CURIOSITY COMPASSION COURAGE

Academic outline 2022-23

	A Level Mathematics					
	Term 1 Aug-Oct	Term 2 Nov-Dec	Term 3 Jan-Feb	Term 4 Mar-Apr	Term 5 Apr-May	Term 6 Jun-Jul
Year 12:	• Pure Chapter 1 – Algebraic Expressions • Pure Chapter 2 – Quadratic Functions • Pure Chapter 3 – Equations/Inequalities • Pure Chapter 4 – Graphs/Transformations • Pure Chapter 5 – Straight Line Graphs • Pure Chapter 6 - Circles	• Pure Chapter 9 – Trigonometric ratios and graphs • Pure Chapter 7 – Algebraic Fractions/Factor Theorem/Proof • Pure Chapter 11 - Vectors • Applied Chapter 1 – Statistical Sampling • Applied Chapter 2 – Data presentation and interpretation • Applied Chapter 8 – Quantities and units in mechanics • Applied Chapter 9 – Kinematics 1	• Pure Chapter 12 – Differentiation • Pure Chapter 10 – Trigonometric ratios and graphs • Pure Chapter 8 – Binomial Expansion • Applied Chapter 3 - Data presentation and interpretation	• Pure Chapter 13 - Integration • Pure Chapter 14 – Exponentials and Logarithms • Applied Chapter 10 – Forces and Newton's laws	• Applied Chapter 4 - Data presentation and interpretation • Applied Chapter 5 - Probability • Applied Chapter 6 – Statistical Distributions • Applied Chapter 7 – Statistical Hypothesis Testing • Applied Chapter 11 – Kinematics 2	

Year 13:	• Pure Chapter 1 – Algebraic Methods • Pure Chapter 2 – Functions and Graphs • Pure Chapter 3 – Series and Sequences • Pure Chapter 4 – the binomial theorem • Applied Chapter 1 – Regression and correlation • Applied Chapter 4 - Moments	• Pure Chapter 5 – Trigonometry (Radians and small angles) • Pure Chapter 9 – Differentiation • Pure Chapter 6 – Trigonometry (secant, cosecant and cotangent) • Pure Chapter 12 – Vectors (3D) • Applied Chapter 2 – Functions and Graphs • Applied Chapter 5 – Friction and forces	• Pure Chapter 7 – Trigonometry (Compound and double angle formulae) • Pure Chapter 8 – Parametric Equations • Pure Chapter 10 – Numerical methods • Pure Chapter 11 - Integration	• Applied Chapter 3 – The normal distribution • Applied Chapter 6 – Applications of kinematics (Projectiles) • Applied Chapter 7 – Applications of forces • Applied Chapter 8 – Further kinematics		

Curriculum overview

Subject	Mathematics	**Year group**	12
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
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.

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Learner skills:	Critical thinking  	Organisation  	Collaboration  	Adaptability  	Oracy  	Self-quizzing 
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The Big Question						
Big picture questions:	**How do I manipulate algebra to help me solve problems?** **How do I solve problems with straight line graphs and circles?**	**What are the applications of trigonometry?** **How can I solve more complex algebraic problems?** **Why are vectors useful?** **How can I use sampling in practice?** **What is the difference between scalar and vector quantities?** **How can I use the SUVAT equations to solve problems?**	**What is differentiation?** **What are the applications of trigonometry?** **How can I solve more complex algebraic problems?** **How can I use data to draw conclusions?**	**What are the applications of integration?** **What are the uses of logs?** **How can I apply Newton's laws?**	**How can I use data to draw conclusions?** **How can I use a variety of techniques to interpret the probability of an event happening?** **How can I use a calculator to calculator work out multiple probabilities?** **What is a hypothesis test?** **How does differentiation and integration help in mechanics?**	

