

2.5 Inequalities and linear–quadratic pairs

Name: _____ Class: _____ Date: _____

Total: 25 marks

KEY WORDS quadratic inequality

Inequalities and linear–quadratic pairs

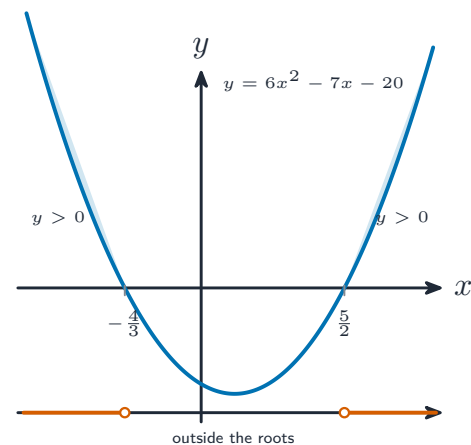
Objective

Use inequality symbols and number-line conventions, solve linear and quadratic inequalities with solution sets on a number line, identify regions defined by linear inequalities, and solve simultaneous pairs where one equation is linear and the other quadratic (objectives Foundation 2.8 and Higher 2.7 D, 2.8).

1 Key knowledge and worked examples

Inequalities. Same moves as equations – but multiplying or dividing by a negative flips the direction: $7 - x \leq 5$ gives $x \geq 2$. Double-ended forms like $1 < x \leq 5$ carry open (excluded) and closed (included) circles on the number line. Quadratic inequalities: find the critical values, then use the parabola's sign – a positive quadratic is greater than zero outside its roots.

Linear–quadratic pairs. Substitute the linear equation into the quadratic, solve the resulting quadratic, then substitute back for the other variable. For $y = 11x - 2$ with $y = 5x^2$: $5x^2 - 11x + 2 = (5x - 1)(x - 2) = 0$, giving $(\frac{1}{5}, 0.2)$ and $(2, 20)$. Both points are kept unless the context removes one.



positive quadratic: $>$ holds
outside the critical values

2 Practice

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

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

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

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

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

3 Exam-style questions

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]

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]