Mathematics Knowledge Organiser

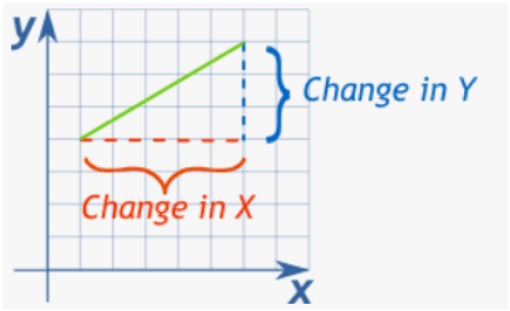
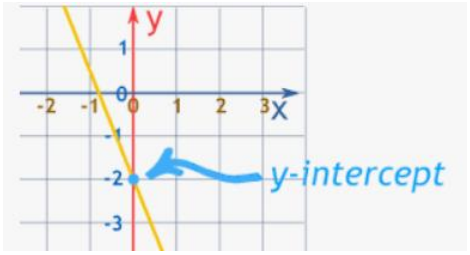
Year 10 – Spring T1

‘Linear graphs’

The Knowledge for Progression:

- To know that a coordinate is in the form (X,Y).
- To know that straight lines are continuous.
- To know that gradient is a measure of the steepness of a line.
- To know that the gradient of a vertical line is undefined.
- To know that the gradient of a horizontal line is 0.
- To know that all straight lines can be written in the form $y = mx + c$.
- To know that $'+c'$ is the y intercept – the point where the line crosses the y axis.
- To know that $'m'$ is the gradient.
- To know that $m = \frac{\Delta y}{\Delta x}$.

Speak Like a Mathematician

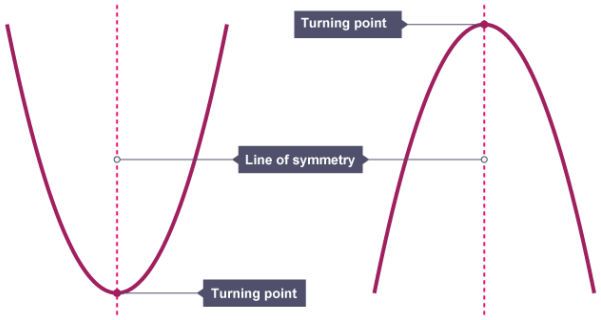
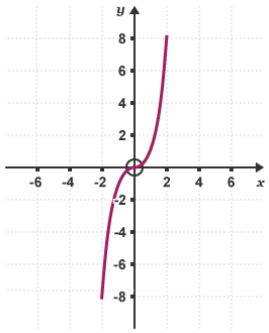
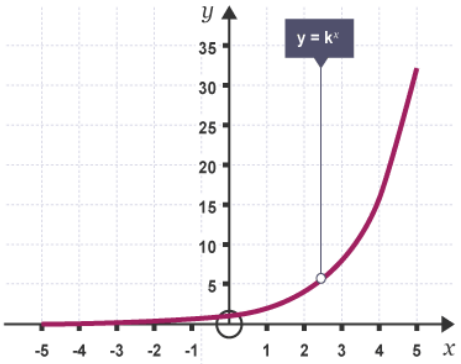
Key Word	Dual Coding	Definition
Gradient		A measure of the steepness of a line.
Y-intercept		The point where the line crosses the y-axis.

