Algebra: Quadratic Inequalities

Practice Worksheet (Jan 2023 Paper 2H Style)

I Do

Solve the inequality

$$6x^2 + 37x \leq 35$$

Show clear algebraic working.

We Do

Solve the inequality

$$4x^2 + 19x \geq 30$$

Show clear algebraic working.

You Do

Solve the inequality

$$8x^2 - 14x \leq 15$$

Show clear algebraic working.

Challenge

Find all the **integer** values of x that satisfy **both** inequalities:

$$3x^2 + 14x < 5 \quad \text{and} \quad x^2 - 4 \geq 0$$

Show clear algebraic working.

Answers

- **I Do:**

$$\text{Rearrange: } 6x^2 + 37x - 35 \leq 0$$

$$\text{Factorise: } (6x - 5)(x + 7) \leq 0$$

$$\text{Critical values: } x = \frac{5}{6} \quad \text{and} \quad x = -7$$

$$\text{Graph is on or below } x\text{-axis between critical values: } \mathbf{-7 \leq x \leq \frac{5}{6}}$$

- **We Do:**

$$\text{Rearrange: } 4x^2 + 19x - 30 \geq 0$$

$$\text{Factorise: } (4x - 5)(x + 6) \geq 0$$

$$\text{Critical values: } x = \frac{5}{4} \text{ (or 1.25)} \quad \text{and} \quad x = -6$$

$$\text{Graph is on or above } x\text{-axis outside critical values: } \mathbf{x \leq -6} \quad \text{or} \quad \mathbf{x \geq \frac{5}{4}}$$

- **You Do:**

$$\text{Rearrange: } 8x^2 - 14x - 15 \leq 0$$

$$\text{Factorise: } (4x + 3)(2x - 5) \leq 0$$

$$\text{Critical values: } x = -\frac{3}{4} \text{ (or } -0.75) \quad \text{and} \quad x = \frac{5}{2} \text{ (or 2.5)}$$

$$\text{Graph is on or below } x\text{-axis between critical values: } \mathbf{-\frac{3}{4} \leq x \leq \frac{5}{2}}$$

- **Challenge:**

$$\text{1st Inequality: } 3x^2 + 14x - 5 < 0 \implies (3x - 1)(x + 5) < 0 \implies -5 < x < \frac{1}{3}$$

$$\text{2nd Inequality: } x^2 - 4 \geq 0 \implies (x - 2)(x + 2) \geq 0 \implies x \leq -2 \quad \text{or} \quad x \geq 2$$

$$\text{Overlap region: } -5 < x \leq -2$$

$$\text{Integer values of } x : \mathbf{-4, -3, -2}$$