A level Mathematics Curriculum Overview (Year 13)

Introduction
Edexcel specification: https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/mathematics-2017.html **Extension links** UKMT senior challenge (https://ukmt.org.uk/senior-challenges) MAT (https://www.maths.ox.ac.uk/study-here/undergraduate-study/maths-admissions-test) STEP modules (https://maths.org/step/assignments)

Term 1 Half Term 1				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Geometric sequences and series Binomial expansion with non-integer powers Radians. Further trigonometric functions and identities. Further trigonometric formulae and solving; proving trigonometric identities.	**Knowledge**: a geometric sequence has a common ratio between consecutive terms; all the required formulae used with geometric sequences and series; definitions of convergent and divergent series; how to convert between degrees and radians; know exact trig values when measured in radians; how to find an arc length and areas of sectors/segments using radians; definitions of the reciprocal and inverse trigonometric functions; addition and double-angle trigonometric formulae. **Understanding:** prove formulae for geometric sequences and series; determine the range of values of *x* for which a binomial expansion is valid; apply knowledge of radians to trigonometric graphs and their transformations; how to derive the graphs of the reciprocal and inverse trigonometric functions; use the addition and double-angle trigonometric formulae. **Skills:** use general formulae for geometric sequences and series to solve problems; use a calculator to calculate coefficients of binomial expansion; find and use binomial expansions with negative and fractional values of *n*; using the calculator in radians mode; solve trigonometric	**Formal homeworks:** Chapter 3 Assessment Chapter 4 Assessment Chapter 5-7 Assessment **Exam conditions:** Chapter 1-4 Test	Edexcel Pure 2 Textbook Chapters 3-7 Note: Ch3 builds on arithmetic sequences & series from C1 as well as sigma notation and recurrence relations. Ch4 builds on Pure 1 Ch8 (where n was a positive integer) & Pure 2 Ch1 Partial fractions (which are used here to simplify expansions). Ch5 builds on trigonometry covered in GCSE & Pure 1 Ch10, as well as calculating arc length and areas of sectors/segments from GCSE but using radians as the angle measure not degrees. Ch's 6 & 7 build on trigonometric	Scheme of Learning – guidance on key learning points and selected questions for each individual lesson Outline PowerPoints with suggested examples and scaffolding activities Practice questions (and markschemes) covering topics using previous exam questions available for each chapter via SharePoint. For extension: UKMT senior challenge, MAT and STEP Foundation materials Online resource: https://sites.google.com/view/tlmaths/home/a-level-maths

	equations in radians; use approximate trigonometric values with small angles; use written methods and a calculator to work out exact values of reciprocal and inverse trigonometric functions; simplify expressions, prove identities and solve equations involving the reciprocal trigonometric functions; use the addition and double-angle formulae to solve trigonometric equations and simplify expressions.		functions taught in Pure 1 Ch10, graph transformations from Pure 2 Ch2, and Pure 2 Ch5.	

Term 1 Half Term 2				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Parametric equations Further calculus techniques (using differentiation) Numerical methods Further calculus techniques (using integration); solving differential equations 3D vectors	**Knowledge**: how to convert parametric equations into cartesian form by substitution and using trigonometric identities; know the standard derivatives and integrals of trigonometric functions, exponentials and logarithms; definition of a continuous function; the three possible cases when locating roots of a function; definitions of convergent and divergent iterations; the Newton-Raphson formula; how to find the distance from the origin to a point and the distance between points using 3d coordinates; unit and column vector notation for 3d vectors; definitions of coplanar and non-coplanar vectors. **Understanding:** use and sketch parametric equations of curves; how to use the domain and range of a parametric function to find the domain and range of the resultant Cartesian function; differentiate sin *x* and cos *x* from first principles; why radians are used when differentiating and integrating trigonometric functions; use the second derivative to determine whether a curve is concave or convex; graphical representations of iterations including the staircase and cobweb diagrams; how the Newton-Rhapson method works; use knowledge of derivatives to integrate familiar functions; adapt addition and scalar	**Formal homeworks:** Chapter 8 Assessment Chapter 9 Assessment Chapter 10 Assessment Chapter 11 Assessment Chapter 12 Assessment **Exam conditions:** Chapter 1-8 Test Y13 Mock Paper 1 Y13 Mock Paper 2	Edexcel Pure 2 Textbook Chapters 8-12 Note: Ch8 builds on rearranging formulae and basic algebraic manipulation from GCSE, C1 and Pure 1 Ch's 1 & 14; circle geometry from Pure 1 Ch6; functions and mappings from Pure 2 Ch2; using the addition formulae from Pure 2 Ch7. Ch9 builds on differentiation techniques from C1 and Pure 1 Ch12; parametric equations from Pure 2 Ch8; trigonometric functions and identities from Pure 2 Ch's 6&7. Ch10 builds on iteration from GCSE; recurrence relations from C1 and Pure 2 Ch3; differentiation	Scheme of Learning – guidance on key learning points and selected questions for each individual lesson Outline PowerPoints with suggested examples and scaffolding activities Practice questions (and markschemes) covering topics using previous exam questions available for each chapter via SharePoint. For extension: UKMT senior challenge, MAT and STEP Foundation materials Online resource: https://sites.google.com/view/tlmaths/home/a-level-maths

