New Line Learning Academy
Believe and Achieve

| Mathematics Intent | Year 10 |
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We believe that all of our pupils can be mathematicians, who enjoy and excel in mathematics at all levels. All The Mathematics Department will provide pupils with exciting, relevant, and challenging Mathematics, delivered by dedicated staff. Pupils will understand the underlying principles of the mathematics they learn, making links and developing reasoning skills and logical thinking. They will progress towards being independent mathematicians who can identify and correct misconceptions for themselves. Pupils will develop their confidence to tackle a range of problems.

To achieve this, staff will design and develop simple and effective systems and interesting and effective teaching ideas and resources to enable classroom delivery and promote mathematics across the school.

At New Line Learning Academy, we teach the National Curriculum for mathematics, which aims to ensure that all pupils:
- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and can recall and apply their knowledge rapidly and accurately to problems.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

**Term 1**
Topic

**Representing Mathematical Relationships and Change**

**Big Picture**
What are the main ideas and big questions in this topic?

Students develop their understanding of graphs, transformations and algebra by representing mathematical relationships in a variety of ways and applying these skills to solve increasingly complex problems.

Foundation students develop confidence in plotting and interpreting linear graphs, including finding gradients and equations of straight lines, before interpreting distance-time graphs and other real-life graphs. They also recognise and apply transformations, including translations, enlargements, reflections and rotations.

Higher students build upon these transformation skills by investigating negative enlargements, geometric constructions and loci. They also develop increasingly sophisticated algebraic techniques by solving quadratic equations, simultaneous equations, inequalities and rearranging formulae, providing the foundation for more advanced algebraic problem solving throughout GCSE Mathematics.

**Zoom In**
What knowledge, skills and key vocabulary will we learn step by step?

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Foundation students begin by investigating linear graphs, plotting straight-line graphs, recognising equations of linear graphs and finding the equation of a line passing through a given point. They then interpret distance-time graphs and other real-life graphs, using graphical information to solve mathematical problems.
Students then develop their understanding of transformations by recognising transformations before applying translations, enlargements, reflections and rotations to shapes on coordinate grids.

Higher students build upon this understanding by investigating negative enlargements, alongside geometric constructions including constructing triangles, bisectors and loci using a pair of compasses. Students also develop their understanding of algebra by solving quadratic equations through factorising, completing the square and using the quadratic formula, solving linear simultaneous equations and simultaneous equations involving a quadratic, before rearranging formulae to make different variables the subject.

Students develop substantive knowledge by understanding the relationship between equations and graphs, recognising the properties of geometric transformations, understanding how quadratic and simultaneous equations represent mathematical relationships, and knowing how algebra can be used to solve increasingly complex problems. Alongside this, students strengthen their disciplinary knowledge by plotting and interpreting graphs accurately, applying transformations precisely, selecting appropriate algebraic techniques, solving equations logically, reasoning mathematically and communicating solutions using accurate mathematical vocabulary.

Key vocabulary is introduced and revisited throughout the topic, including gradient, equation, linear graph, distance-time graph, transformation, translation, reflection, rotation, enlargement, negative enlargement, scale factor, quadratic equation, simultaneous equation, inequality, factorise, quadratic formula, complete the square, rearrange, variable and formula.

| **Pre-Requisite Knowledge**<br>What have we already learned that will help us with this topic? | **Pitch Up**<br>How will we challenge ourselves? |
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| Students build upon their understanding of transformations, graphs and algebra developed throughout Key Stage 3. Previous learning involving perpendicular lines, reflections, rotations, scale factors, plotting straight-line graphs, factorising expressions, solving equations, simplifying surds and expanding brackets provides the foundation for this topic. | Students extend their reasoning by interpreting graphs in increasingly challenging contexts, matching equations to graphs and working backwards from graphical information to determine equations.<br>Students investigate sequences of transformations, describe transformations algebraically and justify whether statements about transformations are correct using mathematical reasoning.<br>Higher students develop greater fluency by solving equations involving brackets, fractions and unknowns on both sides, solving compound inequalities and representing solutions on number lines. They also investigate quadratic equations, simultaneous equations and algebraic proof through increasingly challenging problem-solving activities. |
| **Wider Framework**<br>How does this learning connect to future topics and bigger goals? | **Curriculum Hinterland**<br>What wider knowledge will deepen our understanding of this topic? |

