

2.5.1 Quadratic

Name: _____ Class: _____ Date: _____

KEY WORDS root

<!-- Session 2 native-skill companion -->

Objective

Practise quadratic within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Factorising and solving simple quadratics · Foundation

Expand brackets and factorise simple quadratics. Solve by setting each factor equal to zero, and use a graph to interpret the roots.

$$(x - 3)(x - 7) = 0$$

$x^2 - 10x + 21 = (x - 3)(x - 7)$. Hence the equation $x^2 - 10x + 21 = 0$ has roots 3 and 7. Check each root by substitution and mark both intercepts on the graph.

Multiplying an inequality by a negative number reverses its direction. A sketch must show which side of each root satisfies the inequality. Geometry may restrict x further.

This Foundation/Core lesson uses factorisation and graphical roots; the discriminant, quadratic formula and quadratic inequalities are reserved for the advanced tier.

■ Quadratics and inequalities · Higher

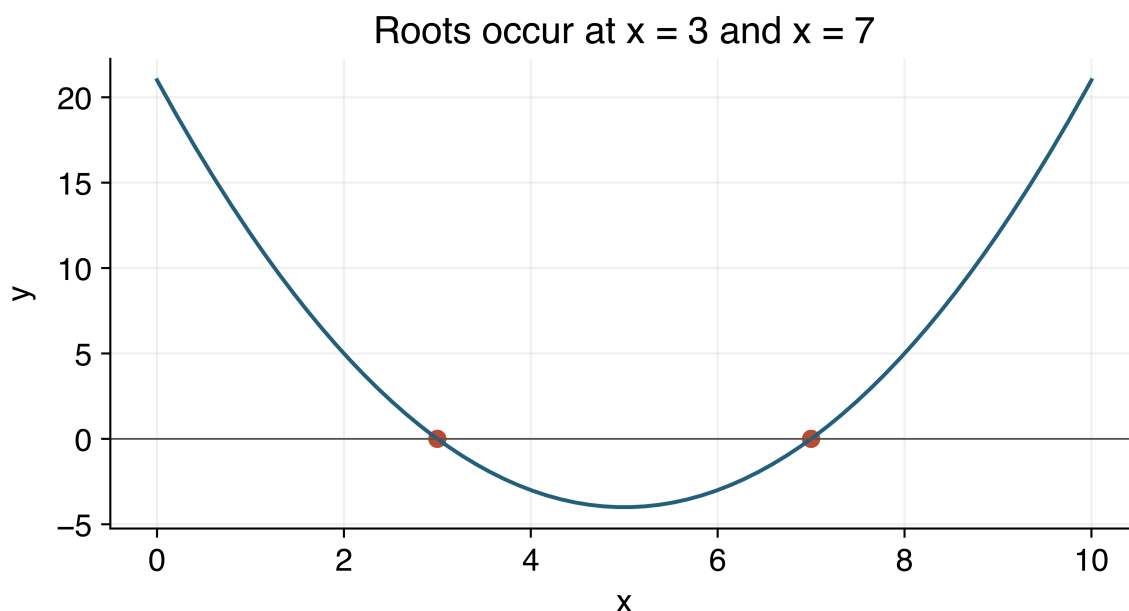
Factor where possible; otherwise complete the square or use the quadratic formula. A quadratic inequality needs the sign on intervals, not only the roots. The discriminant identifies repeated or missing real roots.

