

Year 13 Maths - Pure and Mechanics Teacher

Topic		Ref	Ex
Differentiation	Trigonometric functions 1 (sin x and cos x) <ul style="list-style-type: none"> • Differentiate sin x and cos x from first principles • Differentiate sin kx and cos kx. 	P7.1	9A
	Exponentials and Logarithms <ul style="list-style-type: none"> • Differentiate exponentials and logarithms including e^{kx}, a^{kx}, $\ln x$ and $\ln kx$. 	P7.2	9B
	Chain Rule <ul style="list-style-type: none"> • Differentiate composite functions and functions of functions using the chain rule. 	P7.4	9C
	Product Rule <ul style="list-style-type: none"> • Differentiate the product of two functions using the product rule. 	P7.4	9D
	Quotient Rule <ul style="list-style-type: none"> • Differentiate the quotient of two functions using the product rule. 	P7.4	9E
	Trigonometric functions 2 <ul style="list-style-type: none"> • Differentiate tan kx, cosec kx, sec kx and cot kx • Use the chain rule to differentiate composite trigonometric functions. 	P7.4	9F
	Parametric Differentiation <ul style="list-style-type: none"> • Differentiate functions defined parametrically without converting to Cartesian form. • Use this to find equations of tangents and normals. 	P7.5	9G
	Implicit Differentiation <ul style="list-style-type: none"> • Differentiate functions defined implicitly. • Use this to find equations of tangents and normal. 	P7.5	9H
	Second Derivatives <ul style="list-style-type: none"> • Use the second derivative to determine whether a curve is convex or concave on a given domain. • Use it to determine the nature of a stationary point. 	P7.1	9I
	Rates of Change <ul style="list-style-type: none"> • Use the chain rule to connect rates of change in situations involving more than one variable. 	P7.4	9J
Term 1 Assessment			

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Topic		Ref	Ex
Integration	Standard Functions <ul style="list-style-type: none"> Integrate e^{kx}, $1/x$, $\sin kx$, $\cos kx$ and other trigonometric functions 	P8.2	11A
	f(ax+b) <ul style="list-style-type: none"> Integrate a function of the form $f(ax+b)$ by using the reverse chain rule for differentiation. 	P8.2	11B
	Using Trigonometric Identities <ul style="list-style-type: none"> Use trigonometric identities to make the integrand into something that can be integrated. 	P8.2	11C
	Integration "by sight" <ul style="list-style-type: none"> Integrate by sight functions of the form: $k \frac{f'(x)}{f(x)} \text{ or } kf'(x)(f(x))^n$ 	P8.5	11D
	Integration by Substitution <ul style="list-style-type: none"> Use a substitution to simplify an integral Includes definite integrals. 	P8.5	11E
	Integration by Parts <ul style="list-style-type: none"> Use integration by parts to integrate a product of functions Use this technique to integrate $\ln x$, Use more than one application of this method e.g. for integrating $e^x \sin x$. 	P8.5	11F
	Partial Fractions <ul style="list-style-type: none"> Integrate algebraic fractions using partial fractions 	P8.6	11G
	Finding Areas under or between curves <ul style="list-style-type: none"> Use any of the integration techniques to find areas under or between curves. 	P8.3	11H
	Trapezium Rule <ul style="list-style-type: none"> Use the trapezium rule to approximate the area under a curve whose function you cannot integrate algebraically. Determine whether this gives an under or over estimate. 	P9.4	11I
	Differential Equations <ul style="list-style-type: none"> Solve first order differential equations by separating the variables. Interpret the solution of a DE in the context of solving a problem. 	P8.7 P8.8	11J 11K
Term 2 Assessment			

Year 13 Maths - Pure and Mechanics Teacher

Topic		Ref	Ex
Vectors in 3D	Vectors in 3 dimensions <ul style="list-style-type: none"> Use vectors in 3D both in column vector form and \mathbf{i}, \mathbf{j}, \mathbf{k} unit vector form. Find the angle between a 3D vector and any of the coordinate axes 	P10.1	12A 12B
	Geometric Problems <ul style="list-style-type: none"> Solve geometric problems involving vectors in 3D 	P10.5	12C
	Mechanics Problems <ul style="list-style-type: none"> Model problems in mechanics using 3D vectors 	P10.5	12D
Moments	Definition <ul style="list-style-type: none"> Understand the definition of a moment Calculate the turning effort of a force applied to a rigid body – the moment. 	A9.1	A4A
	Resultant Moments <ul style="list-style-type: none"> Find the resultant moment for several coplanar forces acting on a rigid body. 	A9.1	A4B
	Equilibrium <ul style="list-style-type: none"> Solve problems involving uniform rods in equilibrium 	A9.1	A4C
	Centres of Mass <ul style="list-style-type: none"> Solve problems involving non-uniform rods in equilibrium by finding its centre of mass. 	A9.1	A4D
	Tilting <ul style="list-style-type: none"> Solve problems involving uniform rods on the point of tilting. 	A9.1	A4E
Forces and Friction	Resolving Forces <ul style="list-style-type: none"> Resolve forces into components Use the triangle law to find a resultant force. 	A8.2 A8.4 A8.5	A5A
	Inclined Planes <ul style="list-style-type: none"> Resolve forces into components parallel to and at right angles to the inclined plane 	A8.4 A8.5	A5B
	Friction <ul style="list-style-type: none"> Understand Friction and the coefficient of friction Use $F \leq \mu R$ model for friction 	A8.6	A5C
Projectiles	Horizontal Projection <ul style="list-style-type: none"> Model motion under gravity for an object projected horizontally 	A7.5	A6A
	Projection at any angle <ul style="list-style-type: none"> Resolve velocity into horizontal and vertical components. Solve problems involving particles projected at an angle 	A7.3 A7.5	A6B A6C
	Projectile motion formulae <ul style="list-style-type: none"> Derive the formulae for time of flight, range and greatest height, and the equation of the path of a projectile. 	A7.5	A6D
Term 3 Assessment			

Year 13 Maths - Pure and Mechanics Teacher

Topic		Ref	Ex
Applications of Forces	Static Particles <ul style="list-style-type: none"> • Use force diagrams to model objects in static equilibrium. • Find an unknown force when a system is in equilibrium • Solve statics problems involving weights, tension and pulleys. • Understand and solve problems involving limiting equilibrium and friction. 	A8.4 A8.6	A7A A7B A7C
	Static Rigid Bodies <ul style="list-style-type: none"> • Solve static problems including rotational forces acting on an object. 	A8.6	A7D
	Dynamics and Inclined Planes <ul style="list-style-type: none"> • Solve problems involving motion on smooth or rough inclined planes. 	A8.6	A7E
	Connected Particles <ul style="list-style-type: none"> • Solve problems involving connected particles that require the resolution of forces. 	A8.5 A8.6	A7F
Further Kinematics	Vectors in Kinematics <ul style="list-style-type: none"> • Use two dimensional vectors to describe motion in a plane. • Work with vectors for displacement, velocity and acceleration when using the vector equations of motion. • Use vector equations of motion for projectiles in a vertical plane 	A7.3	A8A A8B
	Variable Acceleration <ul style="list-style-type: none"> • Understand how to model variable acceleration as a function of time. • Use calculus for harder functions of time, including trigonometric or exponential functions. • Differentiate and integrate vectors with respect to time. • Use calculus with vectors to solve problems involving motion in two dimensions with variable acceleration. 	A7.4	A8C A8D A8E
Term 4 Assessment			