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| This topic provides the foundation for future learning involving geometrical proof, coordinate geometry, functions, advanced algebra and more complex algebraic equations. Students continue to develop the graphical, geometric and algebraic reasoning required throughout GCSE Mathematics. | Graphs, transformations and algebra are fundamental ideas within mathematics and are used to represent movement, describe relationships and solve problems. These concepts underpin many developments in engineering, architecture, computing and scientific research, demonstrating how mathematics can be used to model and understand the world around us. |

## Authentic connections

How does this topic connect to real life, careers, other subjects and important values?

Graphs, transformations and algebra are fundamental to many areas of modern life, from designing computer games and engineering structures to modelling climate change and developing intelligent technologies. Understanding mathematical relationships enables students to interpret evidence, solve practical problems and appreciate how mathematics supports innovation across a wide range of industries. SMSC is developed through resilience, logical reasoning and critical thinking as students justify mathematical conclusions, evaluate alternative methods and recognise that complex problems often have multiple valid solution strategies.

Cross-curricular links include Science through motion graphs and formulae, Computing through algorithms, programming and computer graphics, Design Technology through CAD modelling and technical drawing, and Physics through modelling forces, motion and energy.

Students explore careers including:

- Computer Vision Engineer – applying transformations, coordinate geometry and algebra to enable computers to interpret images and movement.
- Transport Systems Engineer – using graphs and mathematical models to design efficient transport networks and analyse traffic flow.
- Operations Research Analyst – applying equations, inequalities and optimisation techniques to improve decision making in business and industry.

The topic supports the Skills Builder Universal Framework, particularly:

- Leadership through evaluating different mathematical approaches and justifying solutions.
- Problem Solving through applying graphical, geometric and algebraic reasoning in unfamiliar contexts.
- Creativity through modelling mathematical relationships and representing problems in different ways.

## Resources

What books, websites, videos and materials will support our learning?

- Tutorial videos for all topics and interactive questions available at www.sparxmath.com
  All students are provided with an account and set weekly homework by their teacher as well as being a tool on which to complete independent study as needed to close gaps from assessments

## Assessment

How will we show what we know, remember and can apply?

Assessment takes place throughout the unit through questioning, class discussion, independent practice, retrieval activities and problem-solving tasks. Students demonstrate their understanding by recalling and applying key mathematical knowledge, selecting appropriate methods, explaining their reasoning and solving increasingly complex mathematical problems.
At the end of each unit, students complete an assessment that measures the progress made throughout the teaching sequence. Assessments include a mixture of substantive knowledge

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| ○ Tutorial videos and practice exam questions available at www.mathsgenie.co.uk<br>○ Tutorial videos, practice questions and practice exam questions available at www.corbettmaths.com<br>○ BBC Bitesize | and disciplinary knowledge, allowing students to demonstrate both their mathematical understanding and their ability to apply this knowledge to unfamiliar problems.<br>Following each assessment, students complete targeted improvement activities to address misconceptions and close identified gaps in learning. Assessment materials are based on GCSE examination-style questions, helping students become familiar with the structure, language and mark schemes used in public examinations. |

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| **Term 2**<br>Topic | **Ratio, Trigonometry and Probability** |

**Big Picture**
What are the main ideas and big questions in this topic?

Students develop their understanding of ratio, proportion, trigonometry and probability by applying mathematical methods to solve increasingly complex mathematical and real-life problems.

Foundation students develop confidence in writing and simplifying ratios, sharing quantities into a ratio and solving proportion problems before applying these skills to compare value for money and solve problems involving recipes. They also apply Pythagoras' Theorem and trigonometry to calculate missing lengths and angles in right-angled triangles. Higher students develop their understanding of probability, calculating probabilities using a range of representations including two-way tables, sample space diagrams, Venn diagrams and probability tree diagrams.

