5.8 Solving Quadratics: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out the value of x.

$x^2 = 49$

(Total for Question 1 is 1 mark)

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2 Solve the equation by factorising.

$2x^2 + 3x = 0$

(Total for Question 2 is 2 marks)

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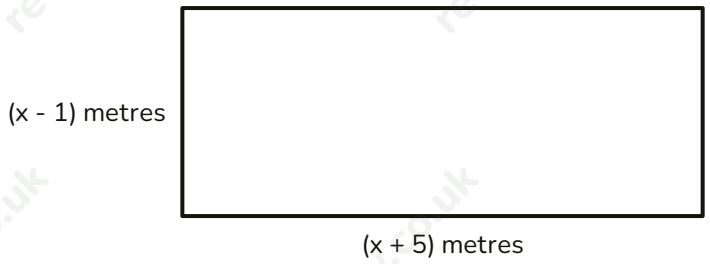
3 Solve $x^2 - 81 = 0$

(Total for Question 3 is 2 marks)

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4 A rectangle has length (x + 5) metres and width (x - 1) metres. The area is 40 m².
Write down an equation and solve for x, explaining why only one of your solutions is valid in this context.

Diagram NOT accurately drawn



(Total for Question 4 is 4 marks)

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

(Total for Question 5 is 2 marks)

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6 Solve $9x^2 - 16 = 0$

(Total for Question 6 is 3 marks)

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7 A small garden is a square of side (2x - 1) metres. Its area is 49 m².
Work out the values of x.

(Total for Question 7 is 5 marks)

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

(Total for Question 8 is 2 marks)

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9 Two consecutive positive even integers have a product of 168. Let n be the smaller integer.
Form an equation in n and solve it to find the two integers.

(Total for Question 9 is 4 marks)

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

(Total for Question 10 is 3 marks)

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11 Solve $5x^2 - 13x - 6 = 0$

(Total for Question 11 is 3 marks)

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12 $g(x) = x^2 + 10x + 19$

(a) Express g(x) in the form $(x + a)^2 + b$, where a and b are integers **(2)**

(b) Hence write down the minimum value of g(x) and the value of x at which it occurs **(2)**

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(Total for Question 12 is 4 marks)

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

(Total for Question 13 is 4 marks)

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14 Prove that $x^2 + 4x + 9$ is positive for all real values of x.

(Total for Question 14 is 3 marks)

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15 The equation $px^2 + 12x + p = 0$, where p is a non-zero constant, has equal roots. Find the possible values of p.

(Total for Question 15 is 4 marks)

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Mark scheme · 5.8 Solving Quadratics: Test Pack

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

Question 1

x = 7 or x = -7 cao	**B1**

Answer: x = 7 or x = -7

Question 2

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

Answer: x = 0 and x = -3/2

Question 3

(x - 9)(x + 9) = 0 oe, or $x^2 = 81$ seen	**M1**
x = 9 and x = -9 cao	**A1**

Answer: x = 9 or x = -9

Question 4

form equation (x + 5)(x - 1) = 40 or equivalent	**M1**
expand to $x^2 + 4x - 5 = 40$ then rearrange to $x^2 + 4x - 45 = 0$	**M1**
factorise to (x + 9)(x - 5) = 0 giving x = -9 or x = 5	**A1**
reject x = -9 (width x - 1 must be positive, so x > 1); x = 5 cao	**A1**

Answer: x = 5 (length = 10 m, width = 4 m, area = 40 m^2). x = -9 is rejected as it gives a negative width.

Question 5

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

Answer: (x + 7)(x - 2)

Question 6

$9x^2 = 16$ oe, or correct factorisation (3x - 4)(3x + 4) = 0	**M1**
x = 4/3 oe	**A1**
x = -4/3 oe	**A1**

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

Question 7

form equation $(2x - 1)^2 = 49$ or equivalent	**M1**
expand or take square roots: (2x - 1) = 7 or (2x - 1) = -7	**M1**
from 2x - 1 = 7, x = 4 cao	**A1**
from 2x - 1 = -7, x = -3 cao	**A1**
communicate both solutions with working shown	**C1**

Answer: x = 4 or x = -3

Question 8

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

Answer: k = 1

Question 9

n(n + 2) = 168 oe, using n for the smaller even integer	**M1**
rearranges to $n^2 + 2n - 168 = 0$ and factorises correctly, e.g. (n - 12)(n + 14) = 0, or uses the quadratic formula	**M1**
n = 12, rejecting n = -14 as it is not a positive integer	**A1**
states the two integers are 12 and 14	**B1**

Answer: The two integers are 12 and 14

Question 10

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	**M1**
$(x - 3)^2 - 2$ cso	**A1**

Answer: $(x - 3)^2 - 2$

Question 11

correct factorisation (5x + 2)(x - 3) = 0 oe	**M1**
x = -2/5 oe	**A1**
x = 3 cao	**A1**

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

Question 12

(a) $(x + 5)^2$ seen (correct value of a)	**M1**
(a) $(x + 5)^2 - 6$ oe cao (correct value of b)	**A1**

(a) Answer: $(x + 5)^2 - 6$

(b) minimum value = -6 (ft from part (a))	**B1**
(b) x = -5 (ft from part (a))	**B1**

(b) Answer: Minimum value = -6 at x = -5

Question 13

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

Answer: $x = (4 + \sqrt{22})/2$ or $x = (4 - \sqrt{22})/2$

Question 14

completes the square correctly, $(x + 2)^2 + 5$ oe	**M1**
states or uses that $(x + 2)^2 \geq 0$ for all real x	**M1**
correct conclusion: since $(x + 2)^2 \geq 0$, $(x + 2)^2 + 5 \geq 5$, so $x^2 + 4x + 9 > 0$ for all real x (cso)	**A1**

Answer: $x^2 + 4x + 9 = (x + 2)^2 + 5$, and since $(x + 2)^2 \geq 0$ for all x, the expression is always at least 5, so it is always positive

Question 15

uses the condition for equal roots, $b^2 - 4ac = 0$, with a = p, b = 12, c = p	**M1**
forms $144 - 4p^2 = 0$ and rearranges to $p^2 = 36$ (dependent on the first M1)	**dM1**
p = 6	**A1**
p = -6	**A1**

Answer: p = 6 or p = -6

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