		criteria (e.g. vertices of shapes) *More complex rules for sequences *Identifying if a number is within a sequence *Find missing terms in a sequence			from graphs such as bar charts	*Reason clearly when unequal chance of outcomes *Working with more than two events *Anticipating outcomes *Linking relative frequency with sampling *Combining multiple events *Algebraic ratios *Working with fractions and percentages with ratio *Reason which method (bar or fraction of amount) is more efficient or effective *Identify values that are in direct proportions *Find fractional multipliers between values in direct proportion	translations and explore the overall translation *Use of fractional scale factors *Justify when shapes are not similar	larger numbers (e.g. 1777100000 (2019 exam)) *Explore Sieve of Eratosthenes *Demonstrate factorisation to work out square roots and cube roots of larger numbers. *Clearly reason why adding zeros does not work *Identify misconceptions *Work backwards to find decimals or powers of 10 used to give a solution *Explain the limitations of standard form on calculators **Reason odd one out for numbers in standard form *Reason when expressions cannot be simplified *Find missing signs or coefficients to make mathematical statements equivalent *Link collecting like terms to perimeter of shapes *Work backwards to find what was expanded *Use visual representations to expand brackets *Explain the links between expanding and factorising *Reason with factorising *Incorporating simple powers *Calculator use to find solutions *Reasoning why some equations may be the odd one out regarding number of steps, coefficients and solutions plus those	*Consider links between fractions, decimals and percentages *How do we know a ratio is fully simplified? *Are there any instances where decimals are allowed in a ratio? *Reason which method (bar or fraction of amount) is more efficient or effective Use ratios to solve complex problems.(e.g. X has 15 more than Y) *Exploring real world probabilities *Explaining the effects of bias *Use equivalent fractions to work out which events are more likely to occur *Reason clearly when unequal chance of outcomes	amounts *Reasoning overall percentage change when two percentage calculations have been made - misconception 10% increase followed by 10% decrease ends up with the original value *Explain the benefits of multipliers *Explaining why 2n looks like the two times tables *Demonstrate what values lie in two sequences using nth terms *Generating simple quadratic terms *Begin to comment on the "steepness" and "direction" of graphs and their links to equations *Label equations given one coordinate *Reason clearly about other student solutions * working in reverse *applied to area *prove if coordinates are on the line *estimate solutions *comparing curves

								that can and cannot be solved *Forming an inequality *Substituting and re-arrangement in complex formulae. * Derive formulae and substitute values as required. *Order of operations reasoning *Reason errors made due to place value misconceptions *Order values involving different measures *Make comparisons using different measures *convert between different units of speed		
	What makes your subject different to other subjects? What are the expectations for students in your subject area in the KS3 National Curriculum?	Understand positive and negative numbers Represent algebraically Use formal methods of calculation Use algebraic notation correctly	Develop a fluency of fractions, decimals and percentages and begin to interchange these at appropriate points. Understand the principles of area and perimeter Interpret data using graphs and averages - begin to make comparisons	Using ratio and proportion to make sense of real world maths problems. Understand how (angle) facts can be used to solve problems Be able to transform shapes.	Calculate positive and negative numbers Use algebraic notation correctly Work with equations and formulae Interpret data using graphs and averages to justify decisions	Become fluent with fractions, decimals and percentages Complete calculations with fractions and percentages Use formal written methods Use formal ratio notation understand ratio and proportion problems	Use geometric understanding to solve angle problems. Convert between measures Understand and apply area and perimeter Work with sequences Represent functions both algebraically and graphically Transform shapes	Understanding standard form Using algebraic notation correctly Create and solve equations work with formulas Calculate with speed Construct using compasses	working with 2D and 3D shapes. Understanding Pythagoras and trigonometry. Using ratio and proportion in real world examples Using Venn diagrams with probability	Use geometric understanding to solve angle problems. Be flexible with the use of fractions and percentages Represent functions both algebraically and graphically