



<b>Unit 16</b>	<b>Quadratic equations and graphs</b>
<b>Intention</b>	To develop skills in expanding double brackets, plotting and interpreting quadratic graphs, factorising quadratic expressions, and solving quadratics algebraically.
<b>Key words</b>	quadratic, discriminant, completing the square, intersection, roots
<b>Study</b>	<a href="https://sites.google.com/langdonpark.org/maths/study/key-stage-4">https://sites.google.com/langdonpark.org/maths/study/key-stage-4</a>

<b>Success criteria</b>	<b>R</b>	<b>A</b>	<b>G</b>
I can recognise a quadratic equation using the structure of a quadratic form			
I can expand and simplify double brackets to form quadratic expressions			
I can plot and draw quadratic graphs using a table of values			
I can factorise quadratic expressions to simplify and solve equations effectively			
I can identify the vertex, axis of symmetry, and x- and y-intercepts on quadratic graphs			
I can solve quadratics by factorising where the coefficient of $x^2$ is 1			
I can form and solve quadratic equations derived from geometric contexts			

<b>Unit sequence</b>	<b>Top career</b>
<ol style="list-style-type: none"> <li>1. Expanding double brackets</li> <li>2. Plotting quadratic graphs</li> <li>3. Using quadratic graphs</li> <li>4. Factorising quadratic expressions</li> <li>5. Solving quadratic equations algebraically</li> </ol>	<p><b>Mechanical Engineer</b></p> <p>Works with complex equations when designing rotating machinery, gears, engines, and other circular components.</p> <p><b>Salary</b></p> <p>£40,000 - £65,000+ per year</p>

<b>Useful links</b>	<b>YouTube channels</b>
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### Be Inclusive

Hattie Scott Peterson (1913–1993) was the first African American woman in the American Society of Civil Engineers focusing, recognised for her work in infrastructure and flood control, enhancing public safety. She broke barriers and inspired future women and minorities in engineering.



<b>Unit 17</b>	<b>Perimeter, area and volume 2</b>
<b>Intention</b>	To understand and calculate the circumference and area of circles, and solve problems involving sectors, composite shapes, cylinders, pyramids, cones, and spheres.
<b>Key words</b>	cylinder, pyramid, base, slant height, cone, sphere, hemisphere, sector, segment
<b>Study</b>	<a href="https://sites.google.com/langdonpark.org/maths/study/key-stage-4">https://sites.google.com/langdonpark.org/maths/study/key-stage-4</a>

<b>Success criteria</b>	<b>R</b>	<b>A</b>	<b>G</b>
I can calculate the circumference of a circle using the correct formula			
I can find the area of a circle using the formula			
I can calculate the circumference and area of semicircles and sectors accurately			
I can solve problems involving composite 2D shapes			
I can calculate the surface area and volume of cylinders			
I can calculate surface area and volume of pyramids and cones			
I can calculate the surface area and volume of spheres and composite 3D solids			

<b>Unit sequence</b>	<b>Top career</b>
<ol style="list-style-type: none"> <li>1. Circumference of a circle 1</li> <li>2. Circumference of a circle 2</li> <li>3. Area of a circle</li> <li>4. Semicircles and sectors</li> <li>5. Composite 2D shapes and cylinders</li> <li>6. Pyramids and cones</li> <li>7. Spheres and composite solids</li> </ol>	<p><b>Aerospace Engineer</b></p> <p>Uses vectors to calculate forces, velocities, and flight paths for aircraft and spacecraft.</p> <p><b>Salary</b></p> <p>£45,000 - £80,000+ per year</p>

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Mary Jackson (1921–2005) was NASA's first Black female engineer, who worked on aerodynamics and flight data analysis, contributing significantly to the U.S. space programme. Her story, along with those of her colleagues, was featured in the book and film *Hidden Figures*.



