

2.2 Quadratic

Name: _____ Class: _____ Date: _____

KEY WORDS discriminant

<!-- 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

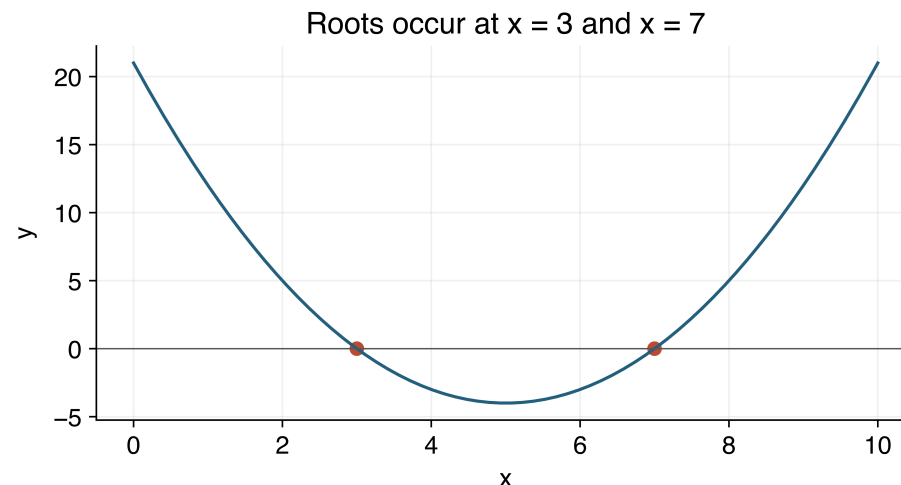
Factor where possible; otherwise complete the square or use the quadratic formula. A quadratic inequality needs the sign on intervals, not only the roots. The discriminant identifies repeated or missing real roots.

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

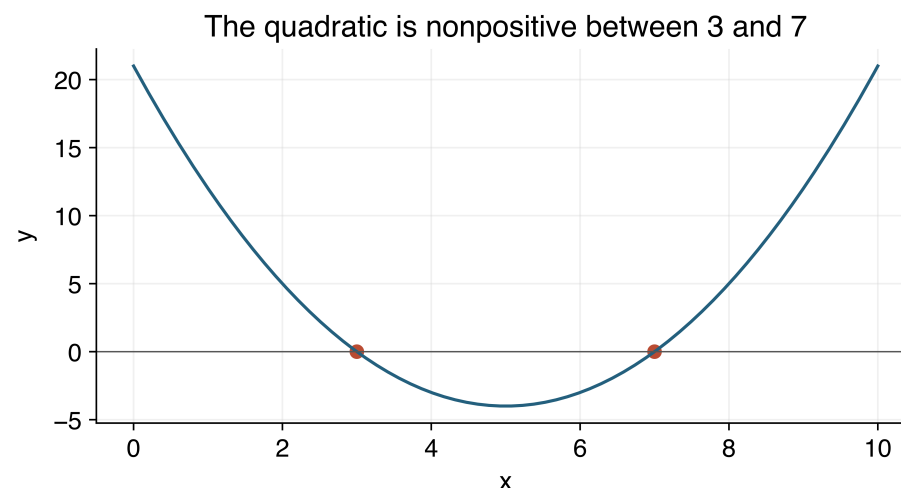
The condition is $x(10 - x) \geq 21$, so $x^2 - 10x + 21 \leq 0$. Factor $(x - 3)(x - 7) \leq 0$. The upward parabola is nonpositive between its roots, giving $3 \leq x \leq 7$. The maximum area is 25 at $x = 5$.

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.

Use the vertex to interpret an optimum. Check an endpoint and a point between the roots; the algebra and graph should tell the same story.



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



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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.