5.8 Solving Quadratics: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out the values of x.

$x^2 - x - 6 = 0$

(Total for Question 1 is 3 marks)

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2 Solve $x^2 - 8x + 15 = 0$

(Total for Question 2 is 2 marks)

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3 Solve $x^2 + 9x = 0$

(Total for Question 3 is 2 marks)

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4 Work out x.

$x^2 + 4x + 4 = 0$

(Total for Question 4 is 3 marks)

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5 Solve the equation by factorising.
$4x^2 - 9 = 0$

(Total for Question 5 is 4 marks)

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6 Solve $x^2 = 2x + 3$.

(Total for Question 6 is 3 marks)

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7 Solve $3(x + 1)^2 = 48$

(Total for Question 7 is 3 marks)

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8 Solve $3x^2 + 11x + 6 = 0$

(Total for Question 8 is 3 marks)

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9 Solve $x^2 + 4x - 3 = 0$ using the quadratic formula. Give your answers in simplified surd form.

(Total for Question 9 is 3 marks)

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

(Total for Question 10 is 3 marks)

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11 Solve the simultaneous equations:

$y = x^2 - x - 7$

$y = 3x - 2$

(Total for Question 11 is 5 marks)

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12 $x^2 + 2x - 24$ is a quadratic expression.

(a) Factorise $x^2 + 2x - 24$ **(2)**

(b) Hence write down the solutions of $x^2 + 2x - 24 = 0$ **(1)**

(c) Hence, or otherwise, solve $(x - 1)^2 + 2(x - 1) - 24 = 0$ **(3)**

(Total for Question 12 is 6 marks)

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13 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 13 is 5 marks)

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Mark scheme · 5.8 Solving Quadratics: 1-hour Pack

Question 1

factorise to $(x - 3)(x + 2) = 0$ or equivalent	**M1**
$x = 3$ cao	**A1**
$x = -2$ cao	**A1**

Answer: $x = 3$ and $x = -2$

Question 2

correct factorisation $(x - 3)(x - 5) = 0$ oe	**M1**
$x = 3$ and $x = 5$ cao	**A1**

Answer: $x = 3$ or $x = 5$

Question 3

$x(x + 9) = 0$ oe	**M1**
$x = 0$ and $x = -9$ cao	**A1**

Answer: $x = 0$ or $x = -9$

Question 4

recognise perfect square: $(x + 2)^2 = 0$ or factorise to $(x + 2)(x + 2)$	**M1**
$x = -2$ cao	**A1**
$x = -2$ given as the only (repeated) solution, dependent on the previous A1, isw	**A1**

Answer: $x = -2$

Question 5

recognise difference of squares: $(2x - 3)(2x + 3) = 0$ or show correct factorisation	**M1**
$2x - 3 = 0$ gives $x = 3/2$ cao	**A1**
$2x + 3 = 0$ gives $x = -3/2$ cao	**A1**
both solutions $x = 3/2$ and $x = -3/2$ stated as the final answer, dependent on correct factorisation, isw	**A1**

Answer: $x = 3/2$ and $x = -3/2$

Question 6

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

Answer: $x = 3$ or $x = -1$

Question 7

$(x + 1)^2 = 16$ oe	**M1**
$x + 1 = \pm 4$	**M1**
$x = 3$ and $x = -5$ both cao	**A1**

Answer: $x = 3$ or $x = -5$

Question 8

correct factorisation $(3x + 2)(x + 3) = 0$ oe	**M1**
$x = -2/3$ oe	**A1**
$x = -3$ cao	**A1**

Answer: $x = -2/3$ or $x = -3$

Question 9

correct substitution into the quadratic formula, $x = (-4 \pm \sqrt{16 + 12}) / 2$ oe	**M1**
simplifies $\sqrt{28}$ to $2*\sqrt{7}$	**M1**
$x = -2 + \sqrt{7}$ and $x = -2 - \sqrt{7}$ oe cao	**A1**

Answer: $x = -2 + \sqrt{7}$ or $x = -2 - \sqrt{7}$

Question 10

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

Answer: Turning point at (2, -3); minimum value -3

Question 11

equates $x^2 - x - 7 = 3x - 2$ oe	**M1**
rearranges to a correct three-term quadratic $x^2 - 4x - 5 = 0$ oe, dependent on the previous M1	**dM1**
correct factorisation $(x - 5)(x + 1) = 0$, or correct use of the quadratic formula	**M1**
$x = 5$ and $x = -1$	**A1**
$y = 13$ and $y = -5$ respectively, cao	**A1**

Answer: (x, y) = (5, 13) or (x, y) = (-1, -5)

Question 12

(a) two brackets of the form $(x + p)(x + q)$ with $pq = -24$ attempted	**M1**
(a) $(x + 6)(x - 4)$ cao	**A1**

(a) Answer: (x + 6)(x - 4)

(b) $x = -6$ and $x = 4$ both stated (ft from part (a))	**B1**

(b) Answer: x = -6 or x = 4

(c) recognises the substitution $u = x - 1$ (or an equivalent direct approach) to give $u^2 + 2u - 24 = 0$	**M1**
(c) $u = -6$ or $u = 4$, following the factorisation pattern from part (a)	**M1**
(c) $x = -5$ and $x = 5$ both cao	**A1**

(c) Answer: x = -5 or x = 5

Question 13

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)	**M1**
combine conditions to $0 < m < 4$ and justify distinctness by strict inequalities	**A1**
final answer $0 < m < 4$ cao	**A1**

Answer: $0 < m < 4$

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