



CURIOSITY

COMPASSION

COURAGE

Curriculum overview



Subject	Mathematics	Year group	13
<p>Vision statement:</p>	<p>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.</p> <p>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:</p> <p><i>‘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.’</i></p> <p>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.</p>		
<p>Curriculum intent:</p>	<p>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.</p> <p>Students will be taught to have a firm understanding of number bonds and be confident in using non-calculator strategies for solving problems.</p> <p>Students will be stretched and challenged through problem solving tasks to develop resilience.</p> <p>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.</p> <p>This will be achieved by staff working together in planning lessons that allow ALL students to achieve/ exceed their potential through:</p> <ul style="list-style-type: none"> 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. 		
<p>Threshold Concepts (TCs):</p>	<p>TC1 Algebraic manipulation - This concept involves recognising mathematical properties and relationships using symbolic representation</p> <p>TC2 Number sense - This concept involves understanding the number system and how they are used in a wide variety of mathematical ways</p> <p>TC3 Shape facts - This concept involves recognising the names and properties of geometry shapes and angles.</p> <p>TC4 Multiplicative reasoning - This concept involves using ratio and proportion and understanding of reciprocals in real world applications</p> <p>TC5 Representing and interpreting data - This concept involves interpreting, manipulating and presenting data in various ways.</p> <p>TC6 Calculator skills - This concept involves fluent application of mathematical operations on a scientific calculator</p> <p>TC7 Understanding and calculating risk - This concept involves knowing the rules of probability in the correct context</p>		









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<p>KS4 National Curriculum summary:</p>	<p>The national curriculum for mathematics aims to ensure that all pupils:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>					
<p>Learner skills:</p>	<p>Critical thinking</p>  <p>CRITICAL THINKING</p>	<p>Organisation</p>  <p>ORGANISATION</p>	<p>Collaboration</p>  <p>COLLABORATION</p>	<p>Adaptability</p>  <p>ADAPTABILITY</p>	<p>Oracy</p>  <p>ORACY</p>	<p>Self-quizzing</p>  <p>SELF QUIZZING</p>
	<p>Term 1 Aug-Oct</p>	<p>Term 2 Nov-Dec</p>	<p>Term 3 Jan-Feb</p>	<p>Term 4 Mar-Apr</p>	<p>Term 5 Apr-May</p>	<p>Term 6 Jun-Jul</p>
<p>The Big Question</p>						
<p>Big picture questions:</p>	<p>How do I model with functions?</p> <p>What is a series?</p> <p>How can I apply the binomial theorem?</p>	<p>What is meant by a parametric equation?</p> <p>How do I differentiate more complex functions?</p>	<p>What numerical methods can I use to solve problems?</p> <p>How can I apply the normal distribution to problems?</p>	<p>How do I apply integration?</p> <p>How can I use calculus to solve acceleration problems?</p>		



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	<p>How can I apply trigonometry to more complex problems?</p> <p>How can I use hypothesis testing when the correlation is 0?</p> <p>What is meant by the centre of mass?</p>	<p>How can I apply trigonometry to more complex problems?</p> <p>How do I use vectors in 3D?</p> <p>What is meant by conditional probability?</p> <p>How can I resolve forces when working with friction?</p>	<p>How do I apply kinematic knowledge to problems involving projectiles?</p> <p>How do I solve problems with particles?</p>		
<p>Content (Linked to TCs):</p>	<p>TC1 Algebraic manipulation TC3 Shape facts TC5 Representing and interpreting data TC6 Calculator skills TC7 Understanding and calculating risk</p> <p>Functions & Graphs Modulus function Composite and inverse functions Transformations Modelling with functions* examples may be Trigonometric, exponential, reciprocal etc.</p>	<p>TC1 Algebraic manipulation TC3 Shape facts TC5 Representing and interpreting data TC6 Calculator skills</p> <p>Parametric equations Definition and converting between parametric and Cartesian forms Curve sketching and modelling</p> <p>Differentiation Differentiating $\sin x$ and $\cos x$ from first principles Differentiating exponentials and logarithms</p>	<p>TC1 Algebraic manipulation TC2 Number sense TC5 Representing and interpreting data TC6 Calculator skills</p> <p>Numerical methods Location of roots Solving by iterative methods (knowledge of 'staircase and cobweb' diagrams) Newton-Raphson method Problem solving</p> <p>The Normal distribution Understand and use the Normal distribution Use the Normal distribution as an</p>	<p>TC1 Algebraic manipulation TC6 Calculator skills</p> <p>Integration Integrating x^n (including when $n = -1$), exponentials and trigonometric functions. Integrating functions defined parametrically. Using the reverse of differentiation, and using trigonometric identities to manipulate integrals Integration by substitution Integration by parts Use of partial fractions Areas under graphs or between two curves, including understanding</p>	<p>Revision for exams</p>



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Series and sequences

Arithmetic and geometric progressions (proofs of 'sum formulae')

