HIGHER

2.9 Quadratic Inequalities: Solving and Graphing Regions: 30-minute Pack

EDEXCEL 4MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Solve $2x^2 \leq 14$

(Total for Question 1 is 3 marks)

2 The quadratic equation $2x^2 - 6x + k = 0$ has equal roots.
Find the value of k.

(Total for Question 2 is 3 marks)

3 Find all the integer values of x that satisfy $x^2 + 2x - 8 \leq 0$

(Total for Question 3 is 4 marks)

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4 The region R is defined by the inequalities

$y \geq (x - 2)^2 - 5$ and $y \leq 4$

Find the number of points with integer coordinates that lie in R (including points on the boundary where the inequality allows it).

(Total for Question 4 is 4 marks)

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5 Solve $x^2 > 36$

(Total for Question 5 is 2 marks)

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6 x satisfies both $x^2 - 9 \leq 0$ and $x \geq 6$.

Find the set of possible values of x.

(Total for Question 6 is 4 marks)

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7 The quadratic equation $3x^2 + 6x + k = 0$ has no real roots.

Find the range of values of k.

(Total for Question 7 is 3 marks)

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Mark scheme · 2.9 Quadratic Inequalities: Solving and Graphing Regions: 30-minute Pack

Question 1

divides both sides by 2 to get $x^2 \leq 7$	**M1**
critical values $x = \sqrt{7}$ and $x = -\sqrt{7}$	**M1**
$-\sqrt{7} \leq x \leq \sqrt{7}$	**A1**

Answer: $-\sqrt{7} \leq x \leq \sqrt{7}$

Question 2

uses the discriminant $b^2 - 4ac = -6^2 - 4 \times 2 \times k = 36 - 8k$	**M1**
sets $b^2 - 4ac = 0$ for equal roots: $36 - 8k = 0$	**M1**
$k = 9/2$	**A1**

Answer: k = 9/2

Question 3

factorises to find the critical values	**M1**
critical values $x = -4$ and $x = 2$	**A1**
writes the solution set $-4 \leq x \leq 2$	**M1**
integers: -4, -3, -2, -1, 0, 1, 2	**A1**

Answer: -4, -3, -2, -1, 0, 1, 2

Question 4

finds where the curve meets the line $y = 4$: $(x - 2)^2 = 9$	**M1**
finds the possible integer x values, from the largest and smallest x with the curve not above the line	**M1**
counts the integer y values for each x: x = -1: 1, x = 0: 6, x = 1: 9, x = 2: 10, x = 3: 9, x = 4: 6, x = 5: 1	**M1**
total = 42	**A1**

Answer: 42

Question 5

critical values $x = 6$ and $x = -6$	**M1**
$x < -6$ or $x > 6$	**A1**

Answer: x < -6 or x > 6

Question 6

factorises and finds the critical values of the quadratic inequality	**M1**
$-3 \leq x \leq 3$	**A1**
solves the linear inequality to get $x \geq 6$	**M1**
the two solution sets do not overlap: no values	**A1**

Answer: no values

Question 7

uses the discriminant $b^2 - 4ac = 6^2 - 4 \times 3 \times k = 36 - 12k$	**M1**
sets $b^2 - 4ac < 0$ for no real roots: $36 - 12k < 0$	**M1**
$k > 3$	**A1**

Answer: k > 3

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