Thomas More Catholic Academy
FAITH | EXCELLENCE | RESPECT

Maths Pi Curriculum Sequence – Key Stage 4

	KS3 National Curriculum prior learning	**By the end of the term, students can:**	Year 10 Term 1	Year 10 Term 2	Year 10 Term 3	Year 11 Term 1	Year 11 Term 2	Year 11 Term 3
What we want our students to know and remember	*Key concepts from KS3 are embedded into the KS4 curriculum such as graph work and extended algebraic reasoning.*	Define the key tier 3 **vocabulary**:	Calculations; Addition; Subtraction; Multiplication; Division; Inverse; Estimation; Approximation; Error Interval; Place Value; Rounding; BIDMAS; Order; Priority; Power; Base; Index; Law; Multiple; Factor; Prime; Highest Common Factor; Lowest Common Multiple; Decomposition; Product; Standard Form; Place Value; Power; Inequality; Substitute; Integer; Expression; Simplify; Expand; Collect; Variable; Integer; Algebraic; Bracket; Factorise; Quadratic; Coefficient; Mean; Median; Mode; Range; Frequency Table; Distribution; Pie; Angle; Circle; Time-series; Line graph; Scatter; Bi Variable; Distribution; Trend; Correlation; Outlier; Solve; Balance; Inverse; Equations; Inequality; Number Line;	Linear; Simultaneous; Variable; Substitute; Value; Check; Circle; Circumference; Area; Diameter; Radius; Radii; Centre; Perimeter; Rearrange; Pi; Right-Angled; Triangle; Calculate; Trigonometry; Sine; Cosine; Tangent; Adjacent; Opposite; Surface Area; Prism; Cross Section; Cylinder; Volume; Dimension; Calculate; Circumference; Circle; Convert; Speed; Distance; Time; Rate; Gradient; Scale; Measure; Plan; Elevation; Corresponding; Alternate; Parallel Line; Angles; Equivalent; Simplify; Fraction; Numerator; Denominator; Mixed Number; Improper;	Percent; Increase; Decrease; Multiplier; Change; Interest; Depreciation; Proportion; Direct; Multiply; Divide; Indirect; Unitary; Equal; Ratio; Fraction; Equivalent; Simplify; Linear; Substitute; Parallel; Constant; Coefficient; Gradient; Intercept; Mirror; Turning Point; Minimum; Maximum; Constant; Intercept; Congruent; Similar; Enlargement; Geometric; Scale Factor; Angle; Reflect; Congruent; Rotate; Clockwise; Anti-clockwise; Translate; Vector; Enlargement; Transformation; Centre; Scale Factor; Volume; Area; Outcome; List; Probability; Two-Way; Table; Venn Notation; Sort; Circle Intersection; Tree; Branch; Probability; Unconditional; Mutually Exclusive; Bisect; Compass; Perpendicular; Arc; Equidistant; Loci; Locus; Perpendicular; Parallel; Construct; Accuracy; Triangle	Standard Form; Power; Index; Place Value; Interpret; Evaluate; Numerical; Commutative; Evaluate; Brackets; Equivalent; Multiply; Divide; Subtract; Add; Calculate; Percentage; Reverse; Increase; Decrease; Fraction; Multiplier; Decimal; Graph; Proportion; Direct; Inverse; Equal; Ratio; Unitary; Equation; Identity; Expression Equivalent; Subject; Inverse; Term; Balance; Substitute; Factorise; Coefficient; Constant; Roots; Linear; Inequality; Number Line; Integer; Solution Set; Simultaneous; Elimination	Sample Space; Probability; Two-Way; Venn; Notation; Intersection; Tree; Unconditional; Mutually Exclusive; Linear; Substitute; Parallel; Constant; Coefficient; Gradient; Intercept; Cubic; Coordinate; Axis; Curve; Equation; Reciprocal; Exponential; Circumference; Area; Arc; Sector; Radius; Perimeter; Proportion; Surface Area; Prism; Cross Section; Cylinder; Volume; Compound; Speed; Distance; Time; Density; Volume; Mass; Force; Pressure; Surface Area; Comparison; Interpret; Scale; Map; Plan; Elevation; Translate; Column Vector; Scalar; Enlarge; Scale factor; Similar; Corresponding; Alternate; Bearing; Direction; Clockwise; Anti-clockwise; Right-Angled; Triangle; Hypotenuse; Lengths; Pythagoras; Trigonometry; Sine; Cosine; Tangent; Adjacent; Opposite; Sequence; Pattern; Difference; Fibonacci; Term; Geometric; Rational	