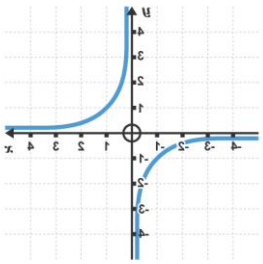
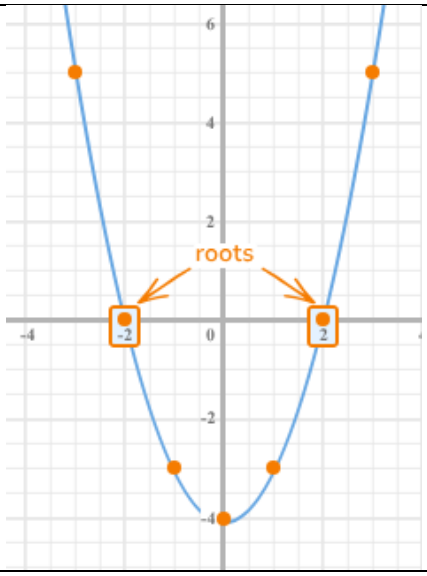
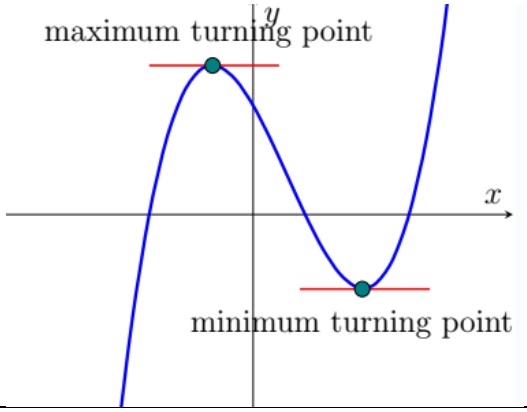
‘Non Linear’

The Knowledge for Progression:

- To know how to calculate a table of values for a quadratic equation.
- To know how to plot a quadratic graph from a table of values.
- To know how to identify roots and turning points from a quadratics graph.
- To know how to calculate a table of values for a cubic equation.
- To know how to plot a cubic graph from a table of values.
- To know how to identify roots and turning points from a cubic graph.
- To know how to plot an exponential graph from a table of values.
- To know how to plot a reciprocal graph from a table of values.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Quadratic Graph		A quadratic graph is produced when you have an equation of the form $y = ax^2 + bx + c$. Coordinates are joined by a smooth curve.
Cubic Graph		A cubic equation contains only terms up to and including x^3.
Exponential Graph (H)		A graph in the form y=kx. These graphs increase rapidly in the y direction and will never fall below the x-axis.

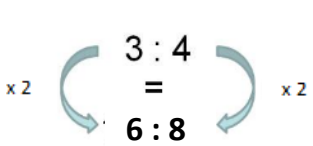
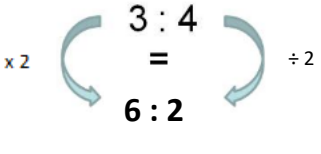
Reciprocal Graph		A graph of the form $y = \frac{1}{x}$.
Roots		Where the graph crosses the x-axis.
Turning Point		A point where a graph changes direction.

‘Direct and inverse proportion’

The Knowledge for Progression:

- To know that direct proportion is a multiplicative relationship between values, as one value increase so does the other.
- To know that inverse proportion is the multiplicative relationship between values, where one value increases the other decreases.
- To know that an exchange rate is the proportional relationship between 2 currencies.
- To know that better value for money is when the cost per unit is less.

Speak Like a Mathematician

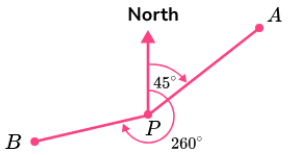
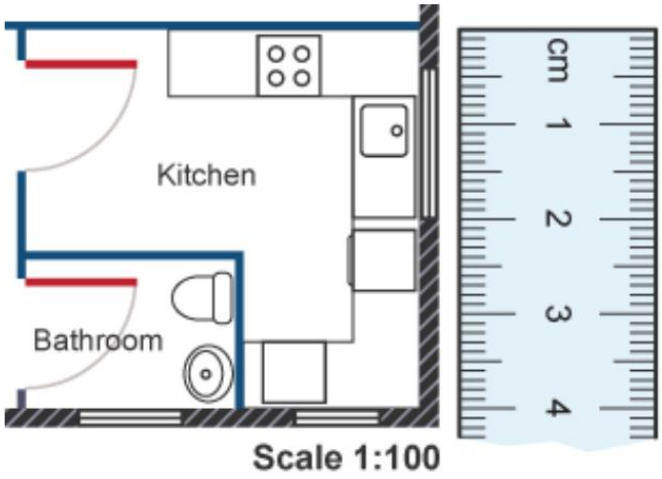
Key Word	Dual Coding	Definition
Proportion	   	A mathematical relationship, where quantities are increasing or decreasing in the same ratio.

