

## 2.5.1 Quadratic

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**KEY WORDS** root

&lt;!-- Session 2 native-skill companion --&gt;

### 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

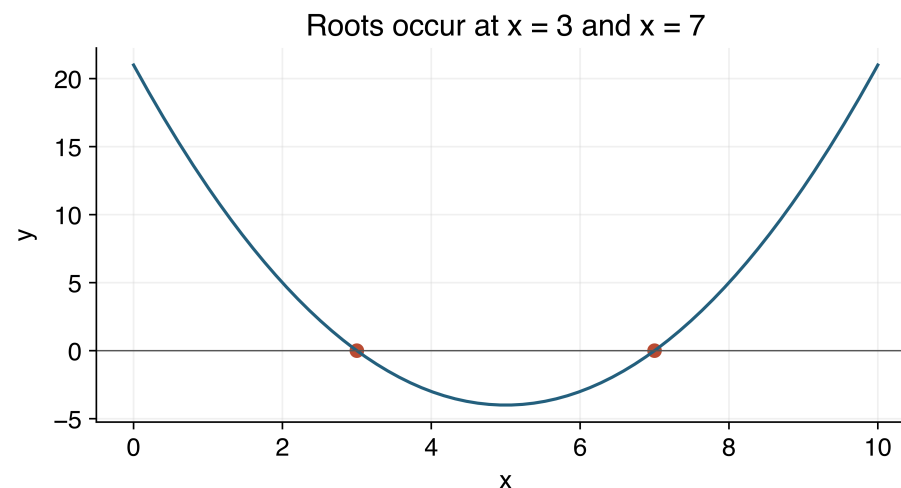
Factor where possible; otherwise complete the square or use the quadratic formula. A quadratic inequality needs the sign on intervals, not only the roots. The discriminant identifies repeated or missing real roots.

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

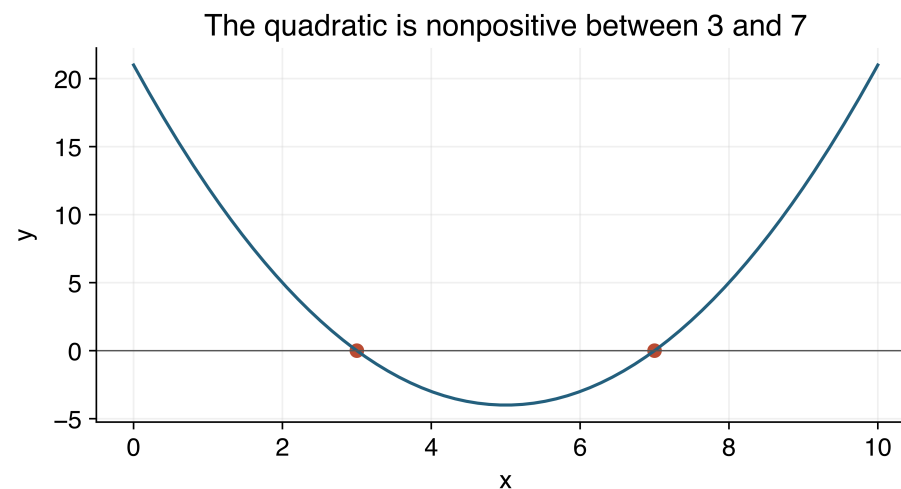
The equation  $x^2 - 10x + 21 = 0$  factorises as  $(x - 3)(x - 7) = 0$ , giving roots 3 and 7. Complete the square:  $x^2 - 10x + 21 = (x - 5)^2 - 4$ , giving turning point (5, -4) and symmetry line  $x = 5$ . The formula  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  also gives  $(10 \pm 4)/2 = 3, 7$ . 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.