	A main focus of this scheme is in transferrable skills that can be used outside the classroom	Recall the **knowledge**:	At the start of year 10, key themes of rounding, indices and estimation are revisited. The language is then formulised in preparation for GCSE. They then take the work they have done on standard form, building on it so they can calculate with standard form. When moving into algebra, the students ensure that the understanding of notation, expressions and equations are secure and then extend the work on quadratics that they started at the end of year 9. Inequalities are also looked at ensuring the different representations are clear. With handling data, the different representations and making comparisons are explored.	At the start of the term, Year 10 build on the work they did on equations in the Autumn term, using the skills to solve simultaneous equations. They then spend time building their knowledge with regards to area, circles, Pythagoras, trigonometry and volume. They will then take a greater depth look at compound measures, and angles in comparison to year 9. They finish the term by securing their understanding of calculating with fractions.	In the summer term, Year 10 take their understanding of fractions and apply this to percentages. This builds on the work from key stage 3, taking in a greater emphasis on the real world. This understanding of proportion is then used to develop proportion and ratio, including formal notation and equations. Students use different representations of linear and non-linear functions. Students will then re-visit their work on transformations, developing the language of congruency and similarity. Students will look at different ways of representing probability, before finishing by looking at differing constructions	The start of year 11 focuses on skills that they have met in Year 10, ensuring that they are secure and looking at further developing these skills in problem skills. They look at standard form, percentages, ratio and proportion. When looking at algebra, students use the skills they have developed in year 10, and apply them to identities, more complex formulas, inequalities and equations (including quadratic equations and simultaneous equations)	Students look at probability ensuring they are fully secure with all elements of this topic. They then move on to graphical representations of linear and non-linear functions, including using these functions to solve problems. Students then return to their work on 3D shapes, and use these within problems including compound shapes. Students also look at compound measures, including graphical representations. They then look at scale drawings, vectors (extending their understanding from translations), nd enlargement. Towards the end of the term there is an opportunity to revisit work on angles, Pythagoras, trigonometry and sequences to ensure a secure understanding	
What we want our students to do	*There will be a big emphasis on the skills that they have learnt in Key Stage 3, and the development of these skills - to demonstrate that this is a continuous curriculum*	Demonstrate excellence in these **skills**:	Working with standard form Using algebraic notation Manipulating expressions Solving equations Representing inequalities Representing and interpreting data	Calculate area of a variety of shapes Use Pythagoras and trigonometry Be flexible when dealing with compound measures Calculate with fractions	Calculating with percentages Understanding ratio and proportion Graphing linear and non-linear functions Transform shapes Understand probability Construct accurately	Using standard form Calculating with percentages Working with ratio and proportion. Representing functions algebraically Solving a range of equations	Graphing linear and nonlinear functions Calculate surface area and volume of 3D shapes Work with compound measures Understand vectors Calculate with trigonometry and Pythagoras	

