HIGHER

8.6 Quadratic Inequalities: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Solve the inequality $x^2 - 9 \leq 0$. Give your answer in inequality form.

(Total for Question 1 is 2 marks)

2 Solve the inequality $x^2 + 4x + 3 < 0$. Give your answer in inequality form.

(Total for Question 2 is 2 marks)

3 For which integer values of n is $n^2 - 7n + 10 < 0$? Give your answer as a list of integers.

(Total for Question 3 is 2 marks)

4 Solve the inequality $x^2 + 2x - 15 > 0$. Give your answer in inequality form.

(Total for Question 4 is 2 marks)

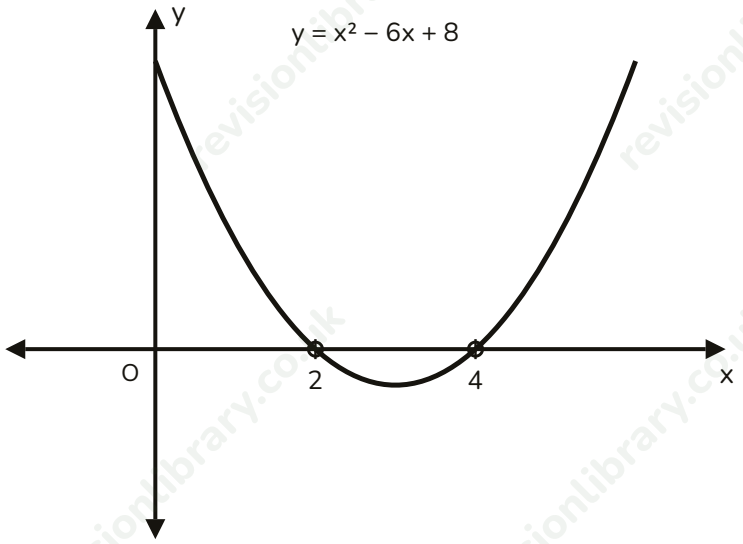
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5 Solve the inequality $x^2 - 5x \geq 0$.

(Total for Question 5 is 3 marks)

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6 The graph of $y = x^2 - 6x + 8$ crosses the x-axis at $x = 2$ and $x = 4$, and the curve opens upward (the sketch is shown. Circle the correct solution set of $x^2 - 6x + 8 \leq 0$ and give a brief reason for your choice.



- ☐ A) $x \leq 2$ or $x \geq 4$
- ☐ B) $2 \leq x \leq 4$
- ☐ C) $x < 2$ or $x > 4$
- ☐ D) $2 < x < 4$

(Total for Question 6 is 2 marks)

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7 Solve the inequality $9 - x^2 \geq 0$.

(Total for Question 7 is 3 marks)

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8 Show that $x^2 + 6x + 11 > 0$ for all real values of x.

(Total for Question 8 is 3 marks)

9 Solve $9x^2 + 9x - 10 < 0$

(Total for Question 9 is 3 marks)

10 Write down all the integer values of x that satisfy $x^2 + 13x + 40 < 0$

(Total for Question 10 is 3 marks)

11 Solve $x^2 \geq 12x - 35$

(Total for Question 11 is 4 marks)

12 Solve $3x^2 + 7x + 2 \leq 0$

(Total for Question 12 is 3 marks)

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13 n is an integer. $n^2 - 3n - 10 \leq 0$. Find all the integer values of n that satisfy this inequality.

(Total for Question 13 is 3 marks)

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14 Solve the inequality $x^2 - 2x - 1 > 0$. Give your answer in exact form.

(Total for Question 14 is 3 marks)

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15 The height, h metres, of a ball above the ground t seconds after it is thrown is modelled by $h = 20t - 5t^2$. Find the range of values of t for which the ball is at least 15 metres above the ground.

