Mathematics Knowledge Organiser

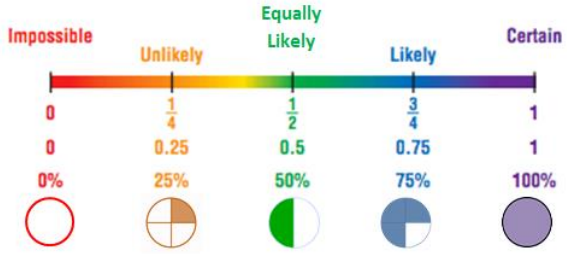
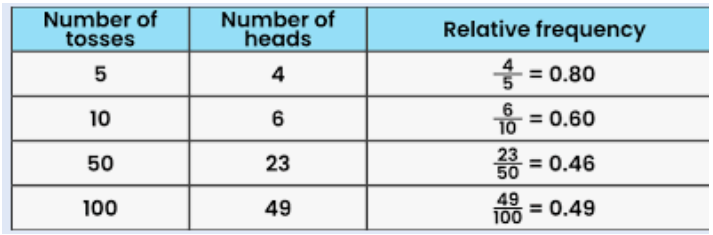
Year 11 – Autumn T1

‘Probability’

The Knowledge for Progression:

- To know how to calculate a probability of an event occurring.
- To know how to complete a sample space diagram.
- To know how to calculate probabilities from tree diagrams.
- To know how to complete a probability tree diagram.
- To know how to calculate relative frequency.
- To know how to calculate the expectation of an event from its relative frequency.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Probability		The chance of an event happening
Relative Frequency		How often an event occures, divided by the total number of trials

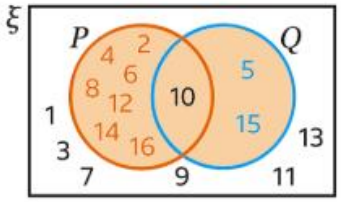
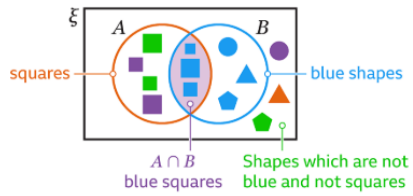
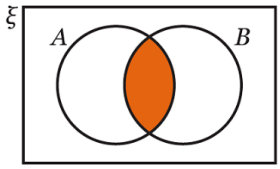
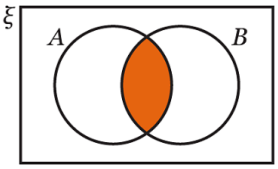
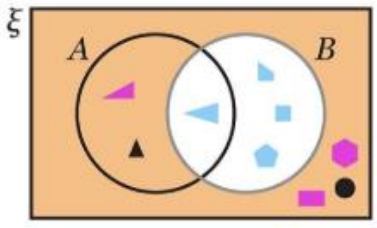
Number of tosses	Number of heads	Relative frequency
5	4	$\frac{4}{5} = 0.80$
10	6	$\frac{6}{10} = 0.60$
50	23	$\frac{23}{50} = 0.46$
100	49	$\frac{49}{100} = 0.49$

‘Set Notation’

The Knowledge for Progression:

- To know how to read set notation.
- To know how to represent set notation on a Venn diagram.
- To know how to calculate probability of a region from set notation.

Speak Like a Mathematician

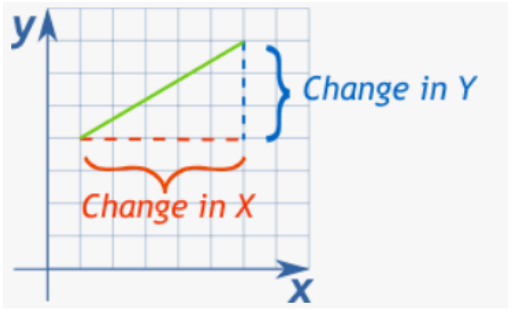
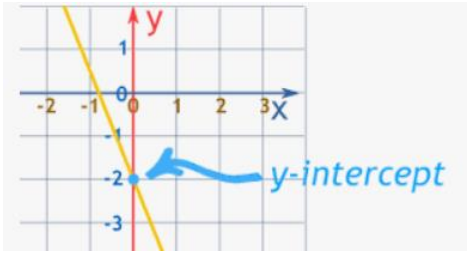
Key Word	Dual Coding	Definition
Union	 $P \cup Q = \{2, 4, 6, 8, 12, 14, 16, 10, 5, 15\}$	The combination of both sets and the intersection
Intersection	A = {squares} B = {blue shapes}   intersection  $A \cap B$	A member of both sets
Complement	 B' = {**not** blue shapes} $B' = \{$ ◢ ▬ ▲ ● ⬢ $\}$	Items not in a set

‘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.

