2.3 Quadratic Equations: Factorising, the Formula and Completing the Square: 30-minute Pack

AQA 8365 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Factorise each expression using the difference of two squares.

(a) $9x^2 - 16$ **(1)**

(b) $25x^2 - 4y^2$ **(1)**

(c) $2x^2 - 50$ **(2)**

(Total for Question 1 is 4 marks)

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2 Solve the equation $x^2 + 2x - 24 = 0$ by factorising.

(Total for Question 2 is 1 mark)

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3 A rectangular patio has width x metres and length (x + 3) metres. Its area is 270 square metres. Form and solve a quadratic equation to find x, and hence find the perimeter of the rectangle.

(Total for Question 3 is 5 marks)

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4 Find the values of k for which $4x^2 + kx + 1 = 0$ has equal roots.

(Total for Question 4 is 3 marks)

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5 Write $x^2 + 4x - 12$ in the form $(x + p)^2 + q$, where p and q are integers.

(Total for Question 5 is 3 marks)

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6 Solve the inequality $x^2 - 2x - 15 \leq 0$. Give your answer using inequality notation.

(Total for Question 6 is 3 marks)

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7 Find the value(s) of k for which the equation $x^2 + kx + 9 = 0$ has equal roots.

(Total for Question 7 is 3 marks)

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8 By completing the square, express $2x^2 - 12x + 5$ in the form $a(x+p)^2 + q$, where a, p and q are constants to be found.

(Total for Question 8 is 2 marks)

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9 A rectangular photo frame has length (x + 4) cm and width x cm. The area of the frame is 96 cm². Form an equation in x, and solve it to find the width of the frame.

(Total for Question 9 is 3 marks)

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Mark scheme · 2.3 Quadratic Equations: Factorising, the Formula and Completing the Square: 30-minute Pack

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

Question 1

(a) (3x-4)(3x+4) cao	**B1**
(a) Answer: (3x-4)(3x+4)	
(b) (5x-2y)(5x+2y) cao	**B1**
(b) Answer: (5x-2y)(5x+2y)	
(c) takes out common factor 2: $2(x^2-25)$	**M1**
(c) 2(x-5)(x+5) cao	**A1**
(c) Answer: 2(x-5)(x+5)	

Question 2

x = -6 and x = 4 (both values) cao	**B1**
Answer: x = -6 or x = 4	

Question 3

x(x + 3) = 270	**M1**
x^2 + 3x - 270 = 0	**M1**
factorises or solves	**M1**
x = 15 with the negative root rejected	**A1**
66 m cao	**A1**
Answer: 66 m	

Question 4

discriminant k^2 - 4(4)(1) used	**M1**
k^2 = 16	**M1**
k = 4 or k = -4 cao	**A1**
Answer: k = 4 or k = -4	

Question 5

$(x + 2)^2$ seen	**M1**
p = 2 correct	**A1**
$(x + 2)^2$ - 16 cao	**A1**
Answer: $(x + 2)^2$ - 16	

Question 6

factorises to (x-5)(x+3) (=0)	**M1**
critical values x = 5 and x = -3	**A1**
$-3 \leq x \leq 5$ oe cao (correct inequality direction, since coefficient of x^2 is positive)	**A1**
Answer: $-3 \leq x \leq 5$	

Question 7

discriminant = k^2 - 4(1)(9) (= k^2-36)	**M1**
sets discriminant = 0 and rearranges to k^2 = 36	**M1**
k = 6 or k = -6 (both values) oe cao	**A1**
Answer: k = 6 or k = -6	

Question 8

takes out factor 2: $2(x^2-6x)+5$, then $2[(x-3)^2-9]+5$	**M1**
$2(x-3)^2$ - 13 cao (a=2, p=-3, q=-13)	**A1**
Answer: $2(x-3)^2$ - 13	

Question 9

forms the equation x(x+4) = 96, i.e. x^2 + 4x - 96 = 0	**M1**
factorises (x+12)(x-8) = 0	**M1**
width = 8 cm cao, rejecting x = -12 since a length cannot be negative	**A1**
Answer: Width = 8 cm	

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