**Zoom In**
What knowledge, skills and key vocabulary will we learn step by step?

**Foundation students** begin by developing their understanding of ratio and proportion by writing values as ratios, simplifying ratios, sharing quantities into a given ratio and finding totals or missing values from ratio problems. They then apply proportional reasoning to solve practical problems, including comparing products to determine best value for money and adapting recipes using proportion. Students build upon this understanding by applying Pythagoras' Theorem to calculate missing lengths in right-angled triangles before using SOH CAH TOA to calculate missing lengths and angles. They combine Pythagoras' Theorem and trigonometry to solve multi-step problems, use sine, cosine and tangent on a calculator and apply exact trigonometric values without a calculator.

**Higher students** investigate probability, calculating the probability of events, interpreting two-way tables, completing sample space diagrams, reading and drawing Venn diagrams, and constructing probability tree diagrams to calculate the probability of two events, including conditional and unconditional probability. Students develop substantive knowledge by understanding proportional relationships, recognising how ratio can be applied to practical situations, understanding how Pythagoras' Theorem and trigonometry describe relationships within right-angled triangles, and understanding probability as a measure of likelihood. Alongside this, students strengthen their disciplinary knowledge by selecting appropriate mathematical methods, applying proportional reasoning, solving multi-step problems, interpreting probability models, reasoning mathematically and communicating solutions using accurate mathematical vocabulary.

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Key vocabulary is introduced and revisited throughout the topic, including ratio, proportion, simplify, scale factor, best value, recipe, Pythagoras' Theorem, hypotenuse, trigonometry, sine, cosine, tangent, SOH CAH TOA, exact values, probability, event, outcome, sample space, two-way table, Venn diagram, probability tree, conditional probability and likelihood.

**Pre-Requisite Knowledge**
What have we already learned that will help us with this topic?

Students build upon their understanding of metric conversions, highest common factors, ratio notation, rounding, fractions and systematic listing strategies developed throughout Key Stage 3. Previous learning involving Pythagoras' Theorem, trigonometry and probability provides the foundation for this topic.

**Pitch Up**
How will we challenge ourselves?

Students extend their reasoning by exploring direct and inverse proportion, interpreting proportional relationships algebraically and solving increasingly complex ratio problems. Students investigate probability through combined events, conditional probability, sample space diagrams, two-way tables, Venn diagrams and tree diagrams, before applying probability using fractions, decimals and percentages interchangeably. Students are encouraged to explain their reasoning through "spot the mistake" and "show that" activities, creating their own mathematical problems and justifying their solutions.

**Wider Framework**
How does this learning connect to future topics and bigger goals?

This topic provides the foundation for future learning involving multi-step problems with fractions, decimals, percentages and ratios, whilst strengthening the proportional reasoning and problem-solving skills required throughout GCSE Mathematics.

**Curriculum Hinterland**
What wider knowledge will deepen our understanding of this topic?

Ratio, trigonometry and probability are fundamental mathematical ideas used to compare quantities, calculate unknown measurements and predict the likelihood of events. These concepts underpin developments in engineering, science, finance, navigation and technology, demonstrating how mathematics supports decision making in everyday life and across a wide range of professions.

**Authentic connections**
How does this topic connect to real life, careers, other subjects and important values?

Ratio, trigonometry and probability are used across many aspects of modern life, from designing buildings and analysing medical data to predicting weather patterns and assessing financial risk. Understanding these mathematical ideas enables students to compare information, interpret uncertainty and make informed decisions using evidence. SMSC is developed through logical reasoning, resilience and responsible decision making as students evaluate evidence, justify mathematical conclusions and appreciate how probability influences many real-life situations.

Cross-curricular links include Science through genetics, forces and measurement, Geography through mapping, surveying and environmental modelling, Business Studies through financial comparisons and investment decisions, and Food Technology through scaling recipes and nutritional analysis.

Students explore careers including:

- Hydrographic Surveyor – applying trigonometry and proportional reasoning to map coastlines and seabeds.
- Risk Analyst – using probability and mathematical modelling to assess uncertainty and support business decisions.

