

# Mathematics Knowledge Organiser

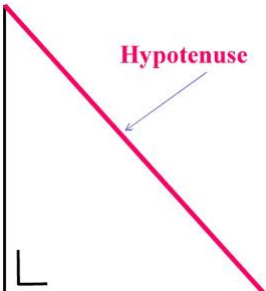
## Year 9 – Spring T1

### 'Pythagoras'

#### 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 represent the shorter sides of a triangle.

#### Speak Like a Mathematician

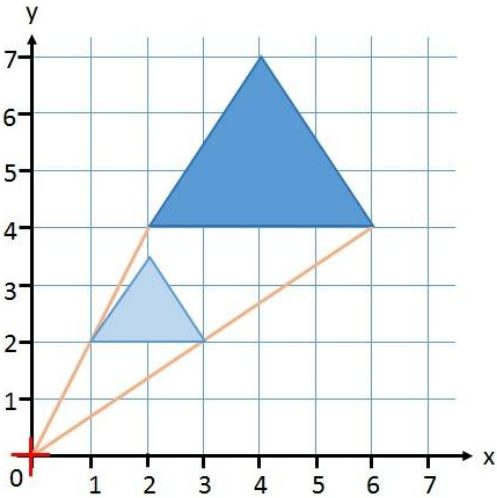
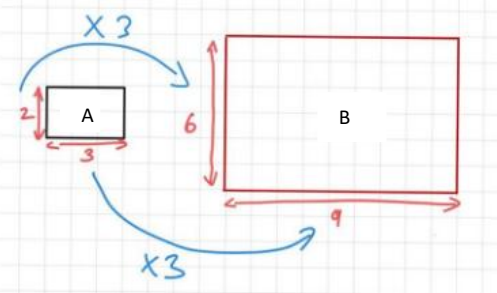
Key Word	Dual Coding	Definition
<b>Hypotenuse</b>		The longest length of a right-angled triangle. Always opposite the right-angle.

## 'Enlargements'

### The Knowledge for Progression:

- To know that an enlargement changes the size of a shape in proportion.
- To know that a scale factor describes how much the shape is enlarged by.
- To know that the centre of enlarge is the point from which a shape is enlarged.

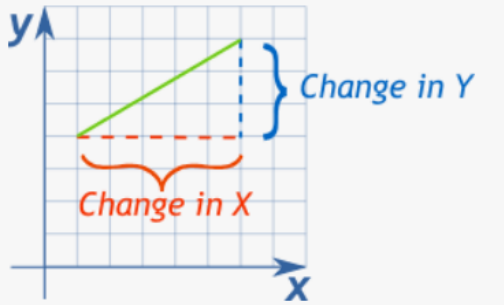
### Speak Like a Mathematician

Key Word	Dual Coding	Definition
<b>Enlargement</b>		A transformation in which lengths are multiplied whilst directions and angles remain the same
<b>Scale Factor</b>	 <p>Shape A has been enlarged into shape B by a ratio of 1:3</p>	The ratio of corresponding edge lengths

## '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  $m = \frac{\Delta y}{\Delta x}$ .

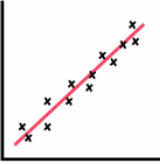
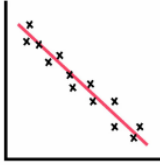
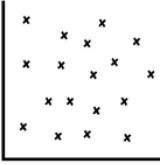
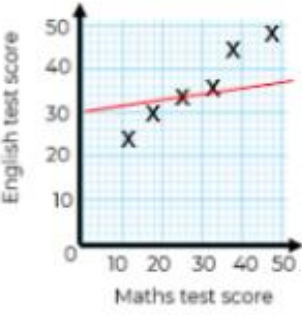

Key Word	Dual Coding	Definition
<b>Gradient</b>		A measure of the steepness of a line.

## 'Scatter graphs'

### The Knowledge for Progression:

- To know that a scatter graph shows the correlation between two variables.
- To know that a positive correlation means that as one variable increases, the other variable increases.
- To know that a negative correlation means that as one variable increases, the other variable decreases.
- To know that no correlation means there is no link between the variables.
- To know that a line of best fit follows the trend of the data.

### Speak Like a Mathematician





Key Word	Dual Coding	Definition	
<b>Variable</b>	<b>Variable</b>	The independent variable is the cause. The dependent variable is the effect.	
	<b>Independent</b>		<b>Dependent</b>
	Temperature		Ice cream sales
	Age of car		Price of car
	Height of student		Arm length
<b>Correlation</b>	<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Positive Correlation</p> </div> <div style="text-align: center;">  <p>Negative Correlation</p> </div> <div style="text-align: center;">  <p>No Correlation</p> </div> </div>	A measure of the strength of the association between two variables.	
<b>Line of best fit</b>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p style="color: red; font-size: 2em; margin-top: 10px;">✗</p> </div> <div style="text-align: center;">  <p style="color: green; font-size: 2em; margin-top: 10px;">✓</p> </div> </div>	A line drawn on to a scatter graph that follows the trend of the data.	
<b>Trend</b>		A pattern in a set of results displayed in a graph.	