	multiple rules of 2d vectors. **Skills:** solve coordinate geometry problems involving parametric equations, including finding points of intersection; use parametric equations to model real-life situations; explore parametric curves using technology; use the chain rule (formal and/or informal methods), product rule and quotient rules for differentiating functions; differentiate/integrate trigonometric functions, using known identities where necessary; use differentiation to find the gradient at a given point of a function given in parametric from; differentiate an implicit function; use iterative formulae to find values and roots, using a calculator where necessary; apply the Newton-Rhapson iterative process; use iterative techniques to find solutions of real-life situations; use the reverse chain rule, substitution, by parts, and partial fractions to integrate more complex functions; use integration and the trapezium rule to find/approximate the area under a curve (including under parametric curves); solve simple differential equations; use vectors to solve geometric problems in 3d; model motion with vectors.		from year 12 and Pure 2 Ch9. Ch11 builds on estimating the area under a curve from GCSE; integration from C1 and Pure 1 Ch13; differentiation from Pure 2 Ch9; partial fractions from Pure 2 Ch1. Ch12 builds on 2d vectors knowledge from GCSE and Pure 1 Ch11.	

Term 2 Half Term 1				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Statistics: Regression, correlation and hypothesis testing Conditional probability Normal distribution	**Knowledge**: basic information about the large data set; how to use regression lines; rules of logs and indices; how to code data to obtain a linear relationship; probability formulae and key terminology; key facts and features of the normal distribution; how to code data so it can be modelled by the standard normal distribution. **Understanding:** exponential models in bivariate data; the product moment correlation coefficient (PMCC); importance of the correct layout when performing a hypothesis test; when to use a one-tailed or two-tailed test; set notation; normal distribution and the characteristics of its curve; when to apply a continuity correction when calculating probabilities. **Skills:** carry out a hypothesis test for zero correlation (one-tailed and two-tailed) and for the mean of a normal distribution; calculate the PMCC on a calculator; draw and shade correctly a Venn diagram; solve probability problems, including conditional; use tree diagrams to represent and solve probability problems; find percentage points and calculate values on a standard normal curve; find unknown means and standard deviations for a normally distributed variable;	**Formal homeworks:** Stats Chapter 1 Assessment Stats Chapter 2 Assessment Stats Chapter 3 Assessment **Exam conditions:** Stats paper	Edexcel Applied 2 Textbook Chapters 1-3 Note: Ch1 builds on exponential functions and modelling from Pure 1 Ch14; correlation and regression from Stats 1 Ch4; hypothesis testing from Stats 1 Ch7. Ch2 builds on probability from GCSE and Stats 1 Ch5. Ch3 builds on probability distributions from Stats 1 Ch6	Scheme of Learning – guidance on key learning points and selected questions for each individual lesson Outline PowerPoints with suggested examples and scaffolding activities Practice questions (and markschemes) covering topics using previous exam questions available for each chapter via SharePoint. For extension: UKMT senior challenge, MAT and STEP Foundation materials Online resource: https://sites.google.com/view/tlmaths/home/a-level-maths

	approximate a binomial distribution using a normal distribution; select appropriate distributions and solve real-life problems in context; use a calculator to find probabilities from a normal distribution and inverse normal distribution.			

