



IG.M18 Quadratic Inequalities: Solving and Graphing Regions

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** In the context of basic factorisation, solve the inequality $x^2 - 5x + 6 > 0$ for x on the real number line.

(Total for Question 1 is 1 mark)

- 2** For the parabola context $y = x^2 - x - 6$, find where $y \leq 0$. Give your answer in inequality form for x .

(Total for Question 2 is 1 mark)

- 3** On the real number line, solve $2x^2 - 8x < 0$ by factorising and state the solution set.

(Total for Question 3 is 2 marks)

- 4** Consider the quadratic expression $q(x) = -x^2 + 6x - 5$. Solve $q(x) \geq 0$ and give the solution for x .

(Total for Question 4 is 2 marks)

- 5** Sketch and shade the region on the xy -plane for the inequality $y > x^2 - 4x + 3$. Indicate clearly which side of the parabola is shaded and mark the critical points on the x -axis.

- 6** A quadratic region problem: solve $x^2 + x - 12 \leq 0$ and then sketch the x-axis interval to show the solution set clearly on a number line.

(Total for Question 6 is 3 marks)

- 7** Solve the inequality $3x^2 - 18x + 23 > 0$. The roots are not integers. Show your working including the critical values found using the quadratic formula, and give the final solution in inequality notation.

(Total for Question 7 is 4 marks)

Mark scheme • IG.M18 Quadratic Inequalities: Solving and Graphing Regions

Question 1

- **B1** correct solution $x < 2$ or $x > 3$, in correct inequality notation
- **Answer:** $x < 2$ or $x > 3$

Question 2

- **B1** $-2 \leq x \leq 3$ cao
- **Answer:** $-2 \leq x \leq 3$

Question 3

- **M1** factorises to $2x(x - 4)$ and identifies roots $x = 0$ and $x = 4$
- **A1** $0 < x < 4$, correct inequality notation
- **Answer:** $0 < x < 4$

Question 4

- **M1** rearranges or factorises, noting $-x^2 + 6x - 5 = -(x^2 - 6x + 5)$ and finds roots $x = 1$ and $x = 5$
- **A1** $1 \leq x \leq 5$ cao
- **Answer:** $1 \leq x \leq 5$

Question 5

- **M1** identifies and plots the roots of $x^2 - 4x + 3 = 0$ as $x = 1$ and $x = 3$ or marks points $(1,0)$ and $(3,0)$
- **M1** sketches a correct upward-opening parabola passing through the roots
- **A1** shades the region above the parabola ($y > x^2 - 4x + 3$) clearly
- **Answer:** Region above the parabola $y = x^2 - 4x + 3$, excluding the curve itself, with the curve crossing the x-axis at $x = 1$ and $x = 3$

Question 6

- **M1** factorises to $(x + 4)(x - 3)$ and finds roots $x = -4$ and $x = 3$
- **A1** $-4 \leq x \leq 3$, correct inequality notation
- **B1** number line or small sketch showing closed dots at -4 and 3 and shading between them
- **Answer:** $-4 \leq x \leq 3$

Question 7

- **M1** uses quadratic formula correctly and computes discriminant: $b^2 - 4ac = 324 - 276 = 48$
- **M1** finds critical values $x = (18 \pm \sqrt{48})/6$ and simplifies exactly to $x = (9 \pm 2\sqrt{3})/3$, oe
- **A1** gives final solution in correct form: $x < (9 - 2\sqrt{3})/3$ or $x > (9 + 2\sqrt{3})/3$, cao
- **A1** states approximate critical values, for example x approximately 1.845 and x approximately 4.155, supporting the correct inequality notation
- **Answer:** $x < (9 - 2\sqrt{3})/3$ or $x > (9 + 2\sqrt{3})/3$