## 'Financial maths with percentages'

### The Knowledge for Progression:

- To know how to calculate a percentage change of two values without a calculator.
- To know how to calculate a percentage change of two values with a calculator.
- To know how to calculate the original amount knowing a percentage.
- To know how to calculate compound interest/depreciation.
- To know how to calculate a bill.
- To know how to calculate monthly payment plans (simple interest).

### Speak Like a Mathematician

Key Word	Dual Coding	Definition
<b>Balance</b>		The amount of money in your bank account.
<b>Credit</b>		Money going <b>into</b> your bank account.
<b>Debit</b>		Money going <b>out</b> of your bank account.
<b>Compound Interest</b>	$  \begin{array}{ccccccc}  \$1,000 & \xrightarrow{\times 10\%} & \$1,100 & \xrightarrow{\times 10\%} & \$1,210 & \xrightarrow{\times 10\%} & \$1,331 \\  & \xrightarrow{\$100} & & \xrightarrow{\$110} & & \xrightarrow{\$121} & \text{etc...}  \end{array}  $	Interest you earn upon previous interest over time.
<b>Depreciation</b>		Reduction in value over time.

# Mathematics Knowledge Organiser

## Year 9 – Spring T2

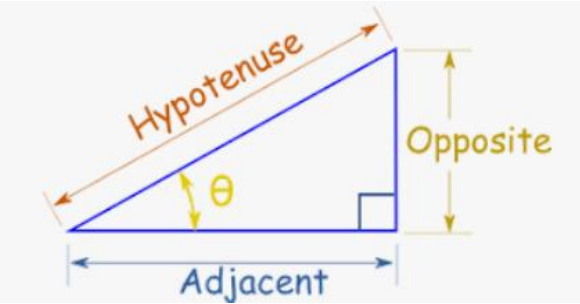
### 'Trigonometry'

#### 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

$$\sin(\text{angle}) = \frac{\text{Opposite}}{\text{Hypotenuse}} \quad \cos(\text{angle}) = \frac{\text{Adjacent}}{\text{Hypotenuse}} \quad \tan(\text{angle}) = \frac{\text{Opposite}}{\text{Adjacent}}$$

#### Speak Like a Mathematician


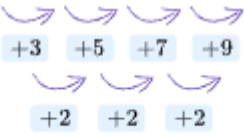
Key Word	Dual Coding	Definition
<b>Hypotenuse</b>		The longest length of a right-angled triangle. Always opposite the right-angle.
<b>Opposite</b>		The length opposite the angle involved (not the right angle).
<b>Adjacent</b>		The length next to the right angle, but not the hypotenuse.

# 'Quadratic Sequences' (H)

## The Knowledge for Progression:

- To know that a quadratic sequence is where the difference in the terms increases by the same number each time.
- To know that quadratic sequences are linked to square numbers.
- To know that “n” is the position of a value in the sequence.
- To know that “n” is always a positive integer.

## Speak Like a Mathematician

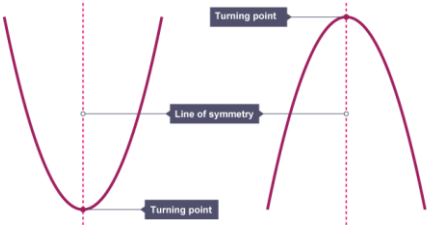
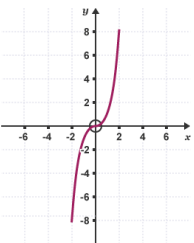
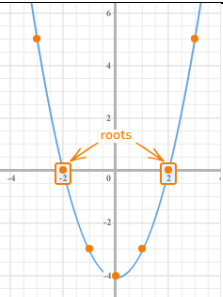
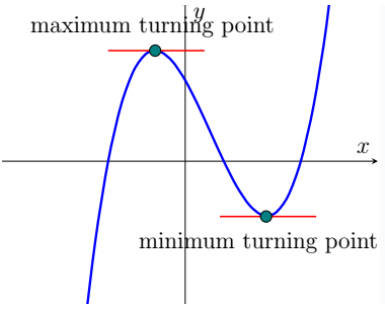
Key Word	Dual Coding	Definition
<b>Sequence</b>	$2, 4, 8, 16 \dots$	A set of values or diagrams that follow a pattern
<b>Term</b>	Term: $1 \quad 2 \quad 3 \quad 4$  Term: $1 \quad 2 \quad 3 \quad 4 \quad 5$	The position of a value or diagram in a sequence
<b>Quadratic sequence</b>	$7, 11, 17, 25, 35 \dots$ First difference: $4 \quad 6 \quad 8 \quad 10$ Second difference: $2 \quad 2 \quad 2$	Terms are generated by adding or subtracting a constant amount to the difference between the terms. Quadratic sequences have a constant second difference.
<b>Nth term</b>	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: auto;"> <math display="block">n^2 + 3</math> <math display="block">4, 7, 12, 19, 28,</math>  </div>	Is the position to term rule that allows you to generate or continue a sequence.