Sigma notation
Recurrence and iterations

Trigonometry

Radians (exact values), arcs and sectors
Small angles

The binomial theorem

Expanding $(a + bx)^n$ for rational n ; knowledge of range of validity

Expansion of functions by first using partial fractions

Regression and correlation

Change of variable
Correlation coefficients
Statistical hypothesis testing for zero correlation

Moments

Moments: Forces' turning effect
Forces at any angle

Differentiating products, quotients, implicit and parametric functions.
Second derivatives (rates of change of gradient, inflections)
Rates of change problems* (including growth and kinematics)

Trigonometry

Secant, cosecant and cotangent (definitions, identities and graphs);
Inverse trigonometrical functions; Inverse trigonometrical functions

Trigonometry

Compound* and double (and half) angle formulae
*geometric proofs expected
 $R \cos(x \pm \alpha)$ or $R \sin(x \pm \alpha)$
Proving trigonometric identities
Solving problems in context (e.g. mechanics)

Vectors (3D)

Use of vectors in three dimensions; knowledge of column vectors and i, j and k unit vectors

Probability

approximation to the binomial distribution
Selecting the appropriate distribution
Statistical hypothesis testing for the mean of the Normal distribution

Applications of kinematics: Projectiles

Resolving horizontal and vertical components
Solving problems involving particles projected at an angle
Derive formulae for time, flight, range and greatest height, and equation of path

Applications of forces

Equilibrium and statics of a particle (including ladder problems)
Dynamics of a particle

the area is the limit of a sum (using sigma notation).
Areas under curves expressed parametrically
The trapezium rule
Differential equations (including knowledge of the family of solution curves)

Further kinematics

Constant acceleration (equations of motion in 2D; the i, j system)
Variable acceleration (use of calculus and finding vectors)



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	<p>Resolving forces Centre of mass</p>	<p>Using set notation for probability Conditional probability Questioning assumptions in probability</p> <p>Friction and Forces Friction forces (including coefficient of friction μ)</p>			
<p>Key vocabulary:</p>	<p>Function, mapping, domain, range, modulus, transformation, composite, inverse, one to one, many to one, mappings, reflect, translate, stretch.</p> <p>Sequence, series, finite, infinite, summation notation, Σ(sigma), periodicity, convergent, divergent, natural numbers, arithmetic series, arithmetic progression (AP), common difference, geometric series, geometric progression (GP), common ratio, nth term, sum to n terms, sum to infinity (S_{∞}), limit.</p> <p>Pythagoras, Pythagorean triple, right-angled triangle, opposite, adjacent, hypotenuse, trigonometry, sine,</p>	<p>Parametric, Cartesian, convert, parameter t, identity, eliminate, substitute, circle, hyperbola, parabola, ellipse, domain, modelling, differential, integral, area.</p> <p>Derivative, tangent, normal, turning point, stationary point, maximum, minimum, inflexion, implicit, differential equation, rate of change, product, quotient, first derivative, second derivative, increasing function, decreasing function.</p> <p>Pythagoras, Pythagorean triple, right-angled triangle, opposite, adjacent, hypotenuse, trigonometry, sine, cosine, tangent, secant, cosecant, cotangent, SOHCAHTOA, exact,</p>	<p>Roots, continuous, function, positive, negative, converge, diverge, interval, derivative, tangent, chord, iteration, Newton-Raphson, staircase, cobweb, trapezium rule.</p> <p>Binomial, discrete distribution, discrete random variable, uniform, cumulative probabilities Normal, mean, variance, continuous distribution, histogram, inflection, appropriate probability distribution.</p> <p>Projectile, range, vertical, horizontal, component, acceleration, gravity, initial velocity, vector, angle of projection, position, trajectory, parabola.</p>	<p>Integral, inverse, differential, coefficient, index, power, negative, reciprocal, natural logarithm, coefficient, exponential, identity, sin, cos, tan, sec, cosec, cot, parametric, definite integral, integrand, limit, indefinite integral, constant of integration, trapezium, substitution, by parts, area, differential equation, first order, separating variables, initial conditions, general solution.</p> <p>Distance, displacement, speed, velocity, constant acceleration, constant force, variable force, variable acceleration, retardation, deceleration, initial ($tt = 0$), stationary (speed = 0), at rest (speed = 0), instantaneously,</p>	



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cosine, tangent, secant, cosecant, cotangent, SOHCAHTOA, exact, symmetry, periodicity, identity, equation, interval, quadrant, degree, radian, circular measure, infinity, asymptote, small angles, approximation, identity.

Binomial, expansion, theorem, integer, rational, power, index, coefficient, validity, modulus, factorial, nCr , combinations, Pascal's triangle, partial fractions, approximation, converges, diverges, root.

