Topic: KS4 Higher Unit 10 Probability **MathsWatch clips:**		Duration: 11 Lessons	Composite: Unit Test
Key vocabulary:	**Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.**	**Core knowledge components. Procedural and conditional knowledge.**	**Links to previous and future topics**
Events Outcomes Sample space Probabilities Mutually exclusive Experimental Theoretical Frequency trees Tree diagrams Independent Conditional Two-way table Venn diagrams	I know that: A **sample space diagram** shows all the possible outcomes of two events. Two events are **mutually exclusive** if they cannot happen at the same time. When two events are mutually exclusive you can add their probabilities. The probabilities of an exhaustive set of mutually excusive events sum to 1. For mutually exclusive events, P(not A) = 1 – P(A) If there are m outcomes for one event and n outcomes for another event, the product rule states that the total number of outcomes for the two events is $m \times n$. Expected number of outcomes = number of trials × probability. Relative frequency = $\frac{\text{frequency}}{\text{total number of trials}}$ As the number of experiments increases, the experimental probability gets closer and closer to the theorectical probability. A **tree diagram** shows two or more events and their probabilities. Two events are **independent** if one happening does not affect the probability of the other. To find the probability of two independent events multiply their probabilities, P(A and B) = P(A) × P(B) The probability for a repeated independent event is the probability multiplied by itself, P(A and A) = P(A) × P(A), P(A and A and A) = P(A) × P(A) × P(A), etc. A **conditional probability** is when one outcome affects another outcome. P(A ∩ B) means the probability of the **intersection** of A and B. P(A ∪ B) means the probability of the **union** of A and B. P(A ∪ B) = P(A) + P(B) – P(A ∩ B) P(A ∩ B | B) means the probability of the intersection of A and B given B.	I know how to: • Use the product rule for finding the number of outcomes for two or more events. • List all the possible outcomes in a sample space diagram. • Identify mutually exclusive outcomes and events. • Find the probabilities of mutually exclusive outcomes. • Find the probability of an event not happening. • Work out the expected results for experimental and theoretical probabilities. • Compare real results with theoretical expected values. • Draw and use frequency trees. • Calculate probabilities of repeated events. I know when to: • Use two-way tables to calculate conditional probability. • Use Venn diagrams to calculate conditional probability. • Use set notation. • Draw and use tree diagrams	This topic builds on prior knowledge: • Understand that a probability is a number between 0 and 1, and distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur. • Mark events and/or probabilities on a probability scale of 0 to 1. This topic will be used in future learning: • Calculate probabilities from real-life graphs.

Topic: KS4 Higher Unit 11 Multiplicative Reasoning

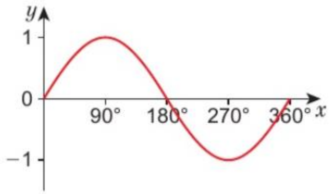
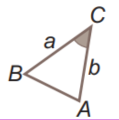
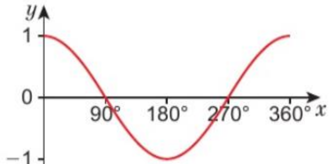
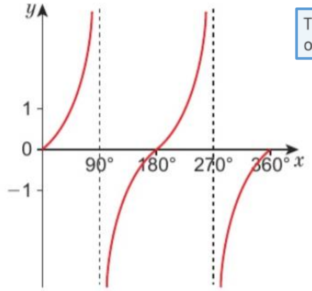
MathsWatch clips:

Duration: 8 Lessons

Composite: Unit Test

Key vocabulary:	Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.	Core knowledge components. Procedural and conditional knowledge.	Links to previous and future topics
Percentage Growth Decay Speed Acceleration Compound measures Direct and indirect proportion	I know that: • In **compound interest** the interest earned each year is added to money in the account and earns interest the next year. Most interest rates are compound interest rates. • Total interest = amount in the account at the end of the investment – amount invested • You can calculate an amount after n years' compound interest using the formula amount = initial amount × $\left(\frac{100 + \text{interest rate}}{100}\right)^n$ • Compound measures such as speed, density and pressure combine measures of two different quantities. • Speed can be measured in metres per second (m/s), kilometres per hour (km/h) or miles per hour (mph). • Average speed = $\frac{\text{distance}}{\text{time}}$ or $S = \frac{D}{T}$ • These are three kinematics formulae: where a is constant acceleration, u is initial velocity, v is final velocity s is displacement from the position when $t = 0$ and t is time taken. $v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$ • **Velocity** is speed in a given direction, possible units are m/s. • **Initial velocity** is speed in a given direction at the start of the motion. • **Acceleration** is the rate of change of velocity, i.e. a measure of how the velocity changes with time, possible units are m/s². • Density is the **mass** of substance in g contained in a certain **volume** in cm³ and is often measured in grams per cubic centimetre (g/cm³). Density = $\frac{\text{mass}}{\text{volume}}$ or $D = \frac{M}{V}$ • Pressure is the **force** in newtons applied over an **area**, in cm² or m². It is usually measured in newtons (N) per square metre (N/m²) or per square centimetre (N/cm²). Pressure = $\frac{\text{force}}{\text{area}}$ or $P = \frac{F}{A}$ • When x and y are in direct proportion $y = kx$, where k is the gradient of the graph of y against x $\frac{y}{x} = k$, a constant • When x and y are in inverse proportion, y is proportional to $\frac{1}{x}$. As one doubles (×2) the other halves (÷2). • When x and y are in inverse proportion then $x \times y$ = a constant $xy = k$, so $y = \frac{k}{x}$	I know how to: • Find an amount after repeated percentage changes. • Solve growth and decay problems. • Calculate rates. • Convert between metric speed measures. • Use a formula to calculate speed and acceleration. • Solve problems involving compound measures. know when to: • Use relationships involving ratio. • Use direct and indirect proportion.	This topic builds on prior knowledge: • Convert between metric units. • Rearrange equations and use these to solve problems. • Solve simple direct and indirect proportion problems, including currency conversion. This topic will be used in future learning: • Write statements of direct proportion and forming an equation to find values. • Use and recognise graphs showing inverse proportion.