- Renewable Energy Engineer – applying trigonometry, ratio and geometry when designing wind turbines and solar installations.

The topic supports the Skills Builder Universal Framework, particularly:

- Listening through evaluating mathematical arguments and interpreting evidence.
- Planning through selecting efficient strategies for multi-step proportional and probability problems.
- Problem Solving through applying ratio, trigonometry and probability in unfamiliar mathematical and real-world contexts.

| **Resources**<br>What books, websites, videos and materials will support our learning? | **Assessment**<br>How will we show what we know, remember and can apply? |
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| ○ Tutorial videos for all topics and interactive questions available at www.sparxmath.com<br>All students are provided with an account and set weekly homework by their teacher as well as being a tool on which to complete independent study as needed to close gaps from assessments<br>○ Tutorial videos and practice exam questions available at www.mathsgenie.co.uk<br>○ Tutorial videos, practice questions and practice exam questions available at www.corbettmaths.com<br>○ BBC Bitesize | Assessment takes place throughout the unit through questioning, class discussion, independent practice, retrieval activities and problem-solving tasks. Students demonstrate their understanding by recalling and applying key mathematical knowledge, selecting appropriate methods, explaining their reasoning and solving increasingly complex mathematical problems.<br>At the end of each unit, students complete an assessment that measures the progress made throughout the teaching sequence. Assessments include a mixture of substantive knowledge and disciplinary knowledge, allowing students to demonstrate both their mathematical understanding and their ability to apply this knowledge to unfamiliar problems.<br>Following each assessment, students complete targeted improvement activities to address misconceptions and close identified gaps in learning. Assessment materials are based on GCSE examination-style questions, helping students become familiar with the structure, language and mark schemes used in public examinations. |

## Term 3
Topic

## Probability, Proportion and Similarity

**Big Picture**
What are the main ideas and big questions in this topic?

Students develop their understanding of probability, percentage change, compound measures and similarity by applying mathematical methods to solve increasingly complex mathematical and real-life problems.

Foundation students calculate and interpret probabilities using two-way tables, sample space diagrams, Venn diagrams and probability tree diagrams before applying percentage change, repeated percentage change and compound measures involving speed, distance, time, mass, density and volume.

Higher students build upon these ideas by investigating growth and decay, direct and inverse proportion, compound measures, ratios and similar shapes, applying proportional reasoning to solve increasingly challenging problems.

## Zoom In
What knowledge, skills and key vocabulary will we learn step by step?

Foundation students begin by developing their understanding of probability, calculating the probability of events, interpreting two-way tables, completing sample space diagrams, and reading and drawing Venn diagrams and probability tree diagrams to calculate the probability of two events. Students then investigate percentage change, calculating percentage increases and decreases, determining the percentage change between values, finding original amounts following percentage change and applying repeated percentage change, including compound interest. They continue by applying compound measures, using the relationships between speed, distance and time, and mass, density and volume to solve practical mathematical problems.

Higher students build upon these skills by solving problems involving repeated percentage change, growth and decay, direct and inverse proportion, compound measures and ratios. Students then investigate congruency and similarity, finding missing lengths in similar shapes and solving problems involving length, area and volume.

Students develop substantive knowledge by understanding probability as a measure of likelihood, recognising percentage change as a multiplicative process, understanding compound measures, recognising proportional relationships and understanding how similarity affects length, area and volume. Alongside this, students strengthen their disciplinary knowledge by selecting appropriate mathematical methods, applying proportional reasoning, interpreting probability models, solving multi-step problems involving compound measures and similarity, reasoning mathematically and communicating solutions using accurate mathematical vocabulary.

Key vocabulary is introduced and revisited throughout the topic, including probability, event, outcome, sample space, Venn diagram, probability tree, percentage change, repeated percentage change, compound interest, growth, decay, ratio, direct proportion, inverse proportion, speed, distance, time, density, mass, volume, congruent, similar, scale factor, length, area and volume.

## Pre-Requisite Knowledge
What have we already learned that will help us with this topic?

Students build upon their understanding of metric conversions, ratio notation, fractions, percentages, compound measures and probability developed throughout Key Stage 3 and earlier GCSE study. Previous learning involving systematic listing strategies, highest common factors and proportional reasoning provides the foundation for this topic.