## 'Non Linear Graphs'

### 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 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 graph

### Speak Like a Mathematician

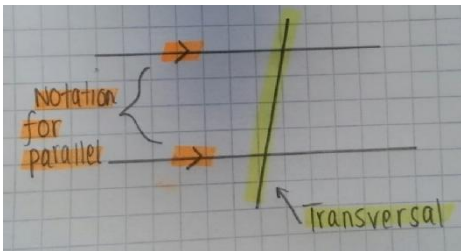
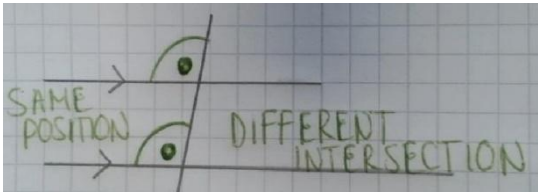
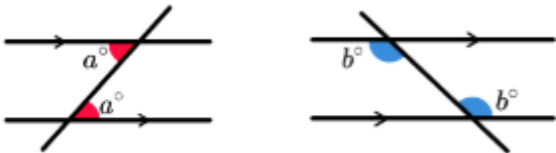
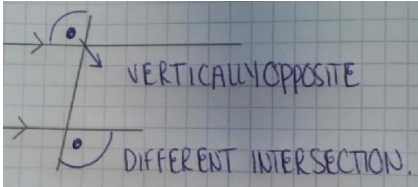
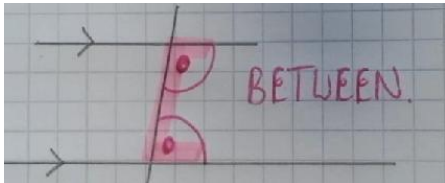
Key Word	Dual Coding	Definition
<b>Quadratic Graph</b>		<p>A quadratic graph is produced when you have an equation of the form <math>y = ax^2 + bx + c</math>.</p> <p>Coordinates are joined by a smooth curve.</p>
<b>Cubic Graph</b>		<p>A cubic equation contains only terms up to and including <math>x^3</math>.</p>
<b>Roots</b>		<p>Where the graph crosses the x-axis.</p>
<b>Turning Point</b>		<p>A point where a graph changes direction.</p>

# 'Angles in parallel lines'

## The Knowledge for Progression:

- 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  $180^\circ$ .
- To know that vertically opposite angles are equal.

## Speak Like a Mathematician

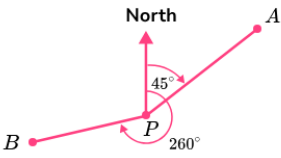
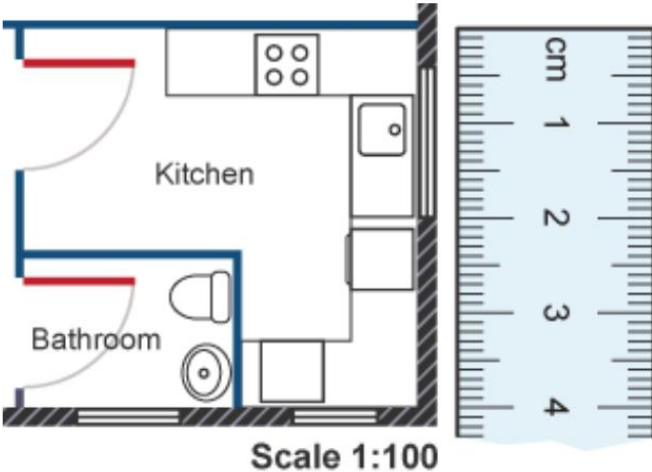
Key Word	Dual Coding	Definition
<b>Parallel</b>		Lines that have the same distance between them and never touch.
<b>Transversal</b>		A straight line that intersects two or more parallel lines.
<b>Corresponding</b>		Angles that are at <b>different intersections</b> but have the <b>same position</b> on the transversal line.
<b>Alternate</b>		Angles formed on the <b>opposite side of the transversal</b> with respect to both the lines are called alternate angles.
<b>Vertically opposite</b>		Angles that are <b>vertically opposite</b> from the initial angle and on a <b>different intersection</b> .
<b>Co-interior</b>		Angles occur <b>between</b> two parallel lines when intersected by a transversal line.

## '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 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
<b>Bearing</b>	 <p>The angles are measured clockwise from the north line.</p> <p>The bearing of <b>A from P</b> is <math>045^\circ</math>.</p> <p>The bearing of <b>B from P</b> is <math>260^\circ</math>.</p>	An angle measured clockwise from north.
<b>Scale</b>	 <p>Scale 1:100</p>	Refers to the ratio between the size of a representation and the actual size.

