



Mathematics is a highly interwoven subject. This curriculum map outlines just some of the next links stemming from each topic.

Unit Context Information: P2 – Pure 2 content, SM – Statistics or Mechanics, CP2 – Core Pure 2, FS – Further Statistics and D – Decision Mathematics

Unit Context	Topic name	Term	Skills developed	Next link in curriculum
P2.5	Radians	Autumn	- Convert between degrees and radians and apply this to trigonometric graphs and their transformations - Know exact values of angles measured in radians - Find an arc length using radians - Find areas of sectors and segments using radians - Solve trigonometric equations in radians - Use approximate trigonometric values when θ is small	Trigonometry and Modelling Y13
P2.6	Trigonometric Functions	Autumn	- Understand the definitions of secant, cosecant and cotangent and their relationship to cosine, sine and tangent - Understand the graphs of secant, cosecant and cotangent and their domain and range - Simplify expressions, prove simple identities and solve equations involving secant, cosecant and cotangent - Prove and use $\sec^2 x \equiv 1 + \tan^2 x$ and $\operatorname{cosec}^2 x \equiv 1 + \cot^2 x$ - Understand and use inverse trigonometric functions and their domain and ranges	Trigonometry and Modelling Y13
P2.7	Trigonometry and Modelling	Autumn	- Prove and use the addition formulae - Understand and use the double-angle formulae - Solve trigonometric equations using the double-angle and addition formulae - Write expressions of the form $a \cos \theta \pm b \sin \theta$ in the forms $R \cos(\theta \pm \alpha)$ or $R \sin(\theta \pm \alpha)$ - Prove trigonometric identities using a variety of identities	- Differentiation Y13 - Integration Y13



			• Use trigonometric functions to model real-life situations	
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P2.9	Differentiation	Autumn	• Differentiate trigonometric functions • Differentiate exponentials and logarithms • Differentiate functions using the chain, product and quotient rules • Differentiate parametric equations • Differentiate functions which are defined implicitly • Use the second derivative to describe the behaviour of a function	• Integration Y13 • Differential Equations Y13
P2.8	Parametric Equations	Autumn	• Convert parametric equations into Cartesian form by substitution • Convert parametric equations into Cartesian form using trigonometric identities • Understand and use parametric equations of curves and sketch parametric curves • Solve coordinate geometry problems involving parametric equations • Use parametric equations in modelling in a variety of contexts	• Calculus or Mechanics in Further Education (Mathematics, Engineering or Physics) and vector equations in Further Mathematics A-level.
CP2.5	Polar Coordinates	Autumn	• Understand and use polar coordinates • Convert between polar and Cartesian coordinates • Sketch curves with r given as a function of θ • Find the area enclosed by a polar curve • Find tangents parallel to, or at right angles to, the initial line	• Maths, Mechanics or Engineering in Further Education



P2.11a P2.11b	Integration	Autumn	- Integrate standard mathematical functions including trigonometric and exponential functions and use the reverse of the chain rule to integrate functions of the form $f(ax + b)$ - Use trigonometric identities in integration - Use the reverse of the chain rule to integrate more complex functions - Integrate functions by making a substitution, using integration by parts and using partial fractions - Use integration to find the area under a curve - Use the trapezium rule to approximate the area under a curve - Solve problems involving connected rates of change and construct simple differential equations - Solve simple differential equations and model real-life situations with differential equations	Calculus in Further Education (Physics and Mathematics) and in Further Mathematics A-level
P2.10	Numerical Methods	Autumn	- Locate roots of $f(x) = 0$ by considering changes of sign - Use iteration to find an approximation to the root of the equation $f(x) = 0$ - Use the Newton-Raphson procedure to find approximations to the solutions of equations of the form $f(x) = 0$ - Use numerical methods to solve problems in context	Further Education (Computing, Engineering, Physics and Mathematics)
P2.12	Vectors	Autumn	- Understand 3D Cartesian coordinates - Use vectors in three dimensions - Use vectors to solve geometric problems - Model 3D motion in mechanics with vectors	Vectors in Further Mathematics or Mechanics in Further Education (Engineering, Physics and Mathematics)



SM2.1	Regression and Correlation	Autumn	- Understand exponential models in bivariate data - Use a change of variable to estimate coefficients in an exponential model - Understand and calculate the product moment correlation coefficient - Carry out a hypothesis test for zero correlation	Normal Distribution (continuation of exploring various Hypothesis Tests) Y13
SM2.4	Moments	Autumn	- Calculate the turning effect of a force applied to a rigid body - Calculate the resultant moment of a set of forces acting on a rigid body - Solve problems involving uniform rods in equilibrium - Solve problems involving non-uniform rods - Solve problems involving rods on the point of tilting	Forces and Friction Y13
SM2.2	Conditional Probability	Autumn	- Understand set notation in probability - Understand conditional probability - Solve conditional probability problems using two-way tables and Venn diagrams - Use probability formulae to solve problems - Solve conditional probability using tree diagrams	Normal Distribution Y13
SM2.5	Forces and Friction	Autumn	- Resolve forces into components - Use the triangle law to find a resultant force - Solve problems involving smooth or rough inclined planes - Understand friction and the coefficient of friction - Use $F \leq \mu R$	Applications of Forces Y13
SM2.6	Projectiles	Autumn	- Model motion under gravity for an object projected horizontally - Resolve velocity into components - Solve problems involving particles projected at an angle - Derive the formulae for time of flight, range and greatest height, and the equation of the path of a projectile	Further Kinematics Y13