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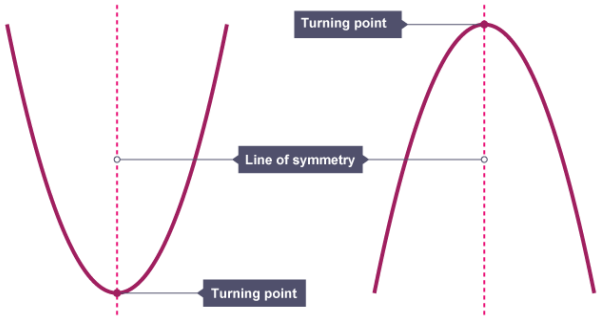
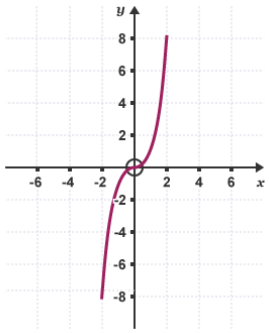
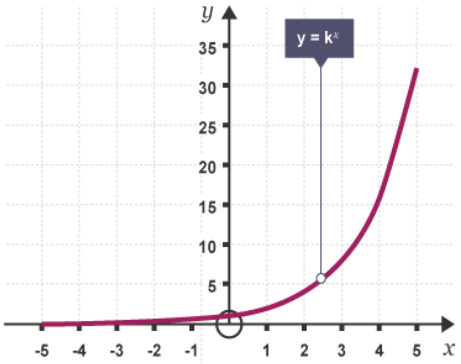
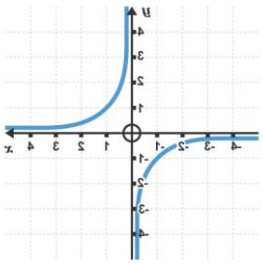
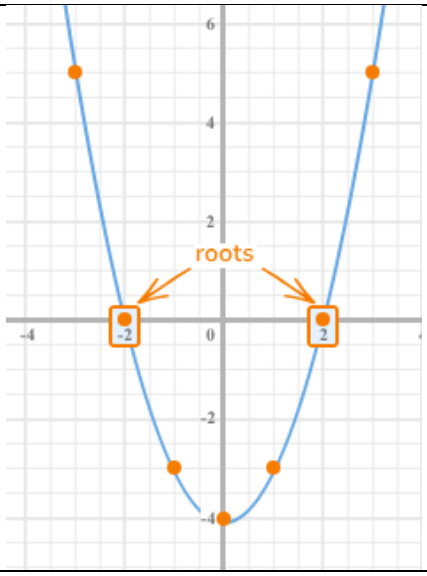
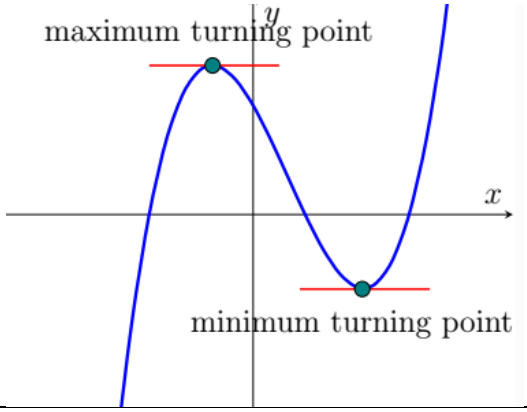
Key Word	Dual Coding	Definition
Quadratic Graph		A quadratic graph is produced when you have an equation of the form $y = ax^2 + bx + c$. Coordinates are joined by a smooth curve.
Cubic Graph		A cubic equation contains only terms up to and including x^3.
Exponential Graph (H)		A graph in the form y=kx. 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.

‘Solving Quadratics’

The Knowledge for Progression:

- To know how to solve a quadratic equation by factorisation.
- To know how to solve a quadratic equation from its graph.
- To know how to solve a quadratic and linear equation from their graphs.
- To know how to solve a quadratic equation by completing the square.

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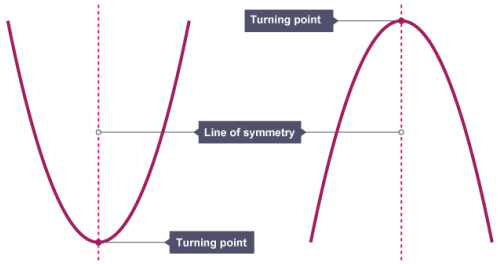
Key Word	Dual Coding	Definition
Quadratic		A quadratic graph is produced when you have an equation of the form $y = ax^2 + bx + c$.
Factorise	*Factorising* $x^2 + 6x + 5 \equiv (x + 5)(x + 1)$ *Expanding brackets*	Put into brackets.
Complete the Square	$x^2 + 6x + 4 = 0$ $(x + 3)^2 - 9 + 4 = 0$	A method to rewrite a quadratic in the form of a squared bracket, plus or minus a constant.