## Pitch Up
How will we challenge ourselves?

Students extend their reasoning by solving increasingly challenging problems involving repeated percentage change, growth and decay, direct and inverse proportion, and similar shapes.
Students investigate proportional relationships, compare different mathematical methods and justify their reasoning through multi-step problem-solving activities. They are encouraged to explain their thinking, identify errors in mathematical arguments and apply their knowledge to unfamiliar contexts involving probability, proportion and similarity.

## Wider Framework
How does this learning connect to future topics and bigger goals?

This topic prepares students for more advanced probability problems and develops the understanding of similar shapes required for future work

## Curriculum Hinterland
What wider knowledge will deepen our understanding of this topic?

Probability, proportion and similarity are fundamental mathematical concepts used to model uncertainty, compare quantities and describe relationships between shapes. These ideas

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| involving trigonometry, circle theorems and geometric problem solving. Students continue to strengthen their proportional reasoning and mathematical problem-solving skills throughout GCSE Mathematics. | underpin many developments in science, engineering, finance and technology, where mathematical models are used to analyse data, predict outcomes and solve practical problems. |

## Authentic connections

How does this topic connect to real life, careers, other subjects and important values?

Probability, proportional reasoning and similarity are used across many aspects of modern life, from predicting weather patterns and analysing financial risk to designing buildings, creating scale models and interpreting scientific data. Understanding these mathematical ideas enables students to compare quantities, interpret uncertainty and solve practical problems using mathematical evidence. SMSC is developed through logical reasoning, resilience and responsible decision making as students justify mathematical conclusions, evaluate evidence and appreciate how probability and proportional reasoning support informed decisions in everyday life.

Cross-curricular links include Science through growth, decay, genetics and compound measures, Geography through scale, mapping and surveying, Business Studies through percentage change, financial modelling and investment, and Design Technology through scale drawings, product design and modelling.

Students explore careers including:

- Data Scientist – using probability and statistical models to identify patterns, predict trends and support decision making.
- Construction Manager – applying ratio, proportion and scale when estimating materials, costs and construction projects.
- Architect – using similarity, scale drawings and proportional reasoning to design buildings and structures.

The topic supports the Skills Builder Universal Framework, particularly:

- Speaking through explaining mathematical reasoning and justifying solutions using precise mathematical vocabulary.
- Creativity through selecting and applying mathematical models to unfamiliar situations.
- Problem Solving through applying probability, proportional reasoning and similarity to increasingly complex mathematical and real-world contexts.

## Resources

What books, websites, videos and materials will support our learning?

- Tutorial videos for all topics and interactive questions available at www.sparxmath.com
  All students are provided with an account and set weekly homework by their teacher as well as being a tool on which to complete independent study as needed to close gaps from assessments
- Tutorial videos and practice exam questions available at www.mathsgenie.co.uk
- Tutorial videos, practice questions and practice exam questions available at www.corbettmaths.com

## Assessment

How will we show what we know, remember and can apply?

Assessment takes place throughout the unit through questioning, class discussion, independent practice, retrieval activities and problem-solving tasks. Students demonstrate their understanding by recalling and applying key mathematical knowledge, selecting appropriate methods, explaining their reasoning and solving increasingly complex mathematical problems.

At the end of each unit, students complete an assessment that measures the progress made throughout the teaching sequence. Assessments include a mixture of substantive knowledge and disciplinary knowledge, allowing students to demonstrate both their mathematical understanding and their ability to apply this knowledge to unfamiliar problems.

Following each assessment, students complete targeted improvement activities to address misconceptions and close identified gaps in learning. Assessment materials are based on

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| | GCSE examination-style questions, helping students become familiar with the structure, language and mark schemes used in public examinations. |

| **Term 4** Topic | **Geometry, Constructions and Trigonometry** |
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**Big Picture**
What are the main ideas and big questions in this topic?

Students develop their understanding of geometry, constructions and trigonometry by applying mathematical methods to solve increasingly complex geometric problems.