CP2.3	Methods in Calculus	Autumn	- Evaluate improper integrals - Understand and evaluate the mean value of a function - Integrate rational functions using trigonometric substitutions - Integrate using partial fractions	Mathematics in Further Education
CP2.4	Volumes of Revolution	Autumn	- Find volumes of revolution around the x-axis - Find volumes of revolution around the y-axis - Find volumes of revolution for curves defined parametrically - Model real-life applications of volumes of revolution	Mathematics or Engineering in Further Education
CP2.7	Methods in differential equations	Autumn	- Solve first-order differential equations using an integrating factor - Solve second-order homogeneous differential equations using the auxiliary equation - Solve second-order non-homogeneous differential equations using the complimentary function and the particular integral - Find particular solutions to differential equations using given boundary conditions	Mathematics, Physics, Engineering or Economics in Further Education
SM2.3	Normal Distribution	Autumn	- Understand the normal distribution and the characteristics of a normal distribution curve - Find percentage points on a standard normal curve - Calculate values on a standard normal curve - Find unknown means and/or standard deviations for a normal distribution - Approximate a binomial distribution using a normal distribution - Select appropriate distributions and solve real-life problems in context - Carry out a hypothesis test for the mean of a normal distribution	Quality of Tests



SM2.7	Applications of Forces	Autumn	- Find an unknown force when a system is in equilibrium - Solve statics problems involving weight, tension and pulleys - Understand and solve problems involving limiting equilibrium - Solve problems involving connected particles that require the resolution of forces	Mechanics in Further Education (Engineering, Physics and Mathematics)
SM2.8	Further Kinematics	Autumn	- Work with vectors for displacement, velocity and acceleration when using the vector equations of motion - Use calculus with harder functions of time involving variable acceleration - Differentiate and integrate vectors with respect to time	Mechanics in Further Education (Engineering, Physics and Mathematics)
FS.3	Geometric and Negative Binomial Distributions	Autumn	- Understand and use the geometric distribution - Calculate and use the mean and variance of the geometric distribution - Understand and use the negative binomial distribution - Calculate and use the mean and variance of the negative binomial distribution	- Hypothesis Testing - Central Limit Theorem
CP2.8	Modelling with differential equations	Spring	- Model real-life situations with first-order differential equations - Use differential equations to model simple harmonic motion - Model damped and forced oscillations using differential equations - Model real-life situations using coupled first-order differential equations	Mathematics, Physics or Engineering in Further Education



CP2.1	Complex Numbers	Spring	- Express a complex number in exponential form - Multiply and divide complex numbers in exponential form - Understand de Moivre's theorem - Use de Moivre's theorem to derive trigonometric identities - Use de Moivre's theorem to find sums of series - Know how to solve completely equations of the form $zn - a - ib = 0$, giving special attention to cases where $a = 1$ and $b = 0$ - Use complex roots of unity to solve geometric problems	Computer Science, Mathematics or Engineering in Further Education
CP2.2	Series	Spring	- Understand and use the method of differences to sum finite series - Find and use higher derivatives of functions - Know how to express functions as an infinite series in ascending powers using Maclaurin series expansion - Be able to find the series expansions of compound functions	Mathematics in Further Education
CP2.6	Hyperbolic Functions	Spring	- Understand the definitions of hyperbolic functions - Sketch the graphs of hyperbolic functions - Understand and use the inverse hyperbolic functions - Prove identities and solve equations using hyperbolic functions - Differentiate and integrate hyperbolic functions	Mathematics, Physics or Engineering in Further Education
FS.4b	Hypothesis Testing	Spring	- Use hypothesis tests to test for the parameter p in a geometric distribution - Find critical regions of a geometric distribution - Apply goodness-of-fit tests to geometric distributions	Statistics in Further Education



FS.5	Central Limit Theorem	Spring	- Understand and apply the central limit theorem to approximate the sample mean of a random variable - Apply the central limit theorem to other distributions	Statistics in Further Education
FS.7	Probability Generating Functions	Spring	- Understand the use of probability generating functions - Use probability generating functions for standard distributions - Use probability generating functions to find the mean and variance of a distribution - Know the probability generating function of the sum of independent random variables	Statistics in Further Education
FS.8	Quality of Tests	Spring	- Know about Type I and Type II errors - Find Type I and Type II errors using the normal distribution - Calculate the size and power of a test - Draw a graph of the power function for a test	Statistics or Psychology in Further Education
D.5	Travelling Salesman Problem	Spring	- Explain the differences between the classical and practical problems - Use a minimum spanning tree method to find an upper bound - Use a minimum spanning tree method to find a lower bound - Use the nearest neighbour algorithm to find an upper bound	Computer Science, Mathematics or Engineering in Further Education
D.2b	Graphs and Networks	Spring	Use the planarity algorithm to determine whether or not a given graph is planar	Computer Science, Mathematics or Engineering in Further Education



D.4b	Route Inspection	Spring	• Use the route inspection algorithm in networks with more than four odd nodes	• Computer Science, Mathematics or Engineering in Further Education
D.7	Simplex Algorithm	Spring	• Understand and use slack and surplus variables • Solve maximising and minimising linear programming problems using simplex tableaux • Use the simplex tableau method to solve linear programming problems requiring integer solutions • Understand and use the two-stage simplex method for maximising and minimising problems which may include $<$ and $>$ constraints • Understand and use the Big-M method for maximising and minimising problems which may include $<$ and $>$ constraints	• Computer Science, Mathematics, Engineering, Economics or Business in Further Education
D.8b	Critical Path Analysis	Spring	• Construct resource histograms • Construct scheduling diagrams	• Computer Science, Mathematics, Engineering, Economics or Business in Further Education