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, correlation coefficients, product moment correlation coefficient, population coefficient, sample, inference, mean, normal distribution, variance, assumed variance, linear

symmetry, periodicity, identity, equation, interval, quadrant, degree, radian, circular measure, infinity, asymptote, small angles, approximation, identity.

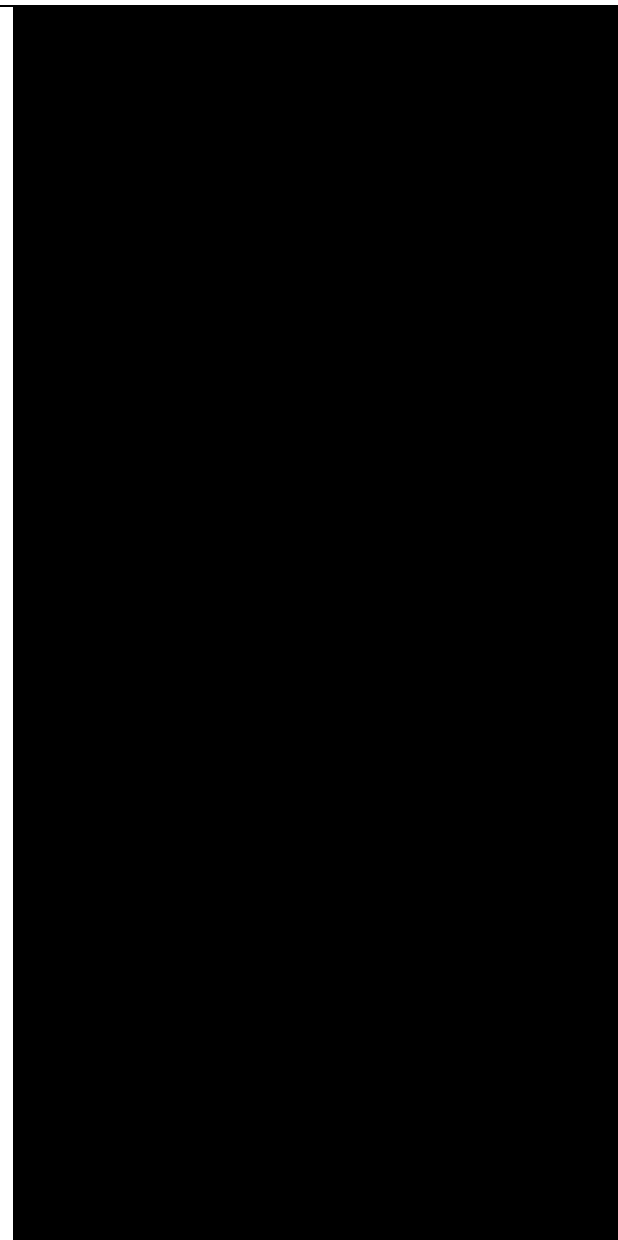
Vector, scalar, column, 3D coordinates, vertices, Cartesian, i, j, k, magnitude, origin, distance, direction, angle, position vector, unit vector, vector addition/subtraction.

Sample space, exclusive event, complementary event, discrete random variable, continuous random variable, mathematical modelling, independent, mutually exclusive, Venn diagram, tree diagram, set notation, conditional probability, two-way tables, critiquing assumptions.

Force, weight, tension, thrust, friction, coefficient of friction, μ , limiting, reaction, resultant, magnitude, direction, bearing, force diagram, equilibrium,

Force, resultant, component, resolving, plane, parallel, perpendicular, weight, tension, thrust, friction, air resistance, reaction, driving force, braking force, force diagram, equilibrium, inextensible, light, negligible, particle, rough, smooth, incline, uniform, friction, coefficient of friction, concurrent, coplanar.

differentiate, integrate, turning point.





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	<p>regression, interpolation, extrapolation, coded data</p> <p>Moment, turning effect, sense, newton metre (Nm), equilibrium, reaction, tension, rod, uniform, non-uniform, centre of mass, resolve, tilting, 'on the point', concurrent.</p>	<p>inextensible, light, negligible, particle, smooth, rough, uniform, perpendicular.</p>			
Assessment:	KLT 1	PPE 1 KLT 2	PPE 2		
Key/Historical misconceptions in this unit:	<p>Interchanging range with domain, 1 to 1 and 1 to many</p> <p>Geometric and arithmetic progression, negative ratios on geometry progression difference between geometric sequence and series, nth term formula and sum formula</p>	<p>Ensuring negatives in the correct place for sin and cos, chain rule, quotient rule and product rule</p> <p>Interchanging position vector with direction vectors,</p>	<p>Using radians for calculations, interchanging reciprocal graphs to inverse functions.</p>		
Sequencing:	<p>We have chosen to sequence the year 13 curriculum like this because it builds on the concepts learnt in year 12 and progresses forward to provide students with the skills for their next steps. The pure content is completed by the end of academy term 3 to allow for students to complete a number of past papers to best prepare them for their exams.</p>				