Foundation students investigate the properties of three-dimensional shapes, develop their skills in geometric constructions and loci, and apply these techniques alongside bearings to solve practical problems. Higher students extend their understanding of trigonometry by drawing and analysing trigonometric graphs, applying the sine rule, cosine rule and calculating the area of any triangle, before using 3D Pythagoras and trigonometry to solve more advanced problems.

**Zoom In**
What knowledge, skills and key vocabulary will we learn step by step?

Foundation students begin by investigating the properties of three-dimensional shapes, recognising their features and applying this knowledge when solving geometric problems. They then use bearings to calculate missing angles and interpret direction accurately. Students continue by developing their understanding of geometric constructions, constructing triangles using a ruler, pair of compasses and a protractor, before applying these skills to solve problems involving loci.

Higher students build upon previous work on trigonometry by drawing and analysing trigonometric graphs, applying the cosine rule, sine rule and calculating the area of a triangle when the perpendicular height is not given. They then extend these ideas by solving problems involving 3D Pythagoras and trigonometry.

Students develop substantive knowledge by understanding the properties of three-dimensional shapes, constructions, loci, bearings and trigonometric relationships, and recognising when different geometric methods should be applied. Alongside this, students strengthen their disciplinary knowledge by selecting appropriate mathematical techniques, constructing accurate geometric diagrams, applying trigonometric methods to solve increasingly complex problems, reasoning mathematically and communicating solutions using accurate mathematical vocabulary.

Key vocabulary is introduced and revisited throughout the topic, including three-dimensional shape, face, edge, vertex, bearing, construction, locus, compass, protractor, triangle, sine rule, cosine rule, trigonometric graph, Pythagoras' Theorem, trigonometry, angle, distance and reasoning.

| **Pre-Requisite Knowledge**<br>What have we already learned that will help us with this topic? | **Pitch Up**<br>How will we challenge ourselves? |
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| Foundation students build upon their understanding of two-dimensional shapes and their properties, together with their ability to use rulers, compasses and protractors accurately. | Students extend their reasoning by solving increasingly challenging geometric problems that combine several mathematical techniques. |

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| Higher students build upon their previous understanding of Pythagoras' Theorem and trigonometry in right-angled triangles before extending these methods to more advanced geometric problems. | Foundation students apply constructions, loci and bearings within multi-step problem-solving activities, whilst Higher students combine the sine rule, cosine rule, area of triangles, and 3D Pythagoras and trigonometry to solve more complex problems. Students are encouraged to explain their reasoning, justify the methods they select and apply their knowledge in unfamiliar contexts. |
| **Wider Framework**<br>How does this learning connect to future topics and bigger goals? | **Curriculum Hinterland**<br>What wider knowledge will deepen our understanding of this topic? |
| Foundation students continue to develop the problem-solving skills required to answer examination questions where several geometric topics are linked together.<br>Higher students build upon the trigonometric techniques developed in this unit to solve more complex angle problems when studying circle theorems later in the GCSE course. | Geometry has played an important role in mathematics for thousands of years, supporting developments in navigation, engineering, architecture and surveying. Accurate constructions, bearings and trigonometry continue to be used to calculate distances, describe locations and solve practical problems involving shape and space. |

**Authentic connections**
How does this topic connect to real life, careers, other subjects and important values?

Geometry, constructions, bearings and trigonometry are used across many aspects of modern life, from designing buildings and planning transport routes to modelling three-dimensional objects and navigating across land, sea and air. Understanding these mathematical ideas enables students to solve practical problems involving shape, direction and measurement with increasing accuracy. SMSC is developed through resilience, precision and logical reasoning as students justify geometric constructions, apply trigonometric methods and appreciate the importance of accuracy when solving mathematical problems.

Cross-curricular links include Geography through mapping, surveying and navigation, Design Technology through technical drawing and construction, Science through forces, waves and measurement, and Engineering through structural design and modelling.

