**Subject Vision**

The Mathematical curriculum provides students with a deep knowledge of mathematical concepts. This will enable students to carry out calculations fluently throughout all domains. This should develop students to be inquisitive problem solvers who can apply Maths to the real world.

**End Points**

- **EP1 Have a deep understanding of maths and how it relates to the real world**
- **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**
- **EP3 Reason, interpret and communicate mathematically**
- **EP4 Can apply mathematical knowledge fluently across and between domains**

**SOUTH DOWNS**
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| **Subject Domains of Knowledge** | **Subject Key Concepts** |
|---|---|
| <ul><li>D1 Number</li><li>D2 Algebra</li><li>D3 Statistics</li><li>D4 Ratio proportion and rates of change</li><li>D5 Geometry and Measure</li><li>D6 Probability</li></ul> | <ul><li>C1 Mathematical operations</li><li>C2 Directed number</li><li>C3 FDPR</li><li>C4 place value</li><li>C5 types of numbers</li><li>C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)</li><li>C7 Equations</li><li>C8 Graphs and sequences</li><li>C9 constructions and loci</li><li>C10 Measures (perimeter, area, volume etc)</li><li>C12 Angles (inc parallel lines and using angles)</li><li>C13 Transformations (including vectors)</li><li>C14 properties of shapes</li><li>C15 Data Handling (including averages, charts and graphs)</li></ul> |

**Medium Term Plan**

**Year 9**

| **Units / Term Adapt according to subject** | **Unit 1: Standard form calculations** | **Unit 2: Area and circumference of circles** | **Unit 3: Ratio and FDP** |
|---|---|---|---|

| Overview | This unit continues to build on the knowledge of standard form and uses it in calculations. | Students have seen pi and have used it to find perimeter and area of circles but within this topic they will investigate what pi is and how the number exists and use in complex questions. | In this unit it develops on converting fractions, decimals and percentages, also connecting to ratio. Students will convert numbers and order them. |
|---|---|---|---|
| **Lesson sequence** | 1. Investigating big and small numbers<br>2. Put numbers in standard form<br>3. Put standard form into ordinary numbers<br>4. Calculating standard form multiplying and dividing<br>5. Calculating standard form adding and subtracting | 1. Circumference of circles<br>2. Using circumference with sectors<br>3. Area of circles<br>4. Using the formula<br>5. Problem solving with circles | 1. Simplify ratio<br>2. Equivalent ratio<br>3. Share an amount in a given ratio<br>4. Putting ratio into a fractions<br>5. Converting ratios in percentage and proportion<br>6. Using ratio in multi step problems<br>7. Using ratio in worded problems |
| **Key Domains and Concepts taught in this Unit / Term** | D1 Number<br>D2 Algebra<br>C1 Mathematical operations<br>C2 Directed number<br>C5 types of numbers<br>C7 Equations | C7 Equations<br>C10 Measures (perimeter, area, volume etc)<br>C12 Angles (inc parallel lines and using angles)<br>C14 properties of shapes<br>D5 Geometry and Measure | C3 FDPR<br>D4 Ratio proportion and rates of change |
| **KS4 End Points taught in this Unit / Term** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge** | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically** |
| **Declarative Knowledge** | know how to use standard form and what big and small numbers look like | Know the area of a circle and the circumference of a circle | Identify ratio and share in the parts |

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| (Students should know) | Can use index laws to calculate standard form | Know the different names of circle parts<br>Know pi | Understand what the denominator and numerator represent in a fraction |
|---|---|---|---|
| **Procedural Knowledge (Students should be able to do)** | Use standard form in all contexts and be able to calculate standard form adding, subtracting, multiplying and dividing. | Use the formulas to find area and circumference of different circles.<br>Use the formula to work it backwards to find a missing radius. Use knowledge of area and circumference on semi circles and sectors | Problem solve using ratio and proportion<br>Solve 2 step multiple problems with ratio<br>Find a fraction from a ratio<br>Ratio problems with percentages |
| **Developing T3 Literacy and Numeracy** | **Standard form:** An agreed scientific notation, used for very large and very small numbers<br>**Indices:** A small number placed in the upper-right of a base number which shows how many copies of the base number are multiplied together<br>**Power**: Another word for an index (single of indices) | **Diameter:** A straight line passing through the centre of a circle to touch both sides of the circle<br>**Radius**: A straight line from the centre of a circle to its edge.<br>**Area:** The amount of space inside a 2D shape, measured in square units<br>**Perimeter:** The distance around the outside of a shape, (calculated by adding all the sides together)<br>**Circumference:** The distance specifically around the outside of a circle<br>**Arc:** A part of the circumference of a circle<br>**Sector:** A slice of a circle, bounded by two radii and an arc | **Fraction:** A part of a whole, written with a denominator (the number on the bottom – how many pieces we have split the whole into) and a numerator (the number on the top – how many pieces we actually have)<br>**Decimal:** A number where tenths, hundredths and thousandths etc are written after a decimal point<br>**Proportion:** Two fractions, ratios or amounts that are equal in value are said to be "in proportion" |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |

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| **Links to Prior Learning** | Year 7 – index laws and powers<br>Year 8 – standard form converting numbers in and out | Year 7 – circumference<br>Year 8 – area | Year 7/8 - ratio simplifying / sharing<br>Proportion<br>FDP |
| **Next steps in learning** | Year 11 recap on standard form and indices | Sectors / semi circles / complex questions<br>In terms of pi | Ratio recap – all types of questions |
| **Common Barriers to learning in this unit** | Multiply and add in the same way<br>Do not use index rules<br>Add/subtract - place value of numbers | Mix up the radius and diameter in the formulas<br>Forget to square the radius in the area formula<br>Perimeter of semi-circles, forget to add the diameter<br>Issues with units – linear for circumference, square units for area | Do not add up the parts for the denominator |

| Units / Term | Unit 4: Solving unknowns on both sides | Unit 5: Percentages | Unit 6: Time series and vertical line graphs |
|---|---|---|---|
| **Overview** | Students will develop their fluency in algebra by solving equations with unknowns on both sides and with brackets. | Students to continue to develop percentage skills using multiplers to find an increase and decrease. Students will learn how to identify simple interest and compound interest. | In this unit students will be introduced to time series graphs and vertical line graphs and practise plotting liner line graphs. |
| **Lesson Sequences** | 1. Collecting terms and substitution<br>2. Solving one step equations<br>3. Solving two step equations<br>4. Solving equations with unknowns on both sides | 1. Percentage of an amount with and without a calculator<br>2. Percentage increase and decrease<br>3. Using multipliers<br>4. Percentage change<br>5. Reverse percentage | 1. Draw and interpret vertical line graphs<br>2. Draw and interpret time series graphs<br>3. Draw and plot straight line graphs |
| **Key Domains and Concepts taught in this Unit / Term** | C1 Mathematical operations<br>C2 Directed number<br>C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>D2 Algebra | C3 FDPR<br>C4 place value<br>D1 Number<br>D4 Ratio proportion and rates of change | C8 Graphs and sequences<br>C15 Data Handling (including averages, charts and graphs)<br>D3 Statistics |
| **KS4 End Points taught in this Unit / Term** | EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge<br>EP3 Reason, interpret and communicate mathematically<br>EP4 Can apply mathematical knowledge fluently across and between domains | EP1 Have a deep understanding of maths and how it relates to the real world<br>EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge | EP1 Have a deep understanding of maths and how it relates to the real world<br>EP3 Reason, interpret and communicate mathematically<br>EP4 Can apply mathematical knowledge fluently across and between domains |
| **Declarative Knowledge** | Know what the word solve means<br>Solve 1 step and 2 step equations | Find a percentage of an amount | Draw accurate x and y axis grid with a correct scale |

| (Students should know) | Solve including brackets and fractions | Find a percentage decrease and increase of an amount | Plot coordinates in all 4 quadrants |
|---|---|---|---|
| **Procedural Knowledge (Students should be able to do)** | Solve equations with an unknown on both sides<br>Solve equations with an unknown on both sides including brackets and fractions | Find compound interest over x years<br>Work out a percentage increase and decrease over x many years | Plot coordinates on a grid and join to make a time series and vertical line graph<br>Interpret vertical line graphs and time series<br>Identify the difference between the graphs<br>Plot straight lines on a graph |
| **Developing T3 Literacy and Numeracy** | **Solve**: Finding the numerical value(s) that make the equation true<br>**Inverse operation:** The opposite/reverse mathematical operation that undoes the effect of the operation | **Percentage**: An amount per hundred<br>**Multiplier**: A decimal used to calculate a percentage of amount or a percentage change, in one calculation<br>**Compound interest:** Interest calculated on both the initial amount, and any previous interest, so the amount changes each period | **Axis:** A reference line on a graph (Graphs have a horizontal axis (x-axis) and a vertical axis (y-axis)<br>**Gradient:** How steep a graph is<br>**Frequency:** The number of times a particular number or item appears in a set of data<br>**Trend:** A pattern/change over time in a set of data or graph |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |
| **Links to Prior Learning** | Year 7- collecting terms/function machines<br>Year 8 – expanding brackets/substitution/ solving and forming equations<br>Year 9 – double brackets/solving quadratics | Year 7 – decimal, fraction, percentage converting / basic ratio intro / fractions<br>Year 8 – ratio sharing / percentages / reverse percentages / percentage change | Year 7 – bar charts and plotting axis<br>Year 8 – scatter graphs / plotting line graphs |

