Year 13 Spring 1

Unit Overview: Binomial Expansion 2, Radians, Trigonometric Functions, Moments, Application of forces 1, Normal distribution 2

Half- Term:	AUT 1	AUT 2	SPR 1	SPR 2	SUM 1	SUM 2	**No of Lessons:**	**30**

Key Focus for Unit:

What is the key knowledge being delivered?
What is the intent of this unit?

Pure

Trigonometry and Modelling

- Understand the addition formulae for sin, cos and tan
- Use the addition formulae for sin, cos and tan
- Understand the double angle formulae for sin, cos and tan
- Use the double angle formulae for sin, cos and tan
- Understand how to use identities to rewrite acosx + bsinx
- Solve trigonometric equations that derive from unfamiliar or applied contexts (radians)
- Use sec^2(x) and cosec^2(x) identities in proofs and to solve equations
- Understand the proofs of the addition formulae
- Understand the proofs of the double angle formulae
- Use addition formulae and/or double angle formulae to solve equations
- Extend the use of double angle formulae to half angle formulae for sin and cos
- Solve problems involving acosx + bsinx
- Use addition formulae, double angle formulae and other identities to prove unfamiliar trigonometric identities
- Use trigonometric functions and identities to solve problems in a range of unfamiliar contexts

Parametric Equations

- Understand parametric equations of curves
- Convert between parametric and Cartesian forms using substitution
- Convert between parametric and Cartesian forms using trigonometry
- Sketch graphs of parametric functions
- Solve coordinate geometry problems involving parametric equations
- Use parametric equations in modelling in a variety of contexts

Applied (Mechanics)

Application of Forces and Projectiles 1

- Resolve forces acting at an angle
- Combine forces using a vector diagram
- Find the resultant of coplanar forces given in magnitude/direction form
- Resolve forces parallel and perpendicular to an inclined plane
- Understand motion for a particle on an inclined plane
- Solve problems involving motion on a smooth inclined plane
- Understand the standard model for friction, including in motion, and the coefficient of friction
- Solve problems involving motion on a rough horizontal surface
- Solve problems involving motion on a rough inclined plane
- Solve problems in unfamiliar contexts using the concepts of friction and motion
- Model horizontal projection under gravity
- Resolve velocity into horizontal and vertical components
- Model motion in the vertical plane under gravity, including the use of vectors
- Solve problems in familiar contexts involving projectile motion
- Solve problems in unfamiliar contexts involving projectile motion
- Derive formulae for projectile motion

Applied (Statistics)

Conditional Probability

- Understand the language and notation of conditional probability
- Calculate conditional probabilities using two-way tables
- Calculate conditional probabilities using formulae
- Understand and calculate conditional probabilities in the context of Venn diagrams
- Understand and calculate conditional probabilities in the context of tree diagrams
- Understand independence and its associated rules in the context of conditional probability

Key Knowledge and Big Ideas:

*What **Powerful Knowledge** and **Big Ideas** are explored in this Unit?*
*How have these progressed from previous learning? What **gaps in knowledge** have you identified from **baselining** and how are these being closed?*

BIG IDEAS:

Trigonometric Identities and Parametric Equations, Projectiles, Forces and Friction, Conditional Probability

Powerful Knowledge:

- Understand the double angle formulae for sin, cos and tan
- Use the double angle formulae for sin, cos and tan
- Solve trigonometric equations that derive from unfamiliar or applied contexts (radians)
- Use sec^2(x) and cosec^2(x) identities in proofs and to solve equations
- Solve problems involving acosx + bsinx
- Use addition formulae, double angle formulae and other identities to prove unfamiliar trigonometric identities
- Use trigonometric functions and identities to solve problems in a range of unfamiliar contexts

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- Convert between parametric and Cartesian forms using substitution
- Convert between parametric and Cartesian forms using trigonometry
- Sketch graphs of parametric functions
- Solve coordinate geometry problems involving parametric equations
- Understand motion for a particle on an inclined plane
- Solve problems involving motion on a smooth inclined plane
- Understand the standard model for friction, including in motion, and the coefficient of friction
- Solve problems involving motion on a rough horizontal surface
- Solve problems involving motion on a rough inclined plane
- Solve problems in unfamiliar contexts using the concepts of friction and motion
- Model horizontal projection under gravity
- Understand and calculate conditional probabilities in the context of Venn diagrams
- Understand and calculate conditional probabilities in the context of tree diagrams
- Understand independence and its associated rules in the context of conditional probability

Previous Learning:

- Binomial Expansion 2
- Radians
- Trigonometric Functions
- Moments
- Application of forces 1
- Normal distribution

Gaps in Knowledge and Misconceptions:

Resolving forces

- Some students may still be confused choosing between sin 0 and FcosΘ when resolving forces. Stress the word adjacent used in the definition of cosΘ

Friction

- The concepts relating to friction may create uncertainty. Discuss these points.
- F= P for as long as the object is in equilibrium.
- F reaches Fmax (called limiting friction) when the object is on the point of moving, a position called limiting equilibrium.
- When P increases beyond this limit, P> F max and the object is no longer in equilibrium; it is accelerating.
- Fmax depends on the coefficient of friction, U, between the object and the surface.
- Fmax = UR and the rougher the surface, the greater the value of u

Equilibrium

- When an object is in equilibrium, students may be unsure whether to write an equation with a zero resultant force or an equation showing balanced forces. Both are valid and the students can choose whichever they prefer.
- For example, the diagram shows an object held in equilibrium on a rough slope by a horizontal force P
- Resolving along the slope gives:
- either
- Pcos Θ- F- Wsin Θ = 0 (resultant force is zero)
- or
- Pcos Θ = F+ Wsin Θ (forces balance in equilibrium)

Lami's theorem

- Lami's theorem can only be used for three-force problems where at least one angle is known. Lami's theorem is not required knowledge, but it can sometimes be a useful method.

Unit Assessment:

How will this unit be assessed?
What is the frequency of assessments – baselines etc?

How we will assess

- Students will be assessed at the end of each chapter using past exam questions. These assessments will be cumulative so the chapter 5 assessment will test content from Chapter 1, 2, 3 and 4.

Key Retrieval Topics (Interleaving):

- Revise basic addition formulae
- Revise basic double angle formulae
- Revise solving trigonometric equations

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- Revise solving trigonometric equations with multiple solutions
- Revise basic harmonic identities
- Revise basic trigonometric identities
- Revise trigonometric identities
- Revise functions and the associated notation
- Revise substitution, both numerical and algebraic
- Revise trigonometric identities
- Revise sketching graphs of functions
- Revise solving coordinate geometry problems
- Revise the concept of parametric equations

Key Skills Explored	**Vocabulary Selected for DVI**	**Links to Previous Unit**
Pure Maths • Trigonometry and modelling • Parametric Equation Applied (Mechanics) • Application of forces 1 • Projectiles 1 Applied (Statistics) • Conditional probability 1	• Friction • Resultant Force • Limiting Equilibrium • Coplanar Forces	• The units covered in Spring 1 builds on the work students covered in Autumn 1and 2.

Links to Careers/Employability	**How does this unit prepare students for the next unit?**
• Teaching • Engineering • Accounting • Banking • Architecture	Pure Maths • Differentiation • Integration Applied (Mechanics) • Projectiles 2 • Variable acceleration Applied (Statistics) • Conditional probability 2 • Regression