CURIOSITY COMPASSION COURAGE

Curriculum Overview

Subject	Mathematics	Year group	12/13
Vision statement:	At Landau Forte our curriculum exists to ensure all students regardless of background and ability have the opportunity to unlock their potential. We are committed to students being challenged from their previous key stage learning experiences. Our broad and balanced curriculum is ambitious, coherently planned and sequenced, and will provide the platform for preparing students with the foundations for examination success. Our Curriculum Intent has been informed by a wide variety of researchers and is steeped in evidence based research. Christine Counsell summarises the aspiration of our curriculum to empower all learners creating a pathway to success in university, their career and life: *'A curriculum exists to change the pupil, to give the pupil new power. One acid test for a curriculum is whether it enables even lower attaining or disadvantaged pupils to clamber into the discourse and practices of educated people, so that they gain powers of the powerful.'* As well as excellent academic success we aim to ensure our students leave us as polite and well-rounded young adults. Our new core values of Compassion, Courage and Curiosity are currently being embedded throughout our curriculum offer to ensure we continue to meet our social, emotional, spiritual and moral obligations.		
Curriculum intent:	All students acquire the mathematical life skills necessary for the world of work, no matter what their starting point is, catering for all abilities and backgrounds. We have a strong belief that all students can achieve in Maths. Students will be taught to have a firm understanding of number bonds and be confident in using non-calculator strategies for solving problems. Students will be stretched and challenged through problem solving tasks to develop resilience. Students are encouraged to show **courage** through attempting questions in environment where other students show **compassion** through a culture of being non-judgmental when questions are answered incorrectly. Students are also encouraged to show **curiosity** through asking questions and taking a genuine interest in the real life applications of the Maths that they are learning. This will be achieved by staff working together in planning lessons that allow ALL students to achieve/ exceed their potential through: Common lesson planning formats; Expert knowledge of the subject; Differentiated material; Regular use of AfL to assess progress in a lesson; Regular use of formal marking and feedback; Regular summative assessments to ensure appropriate progress and intervention.		
Threshold Concepts (TCs):	TC1 Algebraic manipulation - This concept involves recognising mathematical properties and relationships using symbolic representation TC2 Number sense - This concept involves understanding the number system and how they are used in a wide variety of mathematical ways TC3 Shape facts - This concept involves recognising the names and properties of geometry shapes and angles. TC4 Multiplicative reasoning - This concept involves using ratio and proportion and understanding of reciprocals in real world applications TC5 Representing and interpreting data - This concept involves interpreting, manipulating and presenting data in various ways. TC6 Calculator skills - This concept involves fluent application of mathematical operations on a scientific calculator TC7 Understanding and calculating risk - This concept involves knowing the rules of probability in the correct context		

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KS4 National Curriculum summary:	The national curriculum for mathematics aims to ensure that all pupils: • become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. • reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language • can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions. Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 4 is organised into apparently distinct domains, but pupils should develop and consolidate connections across mathematical ideas. They should build on learning from key stage 3 to further develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge wherever relevant in other subjects and in financial contexts.
Learner skills:	Critical thinking  Organisation  Collaboration  Adaptability  Oracy  Self-quizzing 

	Term 1 Aug-Oct	Term 2 Nov-Dec	Term 3 Jan-Feb	Term 4 Mar-Apr	Term 5 Apr-May	Term 6 Jun-Jul
Big picture questions:	**What are the different types of sampling?** **What are the disadvantages and advantages of different sampling methods?** **How do time series relate to moving averages?** **What is cumulative frequency?**	**How does probability relate to sample size?** **How do I calculate probabilities using a tree diagram?** **How do I calculate probabilities using a Venn diagram?** **What does all the different probability notation mean?**	**How do I solve linear equations?** **Can I represent real life situations as equations?** **How do I solve simultaneous equations?** **How I plot a straight line graph?**	**How do I calculate with percentages?** **What is growth and decay?** **How do simple interest and compound interest differ?** **What do different types of graphs look like?** **How do I generate a sequence?**	•	

	How do I draw and interpret histograms? **How do I draw and analyse box plots?** **How do I find averages from a list or frequency table?** **How do I find standard deviation from a list or frequency table?** **Does correlation imply causation?** **How do I draw a line of best fit?** **How does the product moment correlation coefficient show correlation?** **How reliable is interpolation and extrapolation?** **What is a regression line?** **How do I draw a regression line?** **What is Spearman's Rank and what does it show?**	**What is conditional probability?** **How do I test if two events are independent?** **How do I know if two events are mutually exclusive?** **What is the inclusion-exclusion principle?** **How do I calculate risk?**	**What are the different ways I can represent inequalities?** **How do I solve linear programming problems?** **How do I formulate a linear programming problems?** **What happens if a linear programming problem requires integer solutions?**	**What are the laws on indices?** **How do I find the nth term of a linear sequence?** **How do I find the nth term of a quadratic sequence?** **What is sigma notation?** **What is an arithmetic series?** **How do I find the sum of n terms in an arithmetic series?** **What is a geometric series?** **How do I find the sum of n terms in a geometric series?** **How do I find the sum to infinity of a geometric series?**		