‘Bearings and Scale’

The Knowledge for Progression:

- To know how to measure a bearing.
- To know how to draw a bearing.
- To know how to calculate a bearing.
- To know how to calculate a scale.
- To know how to calculate a length from a scale.
- To know how to draw accurately to scale.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Bearing	 The angles are measured clockwise from the north line. The bearing of **A from P** is 045°. The bearing of **B from P** is 260°.	An angle measured clockwise from north.
Scale	 **Scale 1:100**	Refers to the ratio between the size of a representation and the actual size.

Mathematics Knowledge Organiser

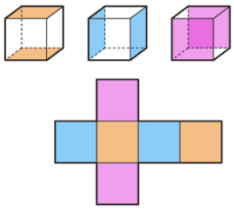
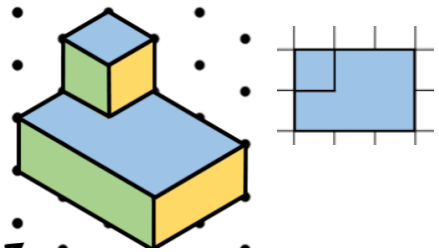
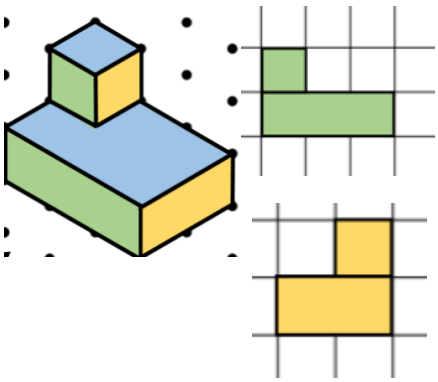
Year 10 – Spring T2

‘Nets, plans and elevations’

The Knowledge for Progression:

- To know that the net of a 3D shape is what the shape would look like if unfolded. It is made up of the faces of the 3D shape.
- To know that the plan is the view of a 3D object from above.
- To know that the front and side elevations are the views of a 3D object from the front and side.

Speak Like a Mathematician

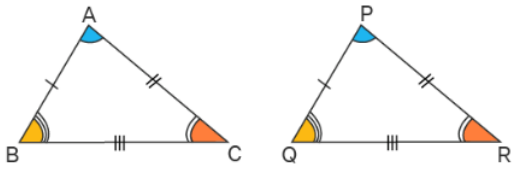
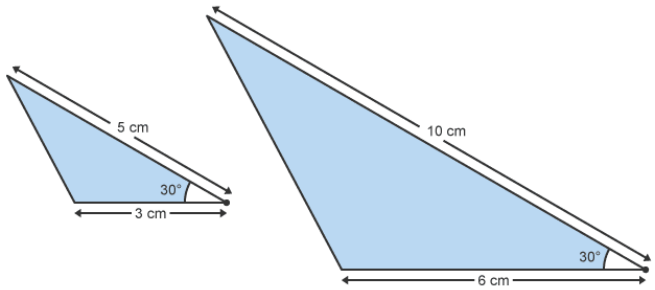
Key Word	Dual Coding	Definition
Net		A 2D representation of a 3D shape unfolded
Plan		The view of a 3D object from above
Elevation		The view of a 3D object from the front or the side

‘Similar Shapes’

The Knowledge for Progression:

- To know how to decide if shapes are similar by calculating the linear scale factor of shapes.
- To know how to calculate missing lengths of similar shapes.
- To know how to calculate the scale factor for area of similar shapes.
- To know how to calculate missing areas of similar shapes.
- To know how to calculate the scale factor for volume of similar shapes.
- To know how to calculate missing volumes of similar shapes.

