



5.8H Solving Quadratics: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1 Factorise fully: $x^2 + 5x - 14$.

(Total for Question 1 is 2 marks)

- 2 Solve the equation $2x^2 - x - 6 = 0$.

(Total for Question 2 is 3 marks)

- 3 Show that $x^2 - 6x + 7$ can be written in the form $(x - 3)^2 - 2$. Give full algebraic working.

(Total for Question 3 is 3 marks)

- 4 Solve $3x^2 + 2x - 5 = 0$ giving exact answers in surd form.

(Total for Question 4 is 4 marks)

- 5 Find the value of k such that the quadratic $x^2 + (k - 2)x + k$ has equal roots.

(Total for Question 5 is 3 marks)

- 6 A rectangle has sides of length $x + 4$ and $x + 2$. The area is 168 cm^2 . Find the dimensions of the rectangle (give the positive solution for x).

(Total for Question 6 is 3 marks)

- 7 Solve $x^2 = 2x + 3$.

(Total for Question 7 is 3 marks)

- 8 For which values of m does the quadratic $f(x) = x^2 - 4x + m$ have two distinct real positive roots? Show your reasoning.

(Total for Question 8 is 5 marks)

- 9 Solve $\frac{1}{2}x^2 - 2x + \frac{3}{2} = 0$. Give exact answers.

(Total for Question 9 is 3 marks)

10 Find the value of k such that $x^2 + kx - 12$ is divisible by $x - 3$.

(Total for Question 10 is 2 marks)

11 Find the vertex (turning point) and minimum value of $y = 2x^2 - 8x + 5$.

(Total for Question 11 is 3 marks)

12 Solve $2x^2 - 7x = x + 3$ and give exact answers in simplest form.

(Total for Question 12 is 4 marks)

Mark scheme · 5.8H Solving Quadratics: Higher Tier Practice

Question 1

- **M1** identify two numbers multiplying to -14 and summing to 5
- **A1** $(x + 7)(x - 2)$ cao
- **Answer:** $(x + 7)(x - 2)$

Question 2

- **M1** correct factorisation or rearrangement shown, e.g. $2x^2 + 3x - 4x - 6$ or $(2x + 3)(x - 2)$
- **M1** obtain factors $(2x + 3)(x - 2)$ oe
- **A1** $x = 2$ or $x = -3/2$ cao
- **Answer:** $x = 2$ or $x = -3/2$

Question 3

- **M1** write $x^2 - 6x + 7$ as $x^2 - 6x + 9 - 9 + 7$ or equivalent completing-the-square step
- **M1** group to $(x - 3)^2 - 2$ or show algebraic rearrangement
- **A1** $(x - 3)^2 - 2$ cso
- **Answer:** $(x - 3)^2 - 2$

Question 4

- **M1** substitute into quadratic formula $x = [-b \pm \sqrt{b^2 - 4ac}] / (2a)$ with $a=3$, $b=2$, $c=-5$
- **M1** evaluate discriminant: $b^2 - 4ac = 4 + 60 = 64$
- **A1** $\sqrt{64} = 8$ substituted correctly
- **A1** $x = (-2 \pm 8) / 6$ giving $x = 1$ or $x = -5/3$ cao
- **Answer:** $x = 1$ or $x = -5/3$

Question 5

- **M1** state discriminant = 0 for equal roots and form $(k - 2)^2 - 4 \cdot 1 \cdot k = 0$ or $b^2 - 4ac = 0$
- **M1** expand and simplify: $k^2 - 4k + 4 - 4k = 0$ giving $k^2 - 8k + 4 = 0$
- **A1** solve $k = [8 \pm \sqrt{64 - 16}] / 2 = [8 \pm \sqrt{48}] / 2 = 4 \pm \sqrt{12}$ oe; both values ($k = 4 + 2\sqrt{3}$ or $k = 4 - 2\sqrt{3}$) cao
- **Answer:** $k = 4 + 2\sqrt{3}$ or $k = 4 - 2\sqrt{3}$

Question 6

- **M1** form equation $(x + 4)(x + 2) = 168$ and expand to $x^2 + 6x + 8 = 168$
- **M1** rearrange to $x^2 + 6x - 160 = 0$ and solve by factorisation or formula to get $x = 10$ or $x = -16$
- **A1** positive solution $x = 10$ giving dimensions 14 cm and 12 cm cao
- **Answer:** Dimensions are 14 cm by 12 cm ($x = 10$)

Question 7

- **M1** rearrange to $x^2 - 2x - 3 = 0$
- **M1** factorise to $(x - 3)(x + 1)$ oe
- **A1** $x = 3$ or $x = -1$ cao
- **Answer:** $x = 3$ or $x = -1$

Question 8

- **M1** state discriminant > 0 and compute: $b^2 - 4ac = 16 - 4m > 0$ leading to $m < 4$
- **M1** state product of roots = $c/a = m$ must be > 0 for roots both positive
- **M1** note sum of roots = 4 which is > 0 so does not restrict further (state sum > 0)
- **A1** combine conditions to $0 < m < 4$ and justify distinctness by strict inequalities
- **A1** final answer $0 < m < 4$ cao
- **Answer:** $0 < m < 4$

Question 9

- **M1** multiply both sides by 2 to get $x^2 - 4x + 3 = 0$ or use quadratic formula
- **M1** factorise or solve to get $(x - 1)(x - 3) = 0$
- **A1** $x = 1$ or $x = 3$ cao
- **Answer: $x = 1$ or $x = 3$**

Question 10

- **M1** use remainder theorem: substitute $x = 3$ into polynomial to get $9 + 3k - 12 = 0$
- **A1** solve $3k - 3 = 0$ giving $k = 1$ cao
- **Answer: $k = 1$**

Question 11

- **M1** complete the square: $2(x^2 - 4x) + 5 = 2[(x - 2)^2 - 4] + 5$ or equivalent
- **M1** simplify to $2(x - 2)^2 - 3$
- **A1** vertex $(2, -3)$ and minimum value -3 cao
- **Answer: Turning point at $(2, -3)$; minimum value -3**

Question 12

- **M1** bring all terms to one side: $2x^2 - 8x - 3 = 0$
- **M1** substitute into quadratic formula or show work: $x = [8 \pm \sqrt{64 + 24}]/4$
- **A1** simplify under root to $\sqrt{88} = 2\sqrt{22}$
- **A1** final answers $x = (4 \pm \sqrt{22})/2$ cao
- **Answer: $x = (4 + \sqrt{22})/2$ or $x = (4 - \sqrt{22})/2$**