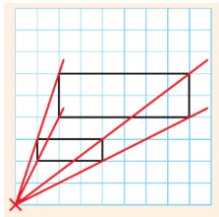
Topic: KS4 Foundation Unit 10 Transformations

MathsWatch clip numbers: 48, 49, 50, 148, 182

Duration: 10 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**
Translate Coordinate Reflection Rotation Enlargement Transform Scale Factor Origin	I know that: You can use a **column vector** to describe a transformation. The top number describes the movement to the left or right, and the bottom number describes the movement up or down. For example: $\begin{pmatrix}3\\2\end{pmatrix}$ means 3 right, 2 up $\quad$ $\begin{pmatrix}-4\\-5\end{pmatrix}$ means 4 left, 5 down. A **transformation** moves a shape so that it is in a different position. To describe fully a reflection on a coordinate grid you need to give the equation of the **mirror line**. You rotate a shape by turning it around a point called the **centre of rotation**. To describe fully a rotation, you need to give the angle, the direction and the centre of rotation. To enlarge a shape you multiply all the side lengths by the same number. The number that the side lengths are multiplied by is called the **scale factor**. The word **enlargement** is used even when the new shape is smaller than the original shape. When you enlarge a shape using a centre of enlargement, you multiply the distance from the centre to each vertex by the scale factor. To describe fully an enlargement, you need to give the scale factor and the centre of enlargement. Scale Factor Write $\frac{\text{length on image}}{\text{length on object}}$ and simplify.  Draw lines through each vertex on the image and the equivalent vertex on the original. All the lines should meet at the **centre of enlargement**.	I know how to: • Translate a shape on a coordinate grid. • Use a column vector to describe a translation. • Draw a reflection of a shape in a mirror line and on a coordinate grid. • Describe reflections. • Rotate a shape on a coordinate grid. • Describe a rotation. • Enlarge a shape by a scale factor. • Enlarge a shape using a centre of enlargement. • Describe an enlargement. • Transform shapes using more than one transformation. I know when to: • Identify the scale factor of an enlargement. • Find the centre of enlargement. • Describe combined transformations of shapes on a grid.	This topic builds on prior knowledge: • Be able to plot points in all four quadrants. • Understand the concept of rotation. • Draw and recognise lines parallel to axes and y = x, y = –x. This topic will be used in future learning: • Use transformation when dealing with more complex 15 constructions, loci and bearings questions •

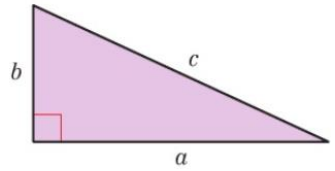
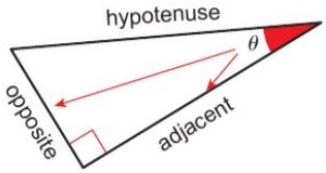
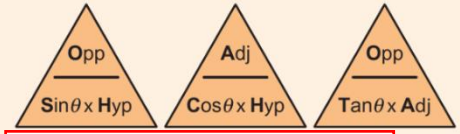
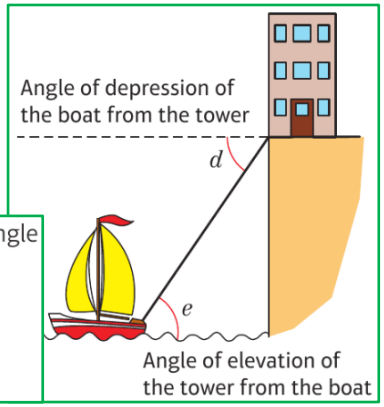
Topic: KS4 Foundation Unit 11 Ratio and Proportion **MathsWatch clips: 38, 39, 41, 42, 106, 107, 144**		**Duration: 12 Lessons**	**Composite: Unit Test**
Key vocabulary:	**Powerful knowledge components crucial to commit to long term memory. Declarative knowledge.**	**Core knowledge components. Procedural and conditional knowledge.**	**Links to previous and future topics**
• Simplify • Unitary • Proportion • Gradient • Direct • Inverse	I know that: You **simplify** a ratio by making the numbers as small as possible. Divide the numbers in the ratio by their **highest common factor** Ratios in their **simplest form** only have whole numbers. You can use **ratios** to convert between units. A **proportion** compares a part with the whole. You can compare ratios by writing them as **unit ratios**. In a unit ratio, one of the numbers is 1. In the **unitary method** you find the value of one item before finding the value of more. You can use the unitary method to work out which product gives better value for money. When two values are in **direct proportion**, if one value is zero so is the other. When one value doubles, so does the other. When two quantities are in direct proportion, plotting them as a graph gives a straight line through the origin. When two values are in **inverse proportion**, one increases at the same rate as the other decreases. For example, as one doubles (×2) the other halves (÷2).	I know how to: • Use ratio notation. • Simplify ratio. • Solve problems using ratios. • Use ratios to convert between units. • Write and use ratios for shapes and their enlargements. • Use ratios involving decimals. • Compare ratios. • Solve proportion problems in words. • Work out which product is better value for money. • Recognise and use direct proportion on a graph. • Recognise different types of proportion. • Solve word problems involving direct and inverse proportion. I know when to: • Use the unitary method to solve proportion problems. • Use the link between the unit ratio and the gradient.	This topic builds on prior knowledge: • Know the four operations of number. • Have a basic understanding of fractions as being ‘parts of a whole’. • Draw a line graph from a table of values. This topic will be used in future learning: • Understanding the relationship with ratio in trigonometry: Sin, Cos and Tan ratios. Know the Pythagoras 3,4,5 triangles and other triples through the understanding ratio of the side lengths.

