Exercise walk-through

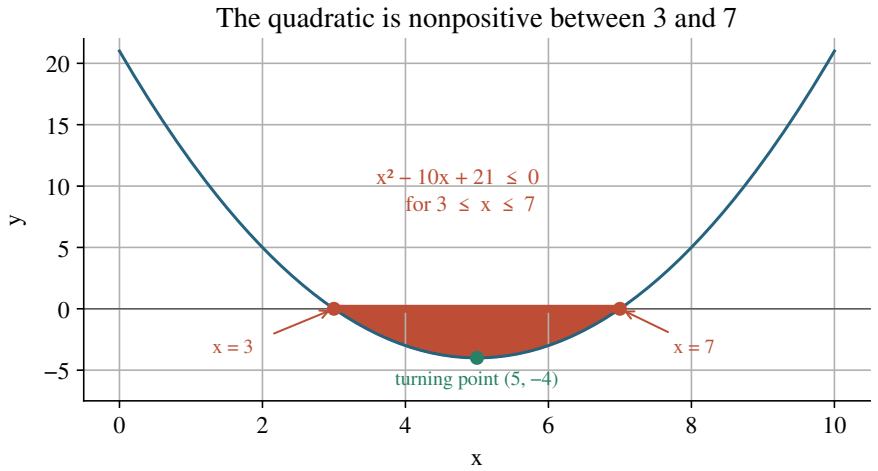
2.5
Inequalities and linear–quadratic pairs

Pearson Edexcel · International GCSE · Mathematics A

Completing the square and solving quadratics (2)

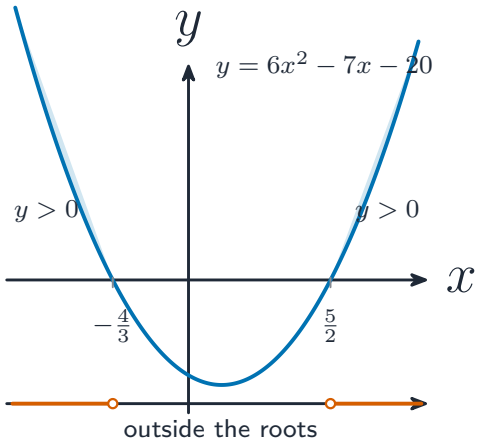
- factorise: $x^2 + x - 30 = 0$ gives $(x+6)(x-5) = 0$, so the **roots** are $x = -6$ and $x = 5$;
- use the **quadratic formula** $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ when it does not factorise;
- complete the square.
- $a = 2$, $b = 6$, $c = -1$: $x = \dfrac{-6 \pm \sqrt{36+8}}{4} = \dfrac{-6 \pm 2\sqrt{11}}{4} = \dfrac{-3 \pm \sqrt{11}}{2}$.

Figure: Completing the square and solving quadratics (2)



- $x^2 - 10x + 21 = (x - 3)(x - 7)$.
- It is ≤ 0 for $3 \leq x \leq 7$.

Figure: Inequalities and linear–quadratic pairs



positive quadratic: $>$ holds
outside the critical values

- Roots $-4/3$ and $5/2$.
- Positive outside the roots.

Exercises 2.1·2.2

2.1 Solve $3x - 2 < 10$ and show the solution set on a number line. [2]

2.2 Solve $7 - x \leq 5$ [2]

Exercises 2.1·2.2

2.1 Solve $3x - 2 < 10$ and show the solution set on a number line. [2]

2.1 $3x < 12$, so $x < 4$: open circle at 4, arrow left.

2.2 Solve $7 - x \leq 5$ [2]

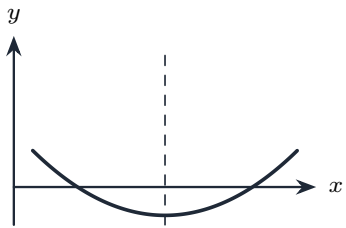
2.2 $-x \leq -2$, and dividing by -1 flips the sign: $x \geq 2$.