Topic: KS4 Higher Unit 12 Similarity and Congruence MathsWatch clips:		Duration: 9 Lessons	Composite: Unit Test
Key vocabulary:	**Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.**	**Core knowledge components. Procedural and conditional knowledge.**	**Links to previous and future topics**
Congruent Prove Corresponding Scale factors Similar shapes Linear	I know that: • Congruent triangles have exactly the same size and shape. Their angles are the same and corresponding sides are the same length. • Two triangles are congruent when one of these conditions of congruence is true. SSS (all three sides equal) SAS (two sides and the included angle are equal) AAS (two angles and a corresponding side are equal) RHS (right angle, hypotenuse and one other side are equal) • You can use congruence to solve problems and prove that shapes are the same. • To prove something, you write a series of logical statements that show the statement is true. Each statement must be supported by a mathematical reason. • Shapes are similar when one shape is an enlargement of the other. Corresponding angles are equal and corresponding sides are all in the same ratio. • When a shape is enlarged by linear scale factor k, the area of the shape is enlarged by scale factor k^2. • When a shape is enlarged by linear scale factor k, the volume is enlarged by scale factor k^3. • When the linear scale factor is k: Lengths are multiplied by k Area is multiplied by k^2 Volume is multiplied by k^3	I know how to: • Show that two triangles are congruent. • Know the conditions of congruence. • Prove shapes are congruent. • Solve problems involving congruence. • Use the ratio of corresponding sides to work out scale factors. • Find missing lengths on similar shapes. know when to: • Use similar triangles to work out lengths in real life. • Use the link between linear scale factor and area scale factor to solve problems. • Use the link between scale factors for length, area and volume to solve problems.	This topic builds on prior knowledge: • Recognise and enlarge shapes and calculate scale factors. • Know how to calculate area and volume in various metric measures. • Measure lines and angles, and use compasses, ruler and protractor to construct standard constructions. This topic will be used in future learning: • Solve similarity and congruence questions that include trigonometry, Pythagoras and transformations.

Topic: KS4 Higher Unit 13 More Trigonometry MathsWatch clips: 124, 196, 201, 202, 203, 206, 217, 218		Duration: 13 Lessons	Composite: Unit Test
Key vocabulary:	**Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.**	**Core knowledge components. Procedural and conditional knowledge.**	**Links to previous and future topics**
Upper and lower bounds Trigonometry Sine, cosine and tangent function Segment of a circle Bearings Pythagoras	I know that: ◉ The **sine** graph repeats every 360° in both directions.  Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ Cosine Rule $a^2 = b^2 + c^2 - 2bc\cos A$ Area of a Triangle = $\frac{1}{2}ab\sin C$  ◉ The **cosine** graph repeats every 360° in both directions.  **Transforming trigonometric graphs** The graph of $y = -f(x)$ is the reflection of the graph of $y = f(x)$ in the x-axis. The graph of $y = f(-x)$ is the reflection of the graph of $y = f(x)$ in the y-axis. The graph of $y = -f(-x)$ is a reflection of the graph of $y = f(x)$ in the x-axis and then the y-axis, or vice versa. These two reflections are equivalent to a rotation of 180° about the origin. The graph of $y = f(x) + a$ is the translation of the graph of $y = f(x)$ by $\begin{pmatrix}0\\a\end{pmatrix}$. The graph of $y = f(x + a)$ is the translation of the graph of $y = f(x)$ by $\begin{pmatrix}-a\\0\end{pmatrix}$. The graph of $y = af(x)$ is a vertical stretch of the graph of $y = f(x)$, with scale factor a, parallel to the y-axis. The graph of $y = f(ax)$ is a horizontal stretch of the graph of $y = f(x)$, with scale factor $\frac{1}{a}$, parallel to the x-axis. ◉ The **tangent** graph repeats every 180° in both directions.  ◉ $\tan x$ is not defined for angles of the form $(90 \pm 180n°)$	I know how to: • Use upper and lower bounds in calculations. • Find the sine of any angle. • Use the graph of the sine function to solve equations. • Find the cosine of any angle. • Use the graph of the cosine function to solve equations. • Find the tangent of any angle. • Use the graph of the tangent function to solve equations. • Find the area of a triangle and a segment of a circle. know when to: • Use the sine and cosine rules to solve 2D problems. • Solve bearings problems using trigonometry. • Use Pythagoras' theorem in 3D. • Use trigonometry in 3D. • Changes in a function affect trigonometric graphs.	This topic builds on prior knowledge: • Use axes and coordinates to specify points in all four quadrants. • Recall and apply Pythagoras' Theorem and trigonometric ratios. • Substitute into formulae. This topic will be used in future learning: • Recall transformations of trigonometric functions when translating, reflecting and stretching graphs of functions.