Speak Like a Mathematician

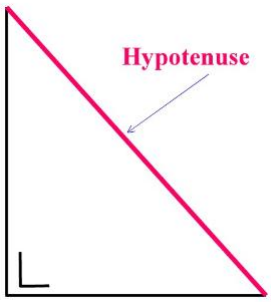
Key Word	Dual Coding	Definition
Congruent		Shapes are exact the same shape and size.
Similar		An enlargement of a shape. Corresponding sides are in proportion; angles remain the same size.

‘3D Pythagoras’ (H)

The Knowledge for Progression:

- To know that Pythagoras’ theorem can only be applied to right-angled triangles. It involves all three sides of the triangle.
- To know that the hypotenuse of a triangle is opposite the right-angle. This will always be the longest side of the triangle.
- To know $a^2 + b^2 = c^2$ where a and b are the shorter sides.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Hypotenuse		The longest length of a right-angled triangle. Always opposite the right-angle.

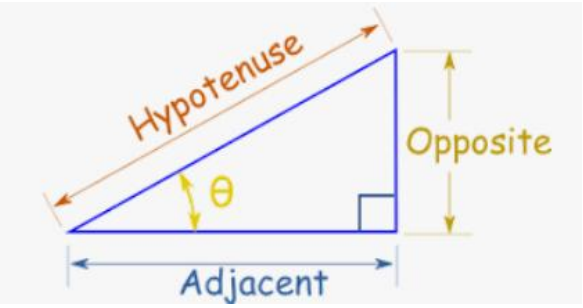
‘3D Trigonometry’ (H)

The Knowledge for Progression:

- To know that trigonometry can only be applied to right-angled triangles where two sides and one angle are involved.
- To know that you can label the sides hypotenuse, adjacent and opposite.
- To know that the hypotenuse of a triangle is opposite the right-angle. This will always be the longest side of the triangle.
- To know that the opposite side is opposite the angle involved (not the right-angle).
- To know that the adjacent side is next to the angle but is not the hypotenuse.
- To know that

$$Sin(angle) = \frac{Opposite}{Hyoptenuse} \quad Cos(angle) = \frac{Adjacent}{Hypotenuse} \quad Tan(angle) = \frac{Opposite}{Adjacent}$$

Speak Like a Mathematician

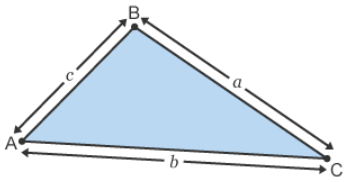
Key Word	Dual Coding	Definition
Hypotenuse		The longest length of a right-angled triangle. Always opposite the right-angle.
Opposite		The length opposite the angle involved (not the right angle).
Adjacent		The length next to the right angle, but not the hypotenuse.

‘Non-Right-Angled Trigonometry’ (H)

The Knowledge for Progression:

- To know how to calculate the area of any triangle using the Sine rule for area.
- To know how to calculate a missing side of a non-right-angled triangle using the Sine rule.
- To know how to calculate a missing angle of a non-right-angled triangle using the Sine rule.
- To know how to calculate a missing side of a non-right-angled triangle using the Cosine rule.
- To know how to calculate a missing angle of a non-right-angled triangle using the Cosine rule.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Sine Rule	 The sine rule is: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ This version is used to calculate lengths. It can be rearranged to: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ This version is used to calculate angles.	A way of finding missing side lengths or angles in non-right-angled triangles.
Cosine Rule	The cosine rule is: $a^2 = b^2 + c^2 - 2bc\cos A$ This version is used to calculate lengths. It can be rearranged to: $\cos A = \frac{b^2+c^2-a^2}{2bc}$ This version is used to calculate angles.	A way of finding missing side lengths or angles in non-right-angled triangles.