Year 12 Spring 2

Unit Overview: Straight Line Graphs, Circles, Algebraic Methods, Constant acceleration, Correlation, Probability								
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 Maths

Trigonometry ratios

- Understand and use the sine rule in simple cases
- Understand and use the formula for the area of a triangle (trigonometric form)
- Understand the ambiguous case of the sine rule
- Solve triangle problems in a range of contexts
- Sketch and describe the key features of the graphs of trigonometric functions
- Recall exact values for trigonometric functions (degrees)
- Transform the graphs of trigonometric functions using stretches and translations
- Determine exact values for trigonometric functions in all four quadrants
- Understand and use the unit circle for all four quadrants

Trigonometric identities and equations

- Understand the trigonometric identity tanx = sinx/cosx
- Understand the trigonometric identity sin^2(x) + cos^2(x) = 1
- Solve simple trigonometric equations in a given interval (degrees)
- Use trigonometric identities to find exact values
- Use trigonometric identities to complete simple proofs
- Solve more complicated trigonometric equations in a given interval such as ones requiring use of the tan identity (degrees)
- Solve trigonometric equations that produce quadratics (degrees)
- Solve trigonometric equations that derive from unfamiliar or applied contexts (degrees)

Applied (Mechanics)

Forces and Motion

- Use Newton's second law to model motion in one direction
- Understand Newton's third law
- Solve simple problems involving particles which are connected or in contact in one dimension
- Solve harder equilibrium problems
- Use Newton's second law to model motion in two directions
- Solve simple problems involving connected particles by pulleys
- Apply Newton's laws to solve problems in unfamiliar contexts

Applied (Statistics)

Correlation

- Know and understand the language of correlation and regression
- Draw and interpret scatter diagrams for bivariate data
- Recognise scatter diagrams that include distinct sections of the population
- Understand correlation and causation
- Calculate the regression-line equation from raw and summary data
- Make predictions using the regression line within the range of the data
- Understand the concepts of interpolation and extrapolation
- Use the principles of bivariate data analysis in the context of the large data set

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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:

Trigonometry, Forces and Motion, Correlation

Powerful Knowledge:

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- Understand and use the unit circle for all four quadrants
- Understand the trigonometric identity sin^2(x) + cos^2(x) = 1
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Previous Learning:

- Area of Triangle using 1/2abSinC
- Sine Rule
- Cosine Rule
- Sine and Cosine Graph
- Constant acceleration
- Scatter graph

Gaps in Knowledge and Misconceptions:

Contact forces between surfaces

- Students are often less knowledgeable about contact forces, that is, forces that occur when two bodies touch and their surfaces press on one another. This contact force always has a component at right angles to the surfaces, called the normal reaction. If there is a tendency for the two surfaces to move relative to each other, or if they actually do move, there is also a component of the contact force along the direction of the surfaces, usually called the resistance or resistive force. If the surface contact is smooth, then the resistive force is zero.
- Explain that, if both these components (normal reaction and resistance) exist, they can be combined using Pythagoras' Theorem and their resultant is called the 'total reaction' between the two objects, but this is not often done - exam questions usually prefer to keep the components separate.

Tensions and thrusts

- Students can confuse these two types of force. Have them imagine an object at rest on an icy surface. If a string is fixed to it and the string pulled, the object would move across the ice because of the force in the string. If the string could feel this happening, it would feel that it was being stretched, so the force in it is a tension.
- However, the object on ice could be moved instead by having a rod pushing it from behind. If the rod could feel what was happening, it would feel it was being squashed by the object. The rod is thrusting the obiect forward - the force is a thrust.

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Resolving a force

- Students may not fully understand what it means to 'resolve' a force. If you resolve a force, you find its component in a particular direction. You often find two components of a force at right-angles to each other, in which case you have resolved in two directions.

Correlation

It is important that students answer questions in context. For example, 'There is strong positive correlation between the two variables, this means that as the age of the silver increases, so does the value? This is the point probably most criticised in examiners' reports.

Correlation does not mean causation. Two variables can show high correlation but this does not mean that an increase or decrease in one causes an increase or decrease in the other. There have been many health stories in the press in recent years attributing longer life to certain foods or activities. Discuss with students if this shows causation or whether the food my just reflect a different lifestyle for example.

This is another area in which questions are likely to focus on outliers and what might happen if they are removed, for example will the value of r increase or decrease.

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 and so on.

Key Retrieval Topics (Interleaving):

- Review the geometry of triangles
- Understand and use the general formula for the area of a triangle
- Understand basic trigonometric functions
- Understand basic graph transformations
- Recall exact values for trigonometric functions
- Understand the concept of a mathematical identity
- Revise the concept of a vector
- Revise the concept of a force and drawing force diagrams
- Revise concepts associated with forces
- Revise the concept of vector arithmetic
- Revise the basic principles of mathematical modelling in mechanics
- Revise the basics of Newton's second law
- Revise basic work on forces
- Research the concept of association
- Revise plotting coordinates in 2D space
- Revise basic techniques for bivariate data analysis
- Revise finding the equation of a straight line
- Revise substituting into formulae
- Revise calculating and using a regression line
- Revise scatter diagrams and regression lines

Key Skills Explored	Vocabulary Selected for DVI	Links to Previous Unit
Pure Maths • Trigonometric ratios • Trigonometric identities and equations **Applied (Mechanics)** • Force and motion **Applied (Statistics)** • Correlation	• Sine, Tan and Cosine Ratio • Force • Resolving • Acceleration • Resultant Force • Net Force	• The units covered in Spring 2 builds on the work students covered in Autumn 1 and 2 and Spring 1

Links to Careers/Employability	How does this unit prepare students for the next unit?
• Teaching • Engineering • Accounting • Banking • Architecture	• Vectors 2D Straight line graphs Circles • Exponentials and Logs • Variable acceleration • Representation of data