Content (Linked to TCs):	**Algebra and functions** Algebraic expressions – basic algebraic manipulation, indices and surds Quadratic functions – factorising, solving, graphs and the discriminants Equations – quadratic/linear simultaneous Inequalities – linear and quadratic (including graphical solutions) Graphs – cubic, quartic and reciprocal Transformations – transforming graphs – f(x) notation **Coordinate geometry in the (x, y) plane** Straight-line graphs, parallel/perpendicular, length and area problems Circles – equation of a circle, geometric problems on a grid	**Trigonometric ratios and graphs** **Further algebra** Algebraic Fraction & dividing polynomials The factor Theorem Mathematical Proof and methods of proof **Vectors (2D)** Definitions, magnitude/direction, addition and scalar multiplication Position vectors, distance between two points, geometric problems **Statistical sampling** Introduction to sampling terminology; Advantages and disadvantages of sampling Understand and use sampling techniques; Compare sampling techniques in context **Data presentation and interpretation** Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation;	**Differentiation** Definition, differentiating polynomials, second derivatives Gradients, tangents, normals, maxima and minima **Trigonometry** Trigonometric identities and equations **Further algebra** The Binomial expansion **Data presentation and interpretation** Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems	**Integration** Definition as opposite of differentiation, indefinite integrals of xn Definite integrals and areas under curves **Exponentials and logarithms** Exponential functions and natural logarithms **Forces & Newton's laws** Newton's first law, force diagrams, equilibrium, introduction to i, j system Newton's second law, 'F = ma', connected particles (no resolving forces or use of F = μR); Newton's third law: equilibrium, problems involving smooth pulleys HUnit7a	**Data presentation and interpretation** Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems **Probability** Mutually exclusive events; Independent events **Statistical distributions** Use discrete distributions to model real-world situations; Identify the discrete uniform distribution; Calculate probabilities using the binomial distribution (calculator use expected) **Statistical hypothesis testing** Language of hypothesis testing; Significance levels Carry out hypothesis tests involving the binomial distribution **Kinematics 2 (variable acceleration)**	**Consolidation of year 12 work**

		Understand and use coding **Quantities and units in mechanics** Introduction to mathematical modelling and standard S.I. units of length, time and mass Definitions of force, velocity, speed, acceleration and weight and displacement; Vector and scalar quantities **Kinematics 1 (constant acceleration)** Graphical representation of velocity, acceleration and displacement Motion in a straight line under constant acceleration; suvat formulae for constant acceleration; Vertical motion under gravity			Variable force; Calculus to determine rates of change for kinematics Use of integration for kinematics problems i.e.	
Key vocabulary:	Expression, function, constant, variable, term, unknown, coefficient, index, linear, identity, simultaneous, elimination, substitution, factorise, completing the square, intersection, change the subject, cross-multiply, power, exponent, base, rational, irrational, reciprocal,	Sine, cosine, tangent, interval, period, amplitude, function, inverse, angle of elevation, angle of depression, bearing, degree, identity, special angles, unit circle, symmetry, hypotenuse, opposite, adjacent, intercept.	Differentiation, derivative, first principles, rate of change, rational, constant, tangent, normal, increasing, decreasing, stationary point, maximum, minimum, integer, calculus, function, parallel, perpendicular.	Calculus, differentiate, integrate, reverse, indefinite, definite, constant, evaluate, intersection. Exponential, exponent, power, logarithm, base, initial, rate of change, compound interest	Mean, median, mode, variance, standard deviation, range, interquartile range, interpercentile range, outlier, skewness, symmetrical, positive skew, negative skew. Sample space, exclusive event, complementary event, discrete random	