Term 2 Half Term 2				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Mechanics: Moments Forces and friction Projectiles Applications of forces Further kinematics	**Knowledge**: need to leave answers in terms of *g* or use the value for *g* of 9.8 and round to two significant figures; definition of a moment/resultant moment and formulae for calculating; need to give the direction of rotation when describing a moment; definition of equilibrium; how to resolve a force into components; triangle law of vector addition; formula for the maximum (limiting value) of the friction between two surfaces; how to derive key formulae for projectiles; SUVAT equations; how to solve problems involving static particles; notation for differentiation with respect to time. **Understanding:** units a moment is measured in; when to choose either the positive or negative direction; using a force diagram; friction and the coefficient of friction; solve problems involving uniform rods in equilibrium; solve problems involving non-uniform rods; solve problems involving rods on the point of tilting; which SUVAT equation to use for a given problem; how to use a vector diagram to solve equilibrium problems involving three forces; use 2d vectors to describe motion in a plane; use the equations of motion for constant acceleration to write	**Formal homeworks:** Mechanics Chapter 4 Assessment Mechanics Chapter 5 Assessment Mechanics Chapter 6 Assessment Mechanics Chapter 8 Assessment Mechanics Chapter 7 Assessment **Exam conditions:** Mechanics paper	Edexcel Applied 2 Textbook Chapters 4-8 Note: Ch's 4 & 5 build on trigonometry from GCSE and year 12; forces & force diagrams from Mechanics 1 Ch10. Ch6 builds on trigonometry from GCSE; SUVAT equations from Mechanics 1 Ch9; solving trigonometric equations from Pure 1 Ch10. Ch7 reviews and consolidates Mechanics 2 Ch's 4&5 Ch 8 builds on vectors from Pure 1 Ch11; SUVAT equations from Mechanics 1 Ch9; calculus from Pure 2 Ch's 9&11	Scheme of Learning – guidance on key learning points and selected questions for each individual lesson Outline PowerPoints with suggested examples and scaffolding activities Practice questions (and markschemes) covering topics using previous exam questions available for each chapter via SharePoint. For extension: UKMT senior challenge, MAT and STEP Foundation materials Online resource: https://sites.google.com/view/tlmaths/home/a-level-maths

	velocity and displacement as functions of time. **Skills:** calculate the moment of a force and resultant moments of a set of forces acting on a rigid body; draw and label a force diagram; solve problems involving uniform rods in equilibrium; solve problems involving non-uniform rods; solve problems involving rods on the point of tilting; calculate the magnitude and direction of a resultant force; solve problems involving smooth or rough inclined planes; solve problems involving the coefficient of friction; model motion under gravity for an object projected horizontally; resolve velocity into components; solve problems involving particles projected at an angle; solve statics problems involving weight, tension and pulleys; analyse projectile motion in a vertical plane with constant acceleration using vector equations of motion; differentiate and integrate a vector with respect to time.			

Term 3 Half Term 1				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Structured revision and use of past papers (often there will be 1-2 weeks of catch up from previous content as well)	**Knowledge**: revisiting and reconsolidating all knowledge from the 2 year course **Understanding:** building a deeper understanding of the course through regular review and practice **Skills:** a particular focus on ensuring exam technique is secure	Past papers	Revision of specific topics using banks of past exam questions	Specimen papers Mock papers Past papers

Term 3 Half Term 2				
What are we learning?	**What knowledge, understanding and skills will we gain?**	**Evaluation and assessment methods**	**Implementation**	**What additional resources are available?**
Structured revision and use of past papers	**Knowledge**: revisiting and reconsolidating all knowledge from the 2 year course **Understanding:** building a deeper understanding of the course through regular review and practice **Skills:** a particular focus on ensuring exam technique is secure	Past papers	Revision of specific topics using banks of past exam questions	Specimen papers Mock papers Past papers