Key assessment questions:			*Error spotting and explaining *Working in reverse *Identifying implications of rounding in calculations *Reason with over and under estimates *Check calculator errors using estimations *Large calculations with repeated index laws being used *Explain the rules of indices clearly *Complete missing indices to create equivalent expressions *Work with HCF and LCM with increasingly 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 *Substituting and re-arrangement in complex formulae. * Derive formulae and substitute values as required. *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	*Error spotting and explaining *Forming simultaneous equations *Using picture representations to explore simultaneous equations *Differing positive coefficients *Reason why leaving solutions in terms of Pi or not is best for different scenarios *Understanding the order of operations when calculating the area *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 *Contextual problems *Working backwards in surface area *Error spotting especially around the misconception of time conversions *Compare speeds when working with different units of speed *Calculating speeds from a scale drawing *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. *Using BIDMAS within fraction calculations *Using fractions in combination with integers in larger problems. *Fluent with the language difference, product and sum *Use known equivalent FDP to identify more equivalences *Compare equivalent	*Error spotting and reasoning *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 *Identify values that are in direct proportions *Find fractional multipliers between values in direct proportion *Algebraic ratios *Working with fractions and percentages with ratio *Reason which method (bar or fraction of amount) is more efficient or effective *Working with combined ratio *Working out lengths in shapes using ratio *Create a shopping list using items for best value *Plan a charity event with best value and recipes *Find missing values for tables of values *Explain why coordinates line on a line equation *Error spot in table of values *Function machines and real life graphs *mirror line for quadratics *begin to identify roots by investigating x intercepts *Explore area changes in similar shapes *Similar shapes where two shapes part of a bigger diagram *Reason using similar shape lengths and angles to find missing information in triangles *Identifying and using	*Error spotting and explaining *Exploring reasons why standard form is used *Interpreting standard form within scientific situations *Substitution with standard form *Calculating with standard form in geometric problems *Repeated percentage change *Does increasing by 10% then decreasing by 10% return the original value? *Identifying uses of direct and inverse proportion *Linking the equation derived to the graph *Algebraic ratios *Working with fractions and percentages with ratio *Reason which method (bar or fraction of amount) is more efficient or effective *Are there enough ingredients? *Do they have enough money? *Prove the LHS equates to the RHS using mathematical reasoning *Reasoning why some equations may be the odd one out regarding number of steps, coefficients and solutions plus those that can and cannot be solved *Work backwards from solutions to sketch graphs using the roots *Error spotting when factorising *Comment on other factorised solutions using mathematical reasoning *Use factorising in basic identities to find missing constants *Forming an inequality *Simultaneous equations within contexts, e.g. pictures including	*Error spotting and explaining *Exploring sample spaces *Interpreting more challenging probabilities from diagrams *Work backwards to find missing probabilities or values *Exploring more than two events *Probability experiments *Interpreting probability within contexts *Find missing values for tables of values *Explain why coordinates line on a line equation *Error spot in table of values *Function machines and real life graphs *Given a gradient construct a line segment *Given a gradient work out the horizontal and vertical lengths *Use trial and improvement to check approximations to roots *Combining other 2D shapes with sectors and circles *Contextual problems *Working backwards in surface area *Making judgements on context problems using speed, density and pressure *Discuss the limitations of a distance time graph *Interpreting distance and speed from a scale diagram *Given a series of vectors explain the resulting vector and what translation it would give *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. *Identifying simple Pythagoras' in context	

			what was expanded *Use visual representations to expand brackets *Explain the links between expanding and factorising *Reason with factorising *More complex variables/coefficients/operations *Use identities and expanding brackets to find missing constants *Apply to geometric areas *Reverse average problems *Calculate averages from graphs such as bar charts *Working with more complex data sets *Exploring grouped frequency tables *Comparing more than two graphs *Interpreting data in context to make decisions *Correlation vs causation *Reasoning why some equations may be the odd one out regarding number of steps, coefficients and solutions plus those that can and cannot be solved *Forming an inequality	FDP within a wider problem	similar properties to find similar measures without use of a diagram *Identifying mirror lines that are not parallel to the axis *Combining transformations *Describe transformations given no axes	rectangle lengths *Reason whether to add or subtract simultaneous equations *Explain why some simultaneous equations have no solution	*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 *Incorporating algebraic terms *Exploring real life applications of sequences	
Disciplinary Rigour		What makes your subject different to other subjects? What are the expectations for students in your subject area in the KS4 National Curriculum if applicable / KS4 qualification specification?	Understanding the limitations of mathematics Applying algebra to real-world situations. Understanding how to interpret different representations	Being able to work with 2D and 3D shapes To understand and use a variety of compound measures - including in real world situations Be flexible in approach to use the appropriate methods to solve problems	Understanding how proportion works in the real world, and different ways we can present this. Differing representations of algebraic functions Real world applications of probability	Applying understanding of ratio, proportion and percentages to real world examples Being able to manipulate equations and formulas to find suitable solutions to problems	Use different representations of compound measures Work with 3D shapes Use formulae in a variety of situations	