(Total for Question 15 is 5 marks)

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Mark scheme · 8.6 Quadratic Inequalities: Test Pack

Question 1

factorise to (x-3)(x+3) or identify roots x=-3,3	**M1**
-3 ≤ x ≤ 3 cao	**A1**

Answer: -3 ≤ x ≤ 3

Question 2

factorise to (x+1)(x+3) or complete the square to find roots -3 and -1	**M1**
-3 < x < -1 cao	**A1**

Answer: -3 < x < -1

Question 3

factorise to (n-5)(n-2) and identify range 2 < n < 5	**M1**
n = 3, 4 cao	**A1**

Answer: n = 3, 4

Question 4

factorise to (x+5)(x-3) or identify roots x=-5,3	**M1**
x < -5 or x > 3 cao	**A1**

Answer: x < -5 or x > 3

Question 5

factorises x(x-5)	**M1**
critical values x = 0 and x = 5 stated	**A1**
x ≤ 0 or x ≥ 5 oe	**A1**

Answer: x ≤ 0 or x ≥ 5

Question 6

valid reason given, e.g. the curve is below or on the x-axis between the roots	**B1**
correct option B selected	**B1**

Answer: B) 2 ≤ x ≤ 4

Question 7

rearranges to $x^2 \leq 9$	**M1**
critical values x = -3 and x = 3 stated	**A1**
-3 ≤ x ≤ 3 oe	**A1**

Answer: -3 ≤ x ≤ 3

Question 8

attempts to complete the square on $x^2 + 6x + 11$	**M1**
$(x+3)^2 + 2$ cao	**A1**
cso: correct conclusion, e.g. $(x+3)^2 \geq 0$ for all real x, so $(x+3)^2 + 2 \geq 2 > 0$ for all real x	**B1**

Answer: $x^2 + 6x + 11 = (x+3)^2 + 2$, and since $(x+3)^2 \geq 0$ for all real x, the expression is always ≥ 2, so it is always greater than 0.

Question 9

factorises or uses the quadratic formula	**M1**
critical values -5/3 and 2/3	**M1**
-5/3 < x < 2/3	**A1**

Answer: -5/3 < x < 2/3

Question 10

finds critical values	**M1**
correct range identified	**M1**
-7, -6	**A1**

Answer: -7, -6

Question 11

rearranges to $x^2 - 12x + 35 \geq 0$	**M1**
finds critical values	**M1**
correct region identified	**M1**
x ≤ 5 or x ≥ 7	**A1**

Answer: x ≤ 5 or x ≥ 7

Question 12

factorises or uses the quadratic formula	**M1**
critical values -2 and -1/3	**M1**
-2 ≤ x ≤ -1/3	**A1**

Answer: -2 ≤ x ≤ -1/3

Question 13

factorises (n-5)(n+2) or finds critical values n = -2, n = 5	**M1**
-2 ≤ n ≤ 5 oe	**A1**
all eight integers listed correctly: -2, -1, 0, 1, 2, 3, 4, 5 (ft from their inequality)	**A1**

Answer: n = -2, -1, 0, 1, 2, 3, 4, 5

Question 14

use quadratic formula to find roots $x = 1 \pm \sqrt{2}$	**M1**
state sign regions for parabola opening up	**M1**
$x < 1 - \sqrt{2}$ or $x > 1 + \sqrt{2}$ cao	**A1**

Answer: $x < 1 - \sqrt{2}$ or $x > 1 + \sqrt{2}$

Question 15

forms the inequality $20t - 5t^2 \geq 15$ oe	**M1**
rearranges to a quadratic ≤ 0 (or ≥ 0) form, e.g. $5t^2 - 20t + 15 \leq 0$	**M1**
simplifies and factorises, e.g. $t^2 - 4t + 3 \leq 0$ as (t-1)(t-3)	**M1**
1 ≤ t ≤ 3	**A1**
ft, correctly interprets in context: the ball is at least 15 m high for 1 ≤ t ≤ 3 seconds	**B1**

Answer: 1 ≤ t ≤ 3 (seconds)

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