2.3 Quadratic Equations: Factorising, the Formula and Completing the Square: 1-hour Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Factorise $x^2 - 3x - 40$

(Total for Question 1 is 1 mark)

2 Factorise $4x^2 - 25$

(Total for Question 2 is 1 mark)

3 Factorise fully $3x^2 - 27$

(Total for Question 3 is 1 mark)

4 Solve the equation $x^2 - 11x + 30 = 0$ by factorising.

(Total for Question 4 is 1 mark)

5 Solve $3x^2 + 17x + 10 = 0$.

(Total for Question 5 is 3 marks)

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6 Solve $x^2 + 14x + 1 = 0$ by completing the square. Give your answers as surds in their simplest form.

(Total for Question 6 is 4 marks)

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7 Solve $3x^2 - 8x + 5 = 0$.

(Total for Question 7 is 3 marks)

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8 Solve $x(x + 2) = -8x - 21$.

(Total for Question 8 is 4 marks)

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9 Solve $x^2 - 5x - 6 = 0$.

(Total for Question 9 is 3 marks)

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10 Solve $x^2 + 16x - 10 = 0$ by completing the square. Give your answers as surds in their simplest form.

(Total for Question 10 is 4 marks)

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11 A rectangular poster has width x metres and length (x + 6) metres. Its area is 315 square metres. Form and solve a quadratic equation to find x, and hence find the perimeter of the rectangle.

(Total for Question 11 is 5 marks)

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12 Solve $12x^2 + 53x + 56 = 0$.

(Total for Question 12 is 3 marks)

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13 Solve $2x^2 + 8x + 5 = 0$. Give your solutions correct to 3 significant figures.

(Total for Question 13 is 3 marks)

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14 Find the values of k for which $2x^2 + kx + 8 = 0$ has equal roots.

(Total for Question 14 is 3 marks)

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15 Write $3x^2 + 42x + 167$ in the form $a(x + p)^2 + q$, where a, p and q are integers.

(Total for Question 15 is 3 marks)

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16 Solve the equation $5/x - 2/(x+3) = 1$, giving your solutions as exact values.

(Total for Question 16 is 5 marks)

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17 Find the value(s) of k for which the equation $x^2 + kx + 16 = 0$ has equal roots.

(Total for Question 17 is 2 marks)

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18 By completing the square, prove that $x^2 - 4x + 8 > 3$ for all real values of x.

(Total for Question 18 is 4 marks)

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Mark scheme · 2.3 Quadratic Equations: Factorising, the Formula and Completing the Square: 1-hour Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

(x-8)(x+5) cao	**B1**

Answer: (x-8)(x+5)

Question 2

(2x-5)(2x+5) cao	**B1**

Answer: (2x-5)(2x+5)

Question 3

3(x-3)(x+3) cao	**B1**

Answer: 3(x-3)(x+3)

Question 4

x = 5 and x = 6 (both values) cao	**B1**

Answer: x = 5 or x = 6

Question 5

factorises as (3x + 2)(x + 5) or substitutes correctly into the formula	**M1**
one correct root	**A1**
x = -5 or x = -2/3 cao	**A1**

Answer: x = -5 or x = -2/3

Question 6

$(x + 7)^2$ seen	**M1**
$(x + 7)^2 = 48$	**M1**
$x + 7 = \pm \sqrt{48}$	**M1**
$x = -7 + 4\sqrt{3}$ or $x = -7 - 4\sqrt{3}$ cao	**A1**

Answer: $x = -7 + 4\sqrt{3}$ or $x = -7 - 4\sqrt{3}$

Question 7

factorises as (3x - 5)(x - 1) or substitutes correctly into the formula	**M1**
one correct root	**A1**
x = 1 or x = 5/3 cao	**A1**

Answer: x = 1 or x = 5/3

Question 8

expands the bracket	**M1**
rearranges to $x^2 + 10x + 21 = 0$	**M1**
factorises or substitutes into the formula	**M1**
x = -7 or x = -3 cao	**A1**

Answer: x = -7 or x = -3

Question 9

factorises as (x + 1)(x - 6) or substitutes correctly into the formula	**M1**
one correct root	**A1**
x = -1 or x = 6 cao	**A1**

Answer: x = -1 or x = 6

Question 10

$(x + 8)^2$ seen	**M1**
$(x + 8)^2 = 74$	**M1**
$x + 8 = \pm \sqrt{74}$	**M1**
$x = -8 + \sqrt{74}$ or $x = -8 - \sqrt{74}$ cao	**A1**

Answer: $x = -8 + \sqrt{74}$ or $x = -8 - \sqrt{74}$

Question 11

x(x + 6) = 315	**M1**
$x^2 + 6x - 315 = 0$	**M1**
factorises or solves	**M1**
x = 15 with the negative root rejected	**A1**
72 m cao	**A1**

Answer: 72 m

Question 12

factorises as (3x + 8)(4x + 7) or substitutes correctly into the formula	**M1**
one correct root	**A1**
x = -8/3 or x = -7/4 cao	**A1**

Answer: x = -8/3 or x = -7/4

Question 13

correct substitution into the quadratic formula	**M1**
-3.22 cao	**A1**
-0.775 cao	**A1**

Answer: x = -3.22 or x = -0.775

Question 14

discriminant $k^2 - 4(2)(8)$ used	**M1**
$k^2 = 64$	**M1**
k = 8 or k = -8 cao	**A1**

Answer: k = 8 or k = -8

Question 15

$3[(x + 7)^2 ...]$ seen	**M1**
p = 7 correct	**A1**
$3(x + 7)^2 + 20$ cao	**A1**

Answer: $3(x + 7)^2 + 20$

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Question 16

multiplies through by $x(x+3)$: $5(x+3) - 2x = x(x+3)$	**M1**
expands correctly: $5x+15-2x = x^2+3x$	**M1**
simplifies to $x^2 = 15$ oe (e.g. $x^2+3x-3x-15=0$)	**A1**
$x = \sqrt{15}$	**A1**
$x = -\sqrt{15}$	**A1**

Answer: $x = \sqrt{15}$ or $x = -\sqrt{15}$

Question 17

sets discriminant $k^2 - 4(1)(16) = 0$ and rearranges to $k^2 = 64$	**M1**
$k = 8$ or $k = -8$ (both values) oe cao	**A1**

Answer: k = 8 or k = -8

Question 18

$(x-2)^2 - 4 + 8$ seen	**M1**
correctly simplifies to $(x-2)^2 + 4$	**A1**
states $(x-2)^2 \geq 0$ for all real x, so the minimum value of the expression is 4	**M1**
since $4 > 3$, $x^2-4x+8 > 3$ for all real x cso	**A1**

Answer: $x^2 - 4x + 8 = (x-2)^2 + 4 \geq 4 > 3$ for all real x

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