Topic: KS4 Foundation Unit 12 Right-angled Triangles

MathsWatch clips: 9, 54, 150, 174

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**
Pythagoras Theorem Coordinate Trigonometry Sine, Cosine and Tangent Line Segment Formulae Surd Elevation Depression Hypotenuse	I know that: • Pythagoras' theorem shows the relationship between the lengths of the three sides of a right-angled triangle.  $c^2 = a^2 + b^2$ • A triangle with sides a, b and c, where c is the longest side, is right-angled only *if* $c^2 = a^2 + b^2$. • In a right-angled triangle, the side opposite the angle θ is called the **opposite**. The side next to the angle θ is called the **adjacent**.  Know the exact values of the sine, cosine and tangent of some angles. The three trigonometric ratios can be remembered using the phrase **SOH CAH TOA**  You can use $\sin^{-1}$, $\cos^{-1}$ or $\tan^{-1}$ to find the size of an angle. The **angle of elevation** is the angle measured upwards from the horizontal. The **angle of depression** is the angle measured downwards from the horizontal.  	I know how to: • Use Pythagoras' theorem to calculate the length of the hypotenuse and shorter sides in a right-angled triangle. • Calculate the length of a line segment AB. • Use the sine ratio to calculate the length of a side. • Use the sine ratio to calculate an angle. • Use the cosine ratio to calculate the length of a side. • Use the cosine ratio to calculate an angle. • Use the tangent ratio to calculate the length of a side. • Use the tangent ratio to calculate an angle. • Use the exact values of the sine, cosine and tangent of some angles. I know when to: • Solve problems using Pythagoras' theorem. • Use trigonometric ratios to solve problems. • Solve problems using an angle of elevation or depression.	This topic builds on prior knowledge: • Rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae. • Recall basic angle facts. • Understand when to leave an answer in surd form. This topic will be used in future learning: • Use angles in triangles to solve more complex bearing problems. • Recall and apply Pythagoras' Theorem on a coordinate grid.

	30°	45°	60°	90°
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	

Topic: KS4 Foundation Unit 13 Probability **MathsWatch clips: 14, 57, 59, 60, 61, 125, 151, 126, 127, 175, 185**		**Duration: 10 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**
Mutually Exclusive Exhaustive Sample Space Diagrams Predictions Experimental Venn Diagrams Frequency Trees Tree Diagrams Independent Events Dependent Events Two-way Tables	I know that: ◉ The probability of an event happening is a number between 0 and 1. If an event is certain, the probability is 1, P = 1. If an event is impossible, the probability is 0, P = 0. ◉ Events are **mutually exclusive** when they cannot happen at the same time. ◉ Events are **exhaustive** if they include all possible outcomes. The probabilities of an exhaustive set of mutually exclusive events sum to 1. ◉ Equally likely outcomes have the same probability of happening. ◉ For equally likely outcomes, the probability that an event will happen is $P = \frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$ ◉ If the probability of an event happening is P, the probability of it not happening is 1 – P. ◉ You can estimate the probability of an event from the results of an experiment or survey. $\text{relative frequency} = \frac{\text{number of successful trials}}{\text{total number of trials}}$ $\text{estimated probability} = \frac{\text{frequency of event}}{\text{total frequency}}$ ◉ Estimated probability is also called **experimental probability**. ◉ A larger number of trials gives a more accurate estimate of probability. ◉ Predicted number of outcomes = probability × number of trials ◉ You can calculate probabilities from a Venn diagram using $\frac{\text{number in the set}}{\text{total number in the Venn diagram}}$. ◉ Two events are **independent** when the results of one do not affect the results of the other. ◉ When the outcome of one event changes the possible outcomes of the next event, the two events are not independent. ◉ A frequency tree shows the number of options for different choices. A probability tree diagram shows all possible outcomes of an experiment.	I know how to: • Calculate simple probabilities from equally likely events. • Use mutually exclusive and exhaustive outcomes. • Use two-way tables to record the outcomes from two events. • Work out probabilities from sample space diagrams. • Find and interpret probabilities based on experimental data. • Use Venn diagrams to work out probabilities. • Use frequency trees and tree diagrams. • Work out probabilities using tree diagrams. I know when to: • Make predictions from experimental data. • Solve probability problems involving events that are not independent. • Use the language of sets and Venn diagrams.	This topic builds on prior knowledge: • Expressing one number as a fraction or percentage of another number. • Convert between fractions, decimals and percentages. • Add and multiply fractions and decimals. This topic will be used in future learning: Considering whether an event is likely to happens strengths pupils self-checking skills within other topics; is it likely that a babysitter will earn £3000 per day?