Content (Linked to TCs):	TC1 Algebraic manipulation TC2 Number sense TC5 Representing and interpreting data various ways. TC6 Calculator skills **Sampling** Simple Random Sampling Stratified Sampling Systematic Sampling Quote Sampling Opportunity Sampling Limitations of Sampling **Time Series** Time Series Graphs Calculate Moving Averages Plotting Moving Averages **Frequency Diagrams** Drawing Histograms Analysing Histograms Cumulative Frequency **Box Plots** Drawing Box Plots Outliers Analysing Box Plots **Central Tendency and Variance** Averages from a list Averages from a table Quartiles	TC1 Algebraic manipulation TC2 Number sense TC6 Calculator skills - TC7 Understanding and calculating risk **Experimental Probability** Increasing Sample Size **Tree Diagrams** Drawing Tree Diagrams Calculating Probability from Tree Diagrams **Independent and Dependent Events** Dependent events from Tree Diagrams Venn Diagrams **Conditional Probability** Conditional Probability from Tree Diagrams Conditional Probability from Venn Diagrams **Probability Notation** Intersection Notation Union Notation Complement Notation Conditional Notation **Probability Formulae** Addition Rule for Mutually Exclusive Events Multiplication Rule for Independent Events Conditional Probability Formula for independent events	TC1 Algebraic manipulation TC2 Number sense TC4 Multiplicative Reasoning TC5 Representing and interpreting data various ways. TC6 Calculator skills **Linear Equations** Derive Equations from Worded Problems Solve Linear Equations **Linear Graphs** Plot Straight Line Graphs Identify Parallel Lines Find Equation of a Line through two given Points Find Equation of a Line through one point with a gradient Sketch Graphs of Linear Functions **Simultaneous Equations** Solve Simultaneous Equations Algebraically Solve Simultaneous Equations Graphically Derive Equations from Worded Problems **Linear Inequalities** Solve Linear Inequalities Represent Solutions on a Number Line Represent Solutions on a Graph **Linear Programming**	TC1 Algebraic manipulation TC2 Number sense TC6 Calculator skills **Percentages** Percentage of an Amount Percentage Increase and Decrease Percentage Change Reverse Percentages **Growth and Decay** Growth and Decay problems Simple and Compound Interest **Graphs** Quadratic Functions Reciprocal Functions Polynomial Functions Exponential Functions Gradient of a Line Rates of Change **Indices** Laws of Indices (Integer and Fractional) **Sequences** Generate Sequences from nth term Fibonacci Sequences and Golden Ratio Recurrence relations **Nth Term** Nth Term of a Linear Sequence Nth Term of a quadratic Sequence	**Revision** • A selection of revisiting certain topics • Exam practice Overview and practice of the pre-release material.	

	Inter-quartile range Standard deviation from a list Standard deviation from a table **Correlation** Correlation and causation Scatter graphs Lines of best fit Interpolation and extrapolation Explanatory and response variables PMCC **Regression** Equation of a regression line Interpreting linear regression **Spearman's Rank** Spearman's rank correlation coefficient Spearman's rank with tied ranks	Conditional Probability Formula for dependent events Complement Formula Inclusion-Exclusion Principle **Risk** Interpret Risk Calculate Risk Compare Levels of Risk	Formulate Linear Programming Problems (up to three variables) Solving Using Objective Line Method Solving Using Vertex testing Method Problems with Integer Solutions	**Arithmetic Series** Interpret Arithmetic Series General Term of an Arithmetic Series Sum to n of an Arithmetic Series **Geometric Series** Interpret Geometric Series General Term of a Geometric Series Sum to n of a Geometric Series Sum to Infinity of a Geometric Series		
Key vocabulary:	**Sampling** Sample, census, population, bias, distributions, random sample, stratified sample, systematic sample, opportunity sample, quote sample.	**Experimental Probability** Empirical unbiased samples, theoretical probability, sample size. **Tree Diagrams** Branches, tree diagram, independent events,	**Linear Equations** Solve, equations, unknowns, variable, formulate, solution, expression. **Linear Graphs**	**Percentages** Percentage Change, percentage increase, percentage decrease, multiplier. **Growth and Decay**		