Mathematics Knowledge Organiser

Year 11 – Autumn T2

‘Angle geometry’

The Knowledge for Progression:

- To know that the sum of interior angles is calculated by (n-2) x 180° , where n is the number of sides of the polygon.
- To know that sum of the interior angle and the exterior angle equal 180°.
- To know that parallel lines are continuous lines that are always the same distance apart.
- To know that the transversal is a line that cuts through two lines.
- To know that corresponding angles are equal.
- To know that alternate angles are equal.
- To know that co-interior angles sum to 180°.
- To know that vertically opposite angles are equal.

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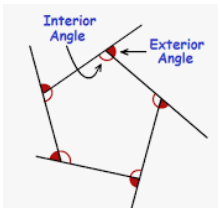
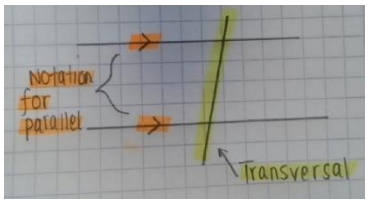
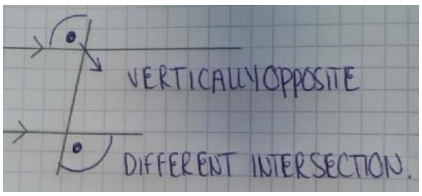
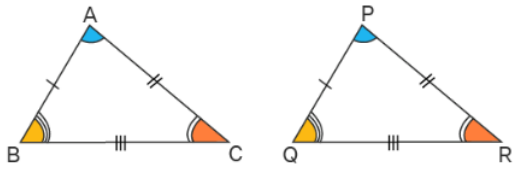
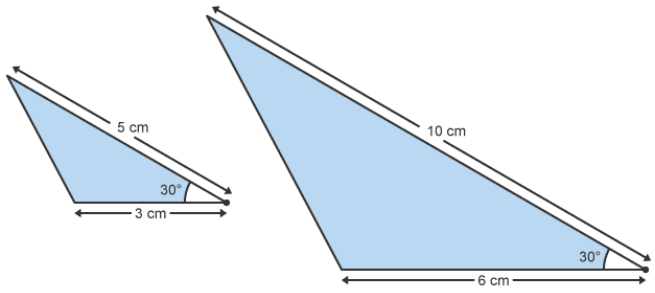
Key Word	Dual Coding	Definition
Interior		Situated in the inside of a polygon.
Exterior		Situated on the outside of a polygon.
Parallel		Lines that have the same distance between them and never touch.
Transversal		A straight line that intersects two or more parallel lines.
Corresponding		Angles that are at **different intersections** but have the **same position** on the transversal line.
Alternate		Angles that are **vertically opposite** from the initial angle and on a **different intersection**.
Co-interior		Angles occur **between** two parallel lines when intersected by a transversal line.

‘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.

‘Frequency Tables’

The Knowledge for Progression:

- To know how to calculate the averages and range from a frequency tables.
- To know how sampling is used and to know its limitations.
- To know how to create a frequency polygon.
- To know to create a cumulative frequency graph.
- To know how to create a box plot.