Setup for exercise 2.3

2.3 Solve $3 < x + 2 \leq 5$ [2]

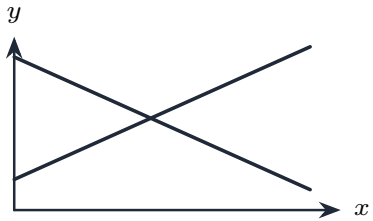


2.4 Write down the critical values of $6x^2 - 7x - 20 = 0$ [3]



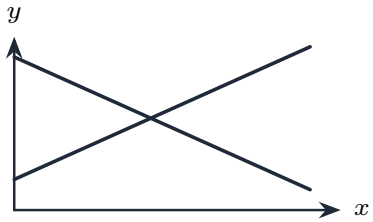
Exercise 2.3

2.5 Solve $y = 3x - 1$ and $y = x + 3$ simultaneously. [2]



Exercise 2.3

2.5 Solve $y = 3x - 1$ and $y = x + 3$ simultaneously. [2]



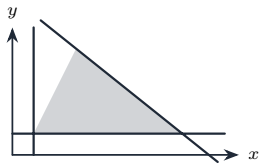
2.3 Subtract 2 throughout: $1 < x \leq 3$.

2.4 $(3x + 4)(2x - 5) = 0$: $x = -\frac{4}{3}$ or $x = \frac{5}{2}$.

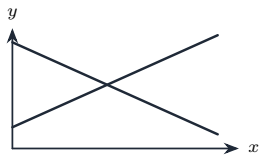
2.5 $3x - 1 = x + 3$, so $x = 2$ and $y = 5$.

Exercises 3.1·3.2

3.1 *(Edexcel 4MA1 2HR June 2024 Q20, adapted.)* Solve the inequality $6x^2 - 7x - 20 > 0$ [4]

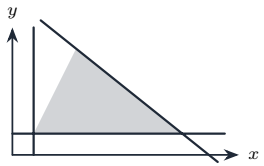


3.2 *(Edexcel-style, specification example.)* Solve the simultaneous equations $y = 2x - 11$ and $x^2 + y^2 = 25$ [4]



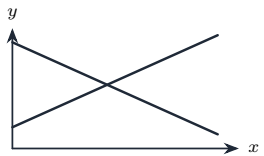
Exercises 3.1·3.2

3.1 *(Edexcel 4MA1 2HR June 2024 Q20, adapted.)* Solve the inequality $6x^2 - 7x - 20 > 0$ [4]



3.1 $(3x + 4)(2x - 5) > 0$: critical values $-\frac{4}{3}$ and $\frac{5}{2}$. The parabola opens upward, so it is positive outside the roots: $x < -\frac{4}{3}$ or $x > \frac{5}{2}$.

3.2 *(Edexcel-style, specification example.)* Solve the simultaneous equations $y = 2x - 11$ and $x^2 + y^2 = 25$ [4]



3.2 Substitute: $x^2 + (2x - 11)^2 = 25$ gives $x^2 + 4x^2 - 44x + 121 = 25$, so $5x^2 - 44x + 96 = 0$ and $x = \frac{44 \pm \sqrt{1936 - 1920}}{10} = \frac{44 \pm 4}{10} = 4.8$ or 4. With $y = 2x - 11$: $(4.8, -1.4)$ and $(4, -3)$.

exercises.lol exercises.com.cn

Exercise 3.3

3.3 *(Original.)* (a) Solve $x^2 + 3x + 2 > 0$. (b) Shade, on sketch axes, the region satisfying $x \geq 0$, $y \geq 1$ and $x + y \leq 5$, and write down the coordinates of the region's three vertices. [6]

Exercise 3.3

3.3 *(Original.)* (a) Solve $x^2 + 3x + 2 > 0$. (b) Shade, on sketch axes, the region satisfying $x \geq 0$, $y \geq 1$ and $x + y \leq 5$, and write down the coordinates of the region's three vertices. [6]

3.3 (a) $(x + 1)(x + 2) > 0$: positive outside the roots, so $x < -2$ or $x > -1$. (b) The boundaries $x = 0$, $y = 1$ and $x + y = 5$ enclose a triangle with vertices $(0, 1)$, $(0, 5)$ and $(4, 1)$; shade inside it.

Local review guidance: critical values before any inequality direction decision; strict vs non-strict notation matches the original sign; linear–quadratic pairs keep both solutions with both coordinates. This is authored classroom guidance.