Students explore careers including:

- Surveyor – using constructions, loci, bearings and trigonometry to measure land and produce accurate maps.
- Civil Engineer – applying geometric constructions and trigonometry when designing roads, bridges and infrastructure.
- Aerospace Engineer – using bearings, trigonometry and three-dimensional modelling to design aircraft and analyse flight paths.

The topic supports the Skills Builder Universal Framework, particularly:

- Teamwork through discussing strategies and solving geometric problems collaboratively.
- Planning through selecting appropriate geometric methods and organising multi-step solutions.
- Problem Solving through applying constructions, bearings and trigonometry to increasingly complex mathematical and real-world contexts.

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| Resources<br>What books, websites, videos and materials will support our learning? | Assessment<br>How will we show what we know, remember and can apply? |
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| ○ Tutorial videos for all topics and interactive questions available at www.sparxmath.com<br>All students are provided with an account and set weekly homework by their teacher as well as being a tool on which to complete independent study as needed to close gaps from assessments<br>○ Tutorial videos and practice exam questions available at www.mathsgenie.co.uk<br>○ Tutorial videos, practice questions and practice exam questions available at www.corbettmaths.com | Assessment takes place throughout the unit through questioning, class discussion, independent practice, retrieval activities and problem-solving tasks. Students demonstrate their understanding by recalling and applying key mathematical knowledge, selecting appropriate methods, explaining their reasoning and solving increasingly complex mathematical problems.<br>At the end of each unit, students complete an assessment that measures the progress made throughout the teaching sequence. Assessments include a mixture of substantive knowledge and disciplinary knowledge, allowing students to demonstrate both their mathematical understanding and their ability to apply this knowledge to unfamiliar problems.<br>Following each assessment, students complete targeted improvement activities to address misconceptions and close identified gaps in learning. Assessment materials are based on GCSE examination-style questions, helping students become familiar with the structure, language and mark schemes used in public examinations. |

| **Term 5 and 6**<br>Topic | **Quadratic Expressions, Graphs and Circles** |
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**Big Picture**
What are the main ideas and big questions in this topic?

Students develop their understanding of quadratic expressions, graphs, circles and data by applying algebraic, graphical and geometric methods to solve increasingly complex mathematical problems.

Foundation students learn how to expand and factorise quadratic expressions, solve and sketch quadratic graphs, before building on their existing knowledge of area to calculate the area and circumference of circles, together with the volume and surface area of cylinders, cones, pyramids and spheres.

Higher students develop their understanding of quadratic and cubic graphs, simultaneous equations, iteration, cumulative frequency graphs, box plots, histograms, comparing distributions and circle theorems. During the majority of Term 6, students consolidate their learning through revision for mock examinations before improving areas identified through their mock exam performance.

**Zoom In**
What knowledge, skills and key vocabulary will we learn step by step?

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Foundation students begin by developing their understanding of quadratic expressions, expanding double brackets, factorising quadratic expressions and solving quadratic equations by factorising. They then sketch quadratic graphs, identifying where they cross the axes. Students build upon their existing knowledge of area by calculating the area and circumference of circles, before calculating the volume and surface area of spheres, cones and pyramids.

Higher students develop their understanding of data by drawing and interpreting cumulative frequency graphs, box plots and histograms, before comparing distributions using cumulative frequency graphs and box plots. Students then extend their algebraic understanding by completing the square to find the turning point of a quadratic, sketching quadratic and cubic graphs, solving simultaneous equations graphically, applying iteration, and using circle theorems to solve problems and write mathematical reasons for their answers.

Students develop substantive knowledge by understanding quadratic expressions and graphs, the properties of circles, area, circumference, volume and surface area, statistical diagrams and circle theorems, recognising how each can be applied to solve mathematical problems. Alongside this, students strengthen their disciplinary knowledge by selecting appropriate mathematical methods, interpreting graphs and statistical diagrams, applying algebraic and geometric techniques, solving multi-step problems and communicating solutions using accurate mathematical vocabulary.

Key vocabulary is introduced and revisited throughout the topic, including quadratic expression, factorise, expand, quadratic graph, turning point, cubic graph, simultaneous equations, iteration, cumulative frequency, box plot, histogram, distribution, circle theorem, circumference, area, volume, surface area, sphere, cone and pyramid.