| Next steps in learning | Solving with inequalities<br>Simultaneous equations<br>Higher - Algebraic fractions | Percentage including simple interest / recap on all percentages | Frequency polygons / histograms<br>SDT graphs / velocity time graphs |
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| Common Barriers to learning in this unit | Not using the inverse operation | Not converting percentage to a decimal correct<br>Not adding or subtracting onto the amount | Coordinate plotting the wrong way<br>Drawing the wrong chart |

**SOUTH DOWNS**
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| Units / Term | Unit 7: Angles in Polygons | Unit 8: Pythagoras | Unit 9: Rounding and Estimating and writing bounds |
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| **Overview** | Students will build on knowledge of 2D shapes and apply the knowledge to investigate interior and exterior angles of polygons. | Students will be introduced to Pythagoras' theorem. Students will use the rule to find missing sides of right angle triangles. | Students will recall prior knowledge of rounding to decimal places and significant figures. This will then be developed by using bounds. |
| **Learning journey** | 1. Angle facts with shapes and straight lines<br>2. Use interior angles<br>3. Use exterior angles | 1. Labelling sides<br>2. Finding side c<br>3. Finding side a or b<br>4. Using Pythagoras in complex questions | 1. Rounding to nearest 10,100,1000<br>2. Rounding to 1dp<br>3. Rounding to 2dp<br>4. Rounding to significant figures<br>5. Using error intervals |
| **Key Domains and Concepts taught in this Unit / Term** | C12 Angles (inc parallel lines and using angles)<br>C14 properties of shapes<br>D3 Statistics<br>D5 Geometry and Measure | C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>D2 Algebra<br>D3 Statistics<br>D5 Geometry and Measure | C1 Mathematical operations<br>C10 Measures (perimeter, area, volume etc)<br>D1 Number<br>D5 Geometry and Measure |
| **KS4 End Points taught in this Unit / Term** | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** |

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| **Declarative Knowledge (Students should know)** | Know polygons and their properties<br>Know facts about the angles in shapes | Recognise a right angle triangle and its properties<br>Know how to substitute into a formula<br>Able to add and subtract and use inverse operations<br>Know square and square root numbers | Know how to round to the nearest integer<br>now how to round to 1 or 2 decimal places<br>Know how to round to 1 or 2 significant figures |
| **Procedural Knowledge (Students should be able to do)** | Find an exterior angle on any regular polygon<br>Reason and interpret interior angles in polygons<br>Solve complex questions with some information about angles in polygons | Find all missing sides of a right angled triangle using Pythagoras<br>Use Pythagoras in real life scenarios | Estimate answers by rounding to 1 significant figure<br>Write bounds – understand place value and lower and upper bounds |
| **Developing T3 Literacy and Numeracy** | **Polygon:** A closed 2D shape, made up of straight edges<br>**Regular:** A polygon with all sides and angles equal<br>**Interior:** Angles inside a polygon<br>**Exterior:** The angle formed outside a polygon when one side is extended | **Right angle:** An angle of 90º (one of the angles in a triangle, in this module)<br>**Square root:** The inverse operation to squaring a number (finding a number that multiplies by itself to give the given answer)<br>**Hypotenuse:** The longest side in a right-angled triangle<br>**Pythagoras Theorem:** A theorem that says the area of the square on the hypotenuse of a right-angled triangle is equal to the sum of the area of the squares of the remaining sides. | **Bounds:** The greatest (Upper Bound) or smallest (Lower Bound) value that a rounded answer could have been equal to<br>**Significant:** The digits that give most meaning to a number<br>**Error intervals:** An inequality that gives the entire range that a rounded value could have been equal to<br>**Truncated:** Cutting a value off after a certain number of digits, without any consideration to rounding |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |

