

Essential Knowledge Milestones		Teaching Points	
<ul style="list-style-type: none"> be able to solve a quadratic equation by factorising; be able to work with quadratic functions and their graphs; know and be able to use the discriminant of a quadratic function, including the conditions for real and repeated roots; be able to complete the square. e.g. $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + \left(c - \frac{b^2}{4a}\right)$; be able to solve quadratic equations, including in a function of the unknown. 		<ul style="list-style-type: none"> Lots of practice is needed as these algebraic skills are fundamental to all subsequent work. Students must become fluent, and continue to develop thinking skills such as choosing an appropriate method, and interpreting the language in a question. Emphasise correct setting out and notation. Students will need lots of practice with negative coefficients for x squared and be reminded to always use brackets if using a calculator. e.g. $(-2)^2$. Include manipulation of surds when using the formula for solving quadratic equations. Where examples are in a real-life context, students should check that solutions are appropriate and be aware that a negative solution may not be appropriate in some situations. Students must be made aware that this sub-unit is about finding the links between completing the square and factorised forms of a quadratic and the effect this has on the graph. Use graph drawing packages to see the effect of changing the value of the '+ c' and link this with the roots and hence the discriminant. Start by drawing $y = x^2$ and add different x terms followed by different constants in a systematic way. Then move on to expressions where the coefficient of x^2 is not 1. 	
Assumed Prior Knowledge/ Links / Interleaving			
<ul style="list-style-type: none"> GCSE: Manipulating quadratic expressions GCSE: Solving quadratic equations Differentiation: Repeated roots and tangents; completing the square and turning points Projectiles: the path of a projectile can be modelled by a quadratic 			
Potential Barriers to Access /Misconceptions		Opportunities for Reasoning/Problem Solving/Proofs	
<ul style="list-style-type: none"> Difficulty in completing the square when the coefficient of x^2 is not equal to 1. Students do not always relate finding the minimum point and line of symmetry to completing the square. Discriminant given by $\sqrt{b^2 - 4ac}$ rather than $b^2 - 4ac$ Quoting the quadratic formula incorrectly; e.g. $\frac{b \pm \sqrt{b^2 - 4ac}}{2a}$ or $\frac{-b \pm \sqrt{b^2 + 4ac}}{2a}$ instead of $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The ability to deal with negative signs when dealing with the formula. Students should be provided with plenty of practice on completing the square with a wide range of quadratic forms. <p>Notation and layout can also be a problem; students must remember to show all the necessary working out at every stage of a calculation, particularly on 'show that' questions.</p>		<ul style="list-style-type: none"> The path of an object thrown can be modelled using quadratic graphs. Various questions can be posed about the path: When is the object at a certain height? What is the maximum height? <p>Will it clear a wall of a certain height, a certain distance away?</p>	
		Questions & Prompts	
		<ul style="list-style-type: none"> Change one coefficient in $y = 1x^2 + 6x + 8$ so that the x -axis is a tangent to the graph. Make up three questions that show you understand three different methods for solving a quadratic equation. The roots of the equation $kx^2 + 4x - 6 = 0$ are equal. What is the value of k? find a quadratic equation whose roots are $\frac{5+\sqrt{3}}{2}$ 	
Key Mathematical Vocabulary	completing the square, intersection, manipulate, sketch, plot, quadratic, maximum, minimum, turning point, discriminant, real roots, repeated roots,		
Personal Development	Notes	Resources	
Pupils are taught that they must be honest and 'truthful' when feeding back opinions and 'respect' the views of others when discussing the math's techniques used.			