**Pre-Requisite Knowledge**
What have we already learned that will help us with this topic?

Students build upon their understanding of algebraic expressions, expanding brackets, factorising, graph sketching and calculating area developed throughout Key Stage 3 and earlier GCSE study. Previous learning involving algebraic manipulation, area, volume and graph interpretation provides the foundation for this topic.

**Pitch Up**
How will we challenge ourselves?

Students extend their reasoning by solving increasingly challenging problems involving quadratic expressions, graphs, circles, volume, surface area, statistical diagrams and circle theorems.
Students investigate different methods for solving quadratic equations, interpret increasingly complex graphs and statistical diagrams, justify their reasoning when applying circle theorems and solve multi-step problems that combine several areas of mathematics. During Term 6, students consolidate their understanding by revisiting key topics, identifying misconceptions and improving areas highlighted through mock examinations.

**Wider Framework**
How does this learning connect to future topics and bigger goals?

This topic prepares students for the final stages of GCSE Mathematics by bringing together algebra, graphs, circles, geometry and data. Students consolidate their understanding through revision and targeted improvement, strengthening the mathematical knowledge and problem-solving skills required for their GCSE examinations.

**Curriculum Hinterland**
What wider knowledge will deepen our understanding of this topic?

Quadratic expressions, graphs, circles and data have helped mathematicians, scientists and engineers solve problems for many years. These mathematical ideas are used to model change, interpret information, calculate measurements and describe relationships, supporting developments in science, engineering, technology and design.

**Authentic connections**
How does this topic connect to real life, careers, other subjects and important values?

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Quadratic expressions, graphs, circles and data are used across many aspects of modern life, from analysing trends and modelling scientific processes to designing buildings, manufacturing products and interpreting statistical information. Understanding these mathematical ideas enables students to solve practical problems, interpret information and apply mathematics in a wide range of real-world contexts. SMSC is developed through resilience, logical reasoning and precision as students justify mathematical conclusions, interpret statistical evidence and apply mathematical methods accurately to increasingly complex problems.

Cross-curricular links include Science through graph interpretation, measurement and data, Design Technology through product design and manufacturing, Geography through interpreting statistical information, and Business Studies through analysing trends and presenting data.

Students explore careers including:

- Statistician – drawing conclusions from large data sets using graphs, histograms and cumulative frequency diagrams.
- Product Designer – applying area, volume and geometric principles when designing three-dimensional products.
- Mechanical Engineer – using graphs, circles and mathematical calculations when designing moving parts and mechanical systems.

The topic supports the Skills Builder Universal Framework, particularly:

- Planning through selecting appropriate mathematical methods and organising multi-step solutions.
- Problem Solving through applying algebra, graphs, circles and data to increasingly complex mathematical and real-world contexts.

| **Resources**<br>What books, websites, videos and materials will support our learning? | **Assessment**<br>How will we show what we know, remember and can apply? |
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| ○ Tutorial videos for all topics and interactive questions available at www.sparxmath.com<br>All students are provided with an account and set weekly homework by their teacher as well as being a tool on which to complete independent study as needed to close gaps from assessments<br>○ Tutorial videos and practice exam questions available at www.mathsgenie.co.uk<br>○ Tutorial videos, practice questions and practice exam questions available at www.corbettmaths.com | Assessment takes place throughout the unit through questioning, class discussion, independent practice, retrieval activities and problem-solving tasks. Students demonstrate their understanding by recalling and applying key mathematical knowledge, selecting appropriate methods, explaining their reasoning and solving increasingly complex mathematical problems.<br>At the end of each unit, students complete an assessment that measures the progress made throughout the teaching sequence. Assessments include a mixture of substantive knowledge and disciplinary knowledge, allowing students to demonstrate both their mathematical understanding and their ability to apply this knowledge to unfamiliar problems.<br>Following each assessment, students complete targeted improvement activities to address misconceptions and close identified gaps in learning. Assessment materials are based on GCSE examination-style questions, helping students become familiar with the structure, language and mark schemes used in public examinations. |