Unit 18	Fractions, indices and standard form
<b>Intention</b>	To develop skills in multiplying and dividing fractions, applying the laws of indices, and working with large and small numbers in standard form.
<b>Key words</b>	vector, column vector, magnitude, direction, collinear, resultant
<b>Study</b>	<a href="https://sites.google.com/langdonpark.org/maths/study/key-stage-4">https://sites.google.com/langdonpark.org/maths/study/key-stage-4</a>

Success criteria	R	A	G
I can multiply fractions by finding the product of numerators and denominators			
I can divide fractions by multiplying by the reciprocal			
I can apply the laws of indices to simplify expressions involving powers			
I can write large numbers in standard form			
I can express small numbers in standard form to simplify calculations			
I can perform calculations in standard form, including multiplication and division			
I can calculate using standard form and apply to real-life problems			

Unit sequence	Top career
<ol style="list-style-type: none"><li>1. Multiplying and dividing fractions</li><li>2. The laws of indices</li><li>3. Writing large numbers in standard form</li><li>4. Writing small numbers in standard form</li><li>5. Calculating with standard form</li></ol>	<p><b>Astronomer</b></p> <p>Use standard form to represent large or small numbers, such as distances between stars, the mass of planets, or the size of particles.</p> <p><b>Salary</b></p> <p>£35,000 - £70,000+ per year</p>

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Priyamvada Natarajan (born 1969) is an astrophysicist and professor at Yale University known for her work on dark matter, dark energy, and black holes. She made significant contributions to the understanding of cosmic phenomena, including mapping the distribution of dark matter in the universe.



<b>Unit 19</b>	<b>Congruence, similarity and vectors</b>
<b>Intention</b>	To understand and apply concepts of similarity, enlargement, and congruence in geometric figures, and to use vectors for solving spatial problems.
<b>Key words</b>	similarity, congruency, proof, enlargement, scale factor, vector, column vector
<b>Study</b>	<a href="https://sites.google.com/langdonpark.org/maths/study/key-stage-4">https://sites.google.com/langdonpark.org/maths/study/key-stage-4</a>

<b>Success criteria</b>	<b>R</b>	<b>A</b>	<b>G</b>
I can identify similar shapes and use scale factors to find missing lengths			
I can enlarge shapes using a given centre and scale factor			
I can solve problems involving similar shapes by applying proportional reasoning			
I can recognise congruent shapes and understand the criteria for congruence			
I can use congruence to prove that two shapes triangles are identical			
I can represent and describe vectors using notation and direction			
I can perform vector addition and subtraction to solve spatial problems			

<b>Unit sequence</b>	<b>Top career</b>
<ol style="list-style-type: none"> <li>1. Similarity and enlargement</li> <li>2. More similarity</li> <li>3. Using similarity</li> <li>4. Congruence 1</li> <li>5. Congruence 2</li> <li>6. Vectors 1</li> <li>7. Vectors 2</li> </ol>	<p><b>Civil engineer</b></p> <p>Designs, constructs, and maintains infrastructure projects, ensuring safety, functionality, and sustainability.</p> <p><b>Salary</b></p> <p>£70,000 - £100,000+ per year</p>

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<b>Be Inclusive</b>
Nasreen Karim (born 1954) is a pioneering Pakistani civil engineer and one of the country's first female engineers, recognised for her contributions to urban planning, sustainable development, and empowering women in engineering.



Unit 20	More algebra
Intention	To develop skills in interpreting and drawing non-linear graphs, solving simultaneous equations, rearranging formulae, and understanding mathematical proof.
Key words	linear, quadratic, reciprocal, simultaneous, formulae, proof
Study	<a href="https://sites.google.com/langdonpark.org/maths/study/key-stage-4">https://sites.google.com/langdonpark.org/maths/study/key-stage-4</a>

Success criteria	R	A	G
I can plot and interpret graphs of cubic and reciprocal functions			
I can recognise and analyse key features of non-linear graphs			
I can solve simultaneous equations by plotting their graphs and finding intersections			
I can solve simultaneous equations algebraically using substitution and elimination			
I can rearrange formulae to make a variable the subject			
I can understand and construct basic mathematical proofs for given statements			
I can apply non-linear graphs and simultaneous equations to solve real-life problems			

Unit sequence	Top career
<ol style="list-style-type: none"> <li>1. Graphs of cubic and reciprocal functions</li> <li>2. Non-linear graphs</li> <li>3. Solving simultaneous equations graphically</li> <li>4. Solving simultaneous equations algebraically</li> <li>5. Rearranging formulae</li> <li>6. Proof</li> </ol>	<p><b>Health Economist</b></p> <p>Analyse the cost-effectiveness and economic impact of healthcare policies, treatments, and interventions.</p> <p><b>Salary</b></p> <p>£40,000 - £60,000+ per year</p>

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William "Sandy" Darity Jr. (born 1953) is an American economist renowned for his research on racial wealth inequality, economic justice, and reparations, significantly influencing policy discussions on wealth disparities and economic equity.