	root, standard form, surd, rationalise, exact, manipulate, sketch, plot, quadratic, maximum, minimum, turning point, discriminant, real roots, repeated roots, intercepts. Factorise, intersection, root, manipulate, sketch, plot, quadratic, maximum, minimum, turning point, transformation, translation, polynomial, discriminant, real roots, repeated roots, factor theorem, quotient, intercepts, inequality, asymptote. Equation, bisect, centre, chord, circle, circumcircle, coefficient, constant, diameter, gradient, hypotenuse, intercept, isosceles, linear, midpoint, parallel, perpendicular, proportion, Pythagoras, radius, right angle, segment, semicircle, simultaneous, tangent.	Binomial, coefficient, probability, proof, assumptions, deduction, exhaustion, disproof, counter-example, polynomials, factorisation, quadratic, cubic, quartic, conjecture, prediction, rational number, implies, necessary, sufficient, converse, fully factorise, factor, expand, therefore, conclusion. Vector, scalar, magnitude, direction, component, parallel, perpendicular, modulus, dimension, ratio, collinear, scalar product, position vectors. Population, census, sample, sampling unit, sampling frame, simple random sampling, stratified, systematic, quota, opportunity (convenience) sampling. Mean, median, mode, variance, standard deviation, range, interquartile range, interpercentile range, outlier, skewness, symmetrical, positive skew, negative skew.	Sine, cosine, tangent, interval, period, amplitude, function, inverse, angle of elevation, angle of depression, bearing, degree, identity, special angles, unit circle, symmetry, hypotenuse, opposite, adjacent, intercept. Binomial, coefficient, probability, proof, assumptions, deduction, exhaustion, disproof, counter-example, polynomials, factorisation, quadratic, cubic, quartic, conjecture, prediction, rational number, implies, necessary, sufficient, converse, fully factorise, factor, expand, therefore, conclusion. Mean, median, mode, variance, standard deviation, range, interquartile range, interpercentile range, outlier, skewness, symmetrical, positive skew, negative skew.	Force, newtons, mass, weight, gravity, tension, thrust, compression, air resistance, reaction, driving force, braking force, resultant, force diagram, equilibrium, inextensible, light, negligible, particle, smooth, uniform, pulley, string, retardation, free particle.	variable, continuous random variable, mathematical modelling, independent, mutually exclusive, Venn diagram, tree diagram. Binomial, probability, discrete distribution, discrete random variable, uniform, cumulative probabilities. Hypotheses, significance level, one-tailed test, two-tailed test, test statistic, null hypothesis, alternative hypothesis, critical value, critical region, acceptance region, p-value, binomial model, accept, reject, sample, inference. Distance, displacement, velocity, speed, constant acceleration, variable acceleration, retardation, deceleration, gradient, area, differentiate, integrate, rate of change, straight-line motion, with respect to time, constant of integration, initial conditions.	[redacted]

		Modelling, smooth, rough, light, inelastic, inextensible, particle, rigid body, mass, weight, rod, plane, lamina, length, distance (m), displacement (m), velocity (m s-1), speed (m s-1), acceleration (m s-2), force (N), retardation (m s-2), newtons (N), scalar, vector, direction, magnitude, (normal) reaction, friction, tension, thrust, compression Distance (m), displacement (m), speed (m s-1), velocity (m s-1), acceleration (m s-2), retardation (m s-2), deceleration (m s-2), scalar, vector, 2D, linear, area, trapezium, gradient, equations of motion, gravity, constant, 9.8 m s-2, vertical.				
Assessment:	**Unit Assessments Baseline Assessment**	**Unit Assessments**	**Unit Assessments Summative Assessment 1**	**Unit Assessments**	**Unit Assessments**	**Unit Assessments Summative Assessment 2**
Key/Historical misconceptions in this unit:	**What it means to have a real root.**	**Confusion of constant and variable acceleration, distance**	**Recalling basic trigonometry**	**Using the correct base for natural logs, rearranging logs and**	**Two tailed and one tailed, level of significance,**	

		time graphs and velocity time graphs	Differentiation for first principals, understanding limits, integrating with respect to the incorrect variable	exponentials, laws of logs	interchanging horizontal and vertical transformations formations, interchanging stretch and compressions of transformations Incorrectly using the tabulated values. Integer values for binomial distribution, binomial PD and binomial CD.	[redacted]
Sequencing:	We have chosen to sequence the year 12 curriculum like this because it builds on the higher concepts learnt in year 11 and progresses forward to provide students with the skills for year 13. Students start with the key algebraic topics which underpin most of the topics which will follow over the course.					