	Frequency Diagrams Discrete, continuous, histograms, frequency, frequency density, class width, cumulative frequency. **Box Plots** Box plot, outliers, median, lower quartile, upper quartile, interquartile range, spread, consistent, average. **Central Tendency and Variance** Lower quartile, upper quartile, percentile, interquartile range, median, mean, range, mode, frequency table, standard deviation, spread, variance, outliers. **Time Series** Time series, line graph, moving averages. **Correlation** Correlation, causation, positive correlation, no correlation, negative correlation, interpolation, extrapolation, line of	dependent events, events, probability. **Independent and Dependent Events** Tree diagrams, Venn diagrams, replacement, independence, dependence. **Conditional Probability** Expected frequency, tree diagrams, Venn diagrams, two-way tables, conditional probability, given. **Probability Notation** Events, independence, intersection, union, complement, conditional probability, and, or, not, given. **Probability Formulae** Complement, given, union, intersection, inclusion-exclusion principle, mutually exclusive, independent. **Risk** Probability, cost, benefit, risk, insurance, comparison, expectation, expected cost, expected profit, total expectation.	Straight line graphs, coordinates, coordinate plane, y=mx+c, equation, point, gradient. **Simultaneous Equations** Solve, equations, unknowns, variables, formulate, solutions, expressions. **Linear Inequalities** Solve, unknown, variable, number line, greater than, less than, at least, at most. **Linear Programming** Objective function, maximise, minimise, variables, cost, profit, constraints, inequalities, formulate, objective line, vertex testing, optimal solution, integer solutions, feasible region, feasible solution.	Growth, decay, percentage change, multiplier, simple interest, compound interest. **Graphs** Functions quadratic, cubic, polynomial, reciprocal, exponential, gradient, rate of change. **Indices** Index, index laws, fractional powers, integer powers, roots, powers. **Nth Term** Sequence, linear sequence, geometric sequence, quadratic sequence, expressions, generate, common difference, common ratio. **Sequences,** Sequence, nth term, formula, generate, recurrence relation, Fibonacci sequences, golden ratio. **Arithmetic Series** Sequence, series, sum to n terms, arithmetic		

	best fit, outliers, product moment correlation coefficient. **Linear Regression** Regression line, straight line, mean, method of least squares. **Spearman's Rank** Spearman's rank, degree of correlation, tied ranks.			series, common difference. **Geometric Series** Sequence, series, sum to n terms, sum to infinity, convergence, geometric series, common ratio.		
Assessment:	**Baseline Assessment** **Unit Assessment 1 - Statistics**	**Unit Assessment 2 – Probability** **PPE1**	**Unit Assessment 3 – Linear Programming**	**Unit Assessment 4 – Sequences** **PPE2**	**Final Exam**	
Key/Historical misconceptions in this unit:	• Mixing up the different sampling techniques. • Plotting frequency rather than frequency density on the y axis of a histogram. • Not plotting cumulative frequency at the end of the intervals. • Not plotting moving averages in the middle of each band.	• Not understanding probability as a theoretical concept. • Adding probabilities on tree diagrams rather than multiplying. • Mixing up Venn diagram notation. • Applying certain probability formulae when the events are not mutually exclusive or independent.	• Mistakes when calculating gradient and the equation of a line. • Confusing the variable x with multiply. • Not flipping the inequality sign when solving inequalities and dividing or multiplying by a negative. • Shading the wrong side of a line when representing an inequality.	• Dividing by the new rather than the original when calculating percentage change. • Working out reverse percentages incorrectly. • Exponential growth means 'fast'. • Mixing up simple and compound interest. • Plotting reciprocal graphs in the		

	• Incorrectly working out fx^2 when calculating standard deviation from the formula. • Incorrectly ranking tied ranks when doing Spearman's rank.	• Miscalculating risk.	• Incorrectly formulating constraints of a linear programming problem, especially those with 'at most' or 'at least' in them. • Not interpreting the intersection of lines in a feasible region being the solution of simultaneous equations.	wrong quadrant. • Working out gradient incorrectly. • Not interpreting gradient as a rate of change. • Mixing up quadratic and geometric sequences. • Trying to find the sum of a quadratic series. • Trying to find the sum to infinity of a geometric series that doesn't converge or an arithmetic series.		
Sequencing:	**We have chosen to sequence the core maths curriculum in this way for a number of reasons. A lot of topics build on each other, for example linear programming can only be taught once students are secure in their knowledge of simultaneous equations and linear inequalities. Some of the topics overlap with GCSE and some of these topics may require more re-teaching than others. Assessments have been incorporated into the curriculum for each unit, along with more general practice exam assessments to give students practice for the exam in May/June**					