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| **Links to Prior Learning** | Year 7/8 - angles – drawing and measuring them / properties about polygons / angle facts/ angles in triangles | Year 7/8 - properties of triangles / substitution / algebraic equations / solving an equation | Year 7 – estimating and rounding to decimal places and significant figures |
| **Next steps in learning** | Link with tessellation<br>Complex questions including polygons | 3D pythagoras<br>Trigonometry | Calculating with bounds |
| **Common Barriers to learning in this unit** | Learning a method and not understanding the maths so make mistakes<br>Mix interior and exterior angles<br>Calculating exterior angles as the angle around the total outside of a polygon, rather than on a straight line | Do not label the hypotenuse correctly<br>Forget to square root the answer<br>Forget whether they should add or subtract the squares | Lower bound – whether it ends in 5 or 9 recurring<br>Do not round to 1 sf<br>Write inequalities incorrectly (usually with the signs pointing in the wrong direction or with/without the equals line) |

SOUTH DOWNS
LEARNING TRUST

| Units / Term | Unit 10: Forming Equations | Unit 11: Fractional and negative indices | Unit 12: Sequences |
|---|---|---|---|
| Overview | Students will use prior knowledge of shapes, perimeter, area and angle facts to form equations. Students will develop their problem solving skills by forming an equation from a wordy scenario. | In this unit students will recall index laws and develop this by using fractional and negative indices. | Students will continue to practise finding the nth term and use it to find various terms in the sequence and connect the sequence with linear graphs and gradients. |
| Learning journey | 1. Solving equations with an unknown on both sides<br>2. Forming equations from words<br>3. Forming and solving equations<br>4. Forming equations with shapes<br>5. Forming and solving equations with shapes | 1. Use powers and indices<br>2. Rules of indices with multiplying and dividing<br>3. Indices with brackets | 1. Term to term sequences<br>2. Generating sequences<br>3. Nth term<br>4. Finding terms |
| Key Domains and Concepts taught in this Unit / Term | C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>C10 Measures (perimeter, area, volume etc)<br>D2 Algebra<br>D3 Statistics | C2 Directed numbers<br>C4 place value<br>C12 Angles (inc parallel lines and using angles)<br>D1 Number<br>D2 Algebra | C1 Mathematical operations<br>C2 Directed number<br>C7 Equations<br>C8 Graphs and sequences<br>D1 Number<br>D2 Algebra |
| KS4 End Points taught in this Unit / Term | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** | **EP3 Reason, interpret and communicate mathematically** | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** |

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| **Declarative Knowledge (Students should know)** | Know how to solve 1 and 2 step equations<br>Know how to expand brackets<br>Know how to find perimeter and area of shapes and angle facts | Know index laws and understand powers<br>Can evaluate indices with positive integers | Find the nth term of a linear sequence<br>Connect the gradient to the number before n<br>Find the 50th term of a sequence |
| **Procedural Knowledge (Students should be able to do)** | Read wordy problems and form an equation from it<br>Solve complex problems including area and perimeter and angle facts | Evaluate fractional indices<br>Evaluate negative indices<br>Calculate with both | Identify different types of special sequences<br>Use the nth term to identify if numbers are in a sequence<br>Consolidate learning on finding the nth term |
| **Developing T3 Literacy and Numeracy** | **Solve:** Finding the numerical value(s) that make an equation true<br>**Form:** Generating an equation from a worded or picture question, to solve to find the unknown<br>**Expand:** Multiplying out brackets in to individual terms<br>**Inverse:** The opposite/reverse mathematical operation that undoes the effect of the operation. | **Index/indices:** A small number placed in the upper-right of a base number which shows how many copies of the base number are multiplied together<br>**Root:** A number that, when multiplied by itself a number of times, produce the original number.<br>**Reciprocal:** The multiplicative inverse of a number (what we can multiply our number by to get the product of 1)<br>**Fractional Indices:** Fractions in the index position, that tell us to take a root of the number<br>**Negative Indices:** A negative number in the index position, that tells us to take the reciprocal of the number | **Term:** A particular number/item in a sequence<br>**Gradient:** The steepness of the graph, shown by the coefficient of x (or n in a sequence)<br>**Rule:** A written or algebraic description of a pattern |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |

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| **Links to Prior Learning** | Year 7- collecting terms/function machines<br>Year 8 – expanding brackets/substitution/ solving and forming equations<br>Year 9 – double brackets/solving quadratics | Year 7 – index laws<br>Year 8 – standard form and powers | Year 7 – nth term<br>Year 8 – plotting line graphs |
| **Next steps in learning** | Solving with inequalities<br>Simultaneous equations<br>Higher - Algebraic fractions | Negative fractional indices<br>Fractional indices with a number in numerator and denominator | Quadratic sequences<br>Fibonacci / geometric sequences |
| **Common Barriers to learning in this unit** | Not forming an equation including an 'equals' sign<br>Not using correct algebra to form an equation<br>Not understanding whether they should be adding or multiplying in their equation | Mix up the negative and fractional methods<br>Do not evaluate the answer<br>Forget the meaning of a reciprocal | Not understand that 3n is 3 x n .<br>Rearrange formula incorrectly,<br>Put "n+5" instead of "5n" in nth term |

| Units / Term | Unit 13: Trigonometry | Unit 14: Data Handing – Quartiles and Box Plots | Unit 15: Surface Area |
|---|---|---|---|
| **Overview** | Students will be introduced to the theory of trigonometry. They will understand how to use sine, cosine and tan to find missing angles and sides in right angle triangles. | This unit develops the knowledge of averages, and connects to quartiles and the median in a cumulative frequency graph and box plots. | Students build on knowledge of 2D and 3D shapes and area of shapes by investigating surface area of 3D shapes and calculating the surface area. |
| **Learning journey** | 1. Label sides of a triangle correctly<br>2. Identify trig ratios<br>3. Find missing sides using SOHCAHTOA<br>4. Find missing angles using SOHCAHTOA | 1. Using the mean median, mode and range<br>2. Using quartiles<br>3. Finding the IQR<br>4. Using grouped frequency<br>5. Estimated mean<br><br>(Higher)<br>1. Box plots and outliers<br>2. Cumulative frequency<br>3. Skewness<br>4. Capture and recapture<br>1. Sampling | 2. Surface area of cuboids<br>3. Surface area of prisms<br>4. Surface area of cylinders<br>5. Surface area of 3D solids |
| **Key Domains and Concepts taught in this Unit / Term** | C1 Mathematical operations<br>C7 Equations<br>C12 Angles (inc parallel lines and using angles)<br>D2 Algebra | C8 Graphs and sequences<br>C15 Data Handling (including averages, charts and graphs)<br>D3 Statistics | C10 Measures (perimeter, area, volume etc)<br>C14 properties of shapes<br>D1 Number<br>D5 Geometry and Measure |

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| KS4 End Points taught in this Unit / Term | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically**<br>**EP4 Can apply mathematical knowledge fluently across and between domains** | **EP1 Have a deep understanding of maths and how it relates to the real world**<br>**EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically** |
|---|---|---|---|
| **Declarative Knowledge (Students should know)** | Find all missing sides of a right angled triangle using Pythagoras<br>use Pythagoras in real life scenarios | Know mean, median, mode, range of data<br>Understand how to cumulative data<br>Draw a cumulative frequency graph | Know area of 2D shapes<br>Know how to find the volume of 3D shapes<br>Know properties of shapes |
| **Procedural Knowledge (Students should be able to do)** | Identify the need to use trigonometry not Pythagoras<br>Label a right angled triangle correctly<br>Use SOCH CAH TOA to calculate a missing side or angle<br>Use trigonometry in real life scenarios | Read a cumulative frequency chart and find the median and LQ and UQ<br>Understand the interquartile range and quartiles<br>Draw and read a box plots | Understand a net of a 3D shape<br>Understand surface area is the packaging of a 3D shape<br>Find the surface area of cuboids/prisms and other 3D shapes |
| **Developing T3 Literacy and Numeracy** | **Right angle:** An angle of 90º (one of the angles in a triangle, in this module)<br>**Hypotenuse:** The longest side in a right-angled triangle<br>**Adjacent:** The side in a right-angled triangle between the right-angle and the included angle | **Median:** An average found by ordering the numbers and locating the central value<br>**Range:** A measure of spread, the difference between the highest and lowest value<br>**Quartile:** A value found by splitting data | **Area:** The amount of space inside a 2D shape, measured in square units<br>**Volume:** The capacity inside a 3D shape, measured in cubic units (eg $cm^3$)<br>**Surface Area:** The total area of all the surfaces of a 3D shape, measured in square units |