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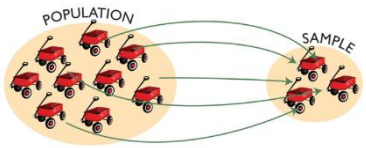
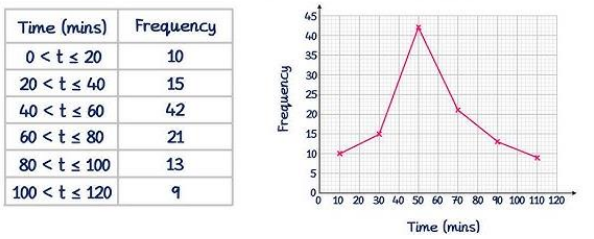
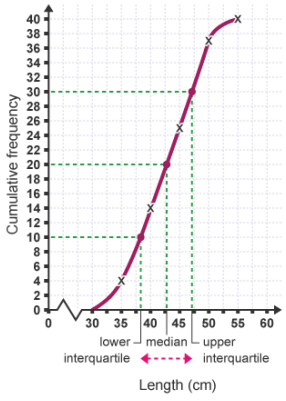
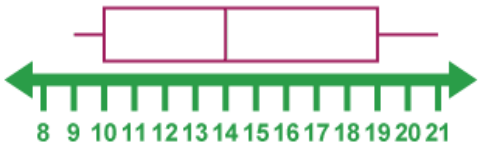
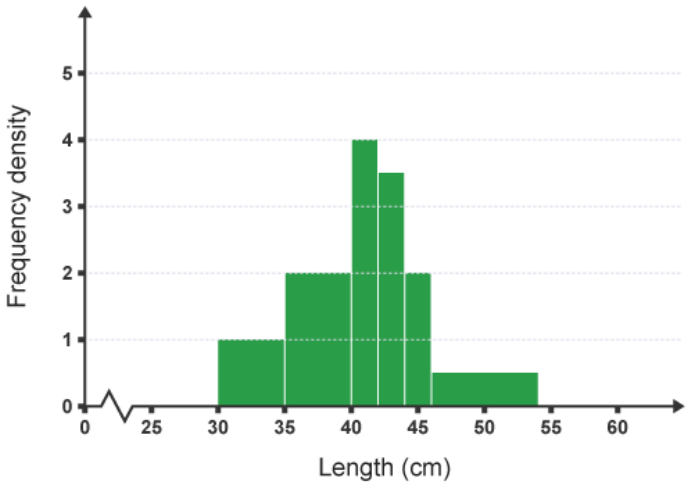
Key Word	Dual Coding	Definition
Sampling		Selecting a group of people from the population.
Frequency Polygon		A graph that shows the frequencies of grouped data.
Cumulative Frequency (H)		A graph that shows a running total of the frequencies.
Box Plot (H)		A box plot shows the median and quartiles of a data set.

‘Histograms’ (H)

The Knowledge for Progression:

- To know how to calculate frequency density.
- To know how to draw a histogram.
- To know how to create a frequency table from a histogram.
- To know how to interpret a histogram.

Speak Like a Mathematician

Key Word	Dual Coding	Definition
Histogram		A way of displaying grouped data, with unequal class intervals. Where the area of the bar represents the frequency.
Frequency Density		Frequency density = $\frac{Frequency}{Class\ Width}$

‘Volume and Surface Area’

The Knowledge for Progression:

- To know how to calculate the volume of a sphere.
- To know how to calculate the surface area of a sphere.
- To know how to calculate the volume of a cone.
- To know how to calculate the total surface area of a cone.
- To know how to calculate the volume of a frustum.

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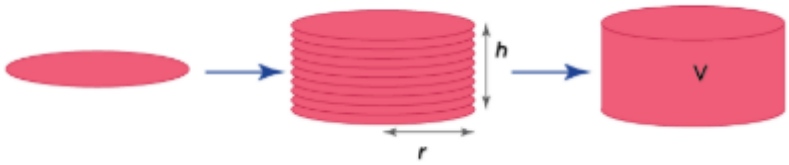
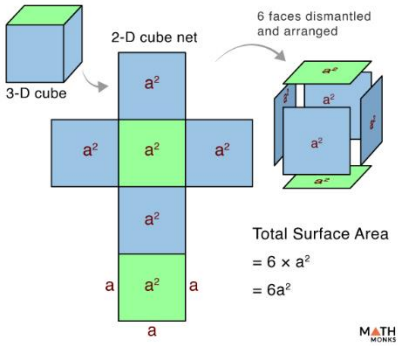
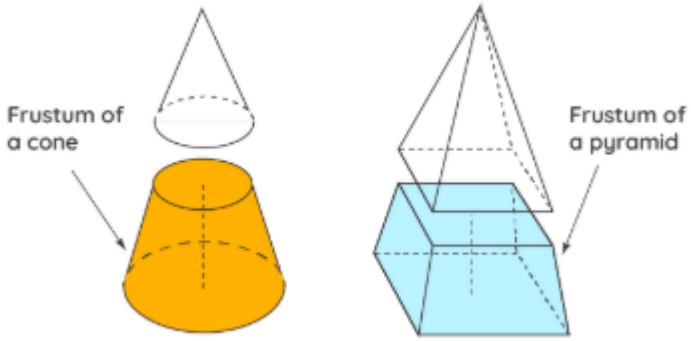
Key Word	Dual Coding	Definition
Volume		The amount of space in a 3D shape.
Surface area		Total area of faces on a 3D shape.
Frustum (H)		A 3D shape made from cutting the top of a cone or pyramid. The top and bottom bases of the frustum are parallel to each other.