$$ax^2 + bx + c = 0, \quad \Delta = b^2 - 4ac$$

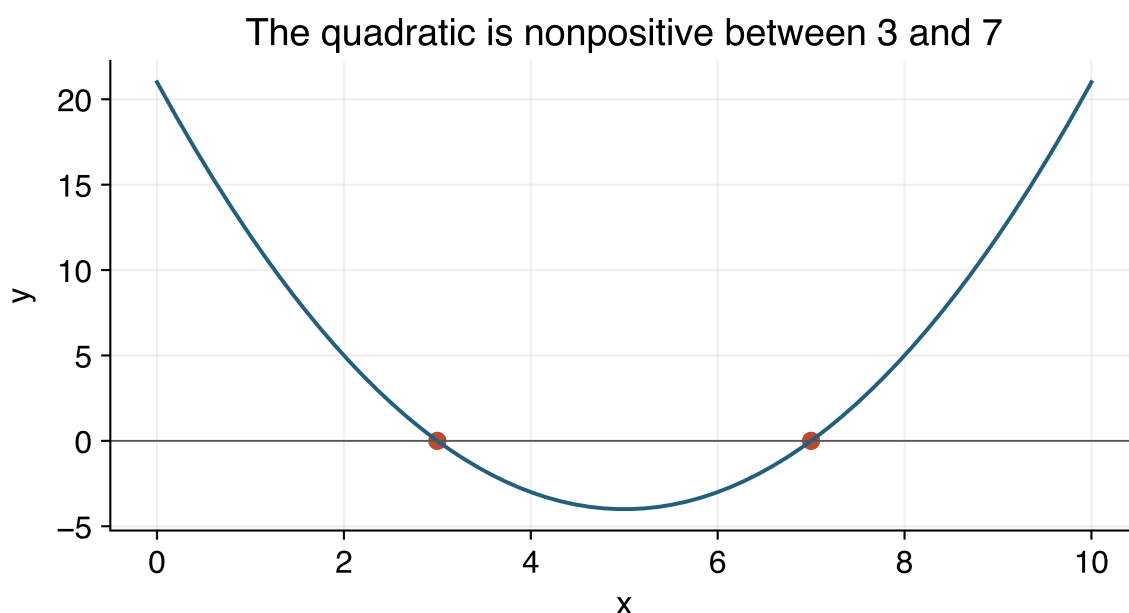
The equation $x^2 - 10x + 21 = 0$ factorises as $(x - 3)(x - 7) = 0$, giving roots 3 and 7. Complete the square: $x^2 - 10x + 21 = (x - 5)^2 - 4$, giving turning point (5, -4) and symmetry line $x = 5$. The formula $x = [-b \pm \sqrt{(b^2 - 4ac)}] / (2a)$ also gives $(10 \pm 4) / 2 = 3, 7$. For $2x^2 + 5x - 3 = 0$, the discriminant is 49 and roots are $(-5 \pm 7) / 4 = 1/2, -3$. A graph gives approximate roots when exact factorisation is inconvenient. For an enclosure with area $A = x(10 - x)$, complete the square to get $A = 25 - (x - 5)^2$. The greatest area is 25 at $x = 5$, within $0 < x < 10$.

Multiplying an inequality by a negative number reverses its direction. A sketch must show which side of each root satisfies the inequality. Geometry may restrict x further.

AQA A11/A18 Higher interprets roots, intercepts and turning points, completes the square and uses the quadratic formula, including equations needing rearrangement. Factorisation and substitution check each result.



Original native-lesson illustration; labels belong to its worked example.



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find the smaller root of $x^2-10x+21=0$.

2.2 (Foundation) Find the larger root of $x^2-10x+21=0$.

2.3 (Foundation) Find $(5-3)(5-7)$.

2.4 (Higher) Find the discriminant of $x^2-6x+9=0$.

2.5 (Higher) Find the maximum value of $x(10-x)$.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: A positive discriminant means that a quadratic has no real roots.

Solutions

2.1 Factorise to $(x-3)(x-7)=0$. The smaller root is 3.

2.2 The factorised roots are 3 and 7; the larger is 7.

2.3 Substitute 5: $(5-3)(5-7)=2 \times (-2)=-4$.

2.4 The discriminant is $(-6)^2-4 \times 1 \times 9=0$.

2.5 Complete the square: $x(10-x)=25-(x-5)^2$. The maximum is 25.

3.1 False. $x^2-1=0$ has discriminant $4>0$ and two distinct real roots, -1 and 1 . A negative discriminant means no real roots.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.