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| | **Opposite:** The side in a right-angled triangle across from the included angle<br>**Inverse:** The undoing of an operation<br>**Sine/ cosine/ tangent:** Trigonometric ratios, with given calculations to find them | in to four equal pieces (Lower Quartile – the median of the lower half of the values, Upper Quartile – the median of the upper half of the values)<br>**Interquartile:** The distance between the Upper Quartile and Lower Quartile<br>**Frequency:** The number of times a particular number or item appears in a set of data<br>**Cumulative:** A running total of the frequencies | **Cuboid/cube:** A 3D shape made up of 6 squares/rectangles connected at right angles<br>**Prism:** A 3D shape with two identical, parallel polygon bases, and all other faces are rectangles<br>**Cylinder:** A 3D shape with two identical, parallel circular faces, and a curved surface between them.<br>**Pyramid:** A 3D shape with a polygon base (usually a square, rectangle or triangle), and triangular faces that taper to a point<br>**Sphere:** A perfectly round 3D shape<br>**Cone:** A 3D shape with a circular base, and a curved surface that tapers to a point |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |
| **Links to Prior Learning** | Year 7/8 property of triangles /substitution<br>Year 9 – Pythagoras /rearranging formula | Year 7 – Basic Averages<br>Year 8 – Averages including Estimated Mean , Drawing cumulative frequency graphs | Year 7 – circumference<br>Year 8 – area / volume of prisms |
| **Next steps in learning** | 3D trigonometry<br>Non right angle triangles | Comparing data using box plots | Volume and surface area of non prisms |
| **Common Barriers to** | Label the sides incorrectly<br>Divide/multiply incorrectly | Plot CF at midpoints<br>Join CF graph with a ruler, rather than a curve | Forget to halve the area of a triangle – do not half it |

| **learning in this unit** | Do not inverse the trigonometry to find an angle | Misunderstand how to find quartiles<br>Not an accurate scale on box plot | Forget the formula for the area of a trapezium<br>Cannot identify the parallel sides in a trapezium<br>Compound shapes – do not find missing sides correctly<br>Miss surfaces on compound surface areas |

SOUTH DOWNS
LEARNING TRUST

| Units / Term | Unit 16: Travel Graphs | Unit 17: Brackets and Quadratics | Unit 18: Simultaneous equations |
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| **Overview** | In this unit students will be introduced to travel graphs. They will use their knowledge of ratio and plotting graphs to read and draw conversion graphs. | Students will develop fluency in algebra in this topic. Recalling how to simplify terms and expand brackets. Students will build on this looking at double brackets and factorising quadratics. | Students will use their prior knowledge of substitution and solving equations to be able to solve simultaneous equations. |
| **Learning journey** | 1. Converting time<br>2. Reading distance time graphs<br>3. Drawing distance time graphs<br>4. Calculating speed<br>5. gradients | 1. Expanding single brackets<br>2. Expanding double brackets<br>3. Factorising single brackets<br>4. Factorising simple quadratics<br>5. Higher – factorise and solve quadratics | 1. Solving linear equations<br>2. Solve simultaneous equations by subtracting<br>3. Solving simultaneous equations by adding<br>4. Solving simultaneous equations by multiplying one<br>5. Solving simultaneous equations by multiplying both |
| **Key Domains and Concepts taught in this Unit / Term** | C7 Equations<br>C8 Graphs and sequences<br>C15 Data Handling (including averages, charts and graphs)<br>D3 Statistics<br>D4 Ratio proportion and rates of change<br>D5 Geometry and Measure | C1 Mathematical operations<br>C2 Directed number<br>C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>C10 Measures (perimeter, area, volume etc)<br>D2 Algebra | C1 Mathematical operations<br>C2 Directed number<br>C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>C8 Graphs and sequences<br>D2 Algebra<br>D3 Statistics |

| KS4 End Points taught in this Unit / Term | EP1 Have a deep understanding of maths and how it relates to the real world<br>EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge<br>EP3 Reason, interpret and communicate mathematically | EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge<br>EP3 Reason, interpret and communicate mathematically | EP1 Have a deep understanding of maths and how it relates to the real world<br>EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge<br>EP3 Reason, interpret and communicate mathematically<br>EP4 Can apply mathematical knowledge fluently across and between domains |
|---|---|---|---|
| Declarative Knowledge (Students should know) | Know how to find speed/distance/time from a formula<br>Know how to rearrange the formula to find another part<br>Know how to plot a straight line graph on a grid | Know how to expand single brackets and factorise back into single brackets<br>Know how to collect terms<br>Know factors | Substitute into a formula<br>Rearranging formula and solve an equation<br>Know how to collect terms |
| Procedural Knowledge (Students should be able to do) | Be able to read a story from a distance – time graph. Understand when someone has stopped/gone faster/slower<br>Use the gradient to find the speed<br>Plot SDT graphs and velocity – time graphs | Expand double brackets including negative numbers and coefficients greater than 1.<br>Factorise quadratically including negative numbers and coefficients greater than 1. | Understand the concept of two scenarios in real life<br>Solving simultaneous equations with the same coefficient<br>Solving simultaneous equations with different coefficients |
| Developing T3 Literacy and Numeracy | **Speed:** How fast something is going (the rate at which an object moves with relation to time)<br>**Distance:** The length between two points, places or objects | **Quadratic:** An algebraic expression where the highest power is a square<br>**Expand:** Multiplying out bracket(s) to give an algebraic expression | **Substitute:** The method used to find missing coordinates from an equation<br>**Coefficient:** The number multiplying a variable (e.g. the coefficient of x in 5x is 5) |

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| | **Velocity:** Speed in a certain direction (synonym for "Speed" up to GCSE level)<br>**Gradient:** The steepness/slope of a line | **Factorise:** Putting an algebraic expression back in to brackets, by taking out common factors | **Equation:** A mathematical statement containing an equals sign<br>**Simultaneous:** Two (or more) equations, both containing two (or more) variables), that need to be solved at the same time (simultaneously) |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |
| **Links to Prior Learning** | Year 8 – SDT /substitution / rearranging formula / plotting straight line graphs | Year 7- collecting terms/function machines<br>Year 8 – expanding brackets/substitution/ solving and forming equations<br>Year 9 – double brackets/solving quadratics | Year 7- collecting terms/function machines<br>Year 8 – expanding brackets/substitution/ solving and forming equations<br>Year 9 – double brackets/solving quadratics |
| **Next steps in learning** | SDT / density and pressure<br>Velocity time graphs<br>Distance under a curve | Solving with inequalities<br>Simultaneous equations<br>Higher - Algebraic fractions/quadratic formula/completing the square | Solving with inequalities<br>Simultaneous equations with quadratics<br>Higher - Algebraic fractions |
| **Common Barriers to learning in this unit** | Horizontal line means they have stopped<br>A line going up means they are going up a hill | Not multiplying all 4 parts out of the bracket mx | Forget to solve for both missing variables<br>Issues with negative numbers<br>Lack understanding as to why they need to make the coefficients match<br>Forget whether they should add or subtract their equations once the coefficients match |

| Units / Term | Unit 19: Data Handling | Unit 20: Quadratic graph plotting | Unit 21: Basic surds (Higher) Properties of number (Foundation) |
|---|---|---|---|
| **Overview** | In this topic students will practice and consolidate data handling topics. Higher students will connect the data with statistics modules. | Students will recall prior knowledge of plotting linear graphs and understanding the equation of a line. They will be introduced to quadratic graphs and will be able to plot them. | For students working towards the foundation GCSE it is a recall unit looking back over types of number, practising ordering numbers, converting numbers and being able to use a calculator. For students working towards the higher GCSE they will be introduced into basic surd calculations. |
| **Learning journey** | 1.Tally charts/collect data<br>2. two way tables link to prob<br>3. questionnaires<br>4. pictograms / bar charts<br>5. stem and leaf link to box plots / freq polygons<br>6. Pie charts | 1. Know horizontal and vertical lines<br>2. Plot straight lines graphs<br>3. Substitute values for a quadratic graph<br>4. Draw a quadratic graph<br>5. Interpret quadratic graphs<br>6. Look at turning points and roots | 1. Understand and simplify surds<br>2. Multiplying and dividing surds<br>3. Adding and subtracting surds |
| **Key Domains and Concepts taught in this Unit / Term** | C8 Graphs and sequences<br>C15 Data Handling (including averages, charts and graphs)<br>D6 Statistics | C1 Mathematical operations<br>C2 Directed number<br>C6 Algebraic manipulation (simplify /expanding/ changing the subject etc)<br>C7 Equations<br>C8 Graphs and sequences<br>D2 Algebra | C1 Mathematical operations<br>C2 Directed number<br>C4 place value<br>C5 types of numbers<br>C7 Equations<br>D1 Number<br>D2 Algebra |
| **KS4 End Points taught in this Unit / Term** | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge**<br>**EP3 Reason, interpret and communicate mathematically** | **EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge** | **EP3 Reason, interpret and communicate mathematically** |

| | | EP3 Reason, interpret and communicate mathematically<br>EP4 Can apply mathematical knowledge fluently across and between domains | |
|---|---|---|---|
| **Declarative Knowledge (Students should know)** | Know how to draw a bar chart and a pictogram<br>Be able to use two way tables<br>Interpret a pie chart | Know how to plot a linear graph<br>Know the equation y = mx+ c<br>Find coordinates on a graph | Know square numbers and square roots of numbers<br>Know factors and product of prime factors |
| **Procedural Knowledge (Students should be able to do)** | Use a stem and leaf diagram<br>Draw pie charts<br>Draw and interpret a frequency polygon | Substitute values into a quadratic equation and plot a quadratic graph.<br>Identify a quadratic graph. See the pattern and how the x2 effects the coordinates and negative numbers<br>Read a quadratic graph and its formula | Simplify surds<br>Be able to multiply and divide surds<br>Be able to calculate with surds<br><br>Find the HCF/LCM of numbers<br>Identify different types of numbers |
| **Developing T3 Literacy and Numeracy** | **Frequency** – number of people | **Quadratic:** An algebraic expression where the highest power is a square<br>**Gradient:** The steepness/slope of a line | **Surd:** Another name for an irrational number that cannot be written as a fraction – up to GCSE Maths, these are usually square roots, occasionally cube roots<br>**Simplify:** To collect common surds together to make the expression easier<br><br>**Factors:** A whole number that divides exactly into another number<br>**Multiples:** The numbers in a given numbers' times table<br>**Common:** A factor or multiple of more than one number (e.g. 2 is a common |

| | | | factor of 8 and 10, as it is a factor of both 8 and 10) |
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| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |
| **Links to Prior Learning** | Year 7– averages, bar charts, pictograms<br>Year 8 – scatter graphs, pie charts | Year 7/8 - straight line graph plotting / gradient / solving equations / substitution | Year 7/8 – place value / using a calculator / index laws / square numbers/ factors |
| **Next steps in learning** | Yr 10 practice all data handling and be able to interpret it.<br>Histograms for higher students | Higher – transformation of graphs / f (x) functions /trig graphs<br>Foundation – recap on plotting all graphs | Rationalising the denominator<br>Recap on surds in year 11<br>Year 10 – HCF/LCM factors and multiples |
| **Common Barriers to learning in this unit** | When more than one number recurs and identifying what to multiply x by | Can not use Substitution.<br>When squaring negative numbers forget it makes it positive.<br>Joining the curve up with a ruler | Struggle with the concept of algebra.<br>Do not know square numbers so simplify to the wrong numbers |

SOUTH DOWNS
LEARNING TRUST

| Units / Term | Unit 22: Recurring decimals (Higher) FDP (Foundation) Yr11 |
|---|---|
| Overview | In this topic students will investigate converting fractions into decimals and discover which ones terminate or are recurring. Higher ability students will use algebra to convert recurring decimals into fractions. |
| Learning journey | 1. Convert terminating decimals into fractions<br>2. Fractions into decimals using the bus stop division<br>3. Ordering fractions and decimals |
| Key Domains and Concepts taught in this Unit / Term | C1 Mathematical operations<br>C3 FDPR<br>C7 Equations<br>D1 Number<br>D2 Algebra |
| KS4 End Points taught in this Unit / Term | EP2 Solve Problems and form reasonable and logical conclusions based on rigorous mathematical knowledge<br>EP3 Reason, interpret and communicate mathematically |
| Declarative Knowledge (Students should know) | Know place value and can identify a decimal<br>Know numbers can recur<br>Convert fractions, decimals and percentages together |

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| | Can use their calculator |
| **Procedural Knowledge (Students should be able to do)** | Find and identify recurring numbers and terminating numbers<br>Use algebra to convert a recurring decimal to a fraction<br>Practise converting fractions decimals and percentages |
| **Developing T3 Literacy and Numeracy** | **Terminating:** A decimal with a finite number of digits i.e. one that ends<br>**Recurring:** A decimal in which a pattern of one or more digits is repeated indefinitely |
| **Assessment (Summative and Formative)** | Formative – exit ticket in topic and feedforward with a tick time task<br>Summative – end of term assessment |
| **Links to Prior Learning** | Year 7/8 – place value and decimals / subtraction<br>Percentage / fraction / decimal conversion |
| **Next steps in learning** | Recap on recurring decimals in yr 11 |
| **Common Barriers to learning in this unit** | When more than one number recurs and identifying what to multiply x by |