5.7 Expanding and Factorising Quadratics: 1-hour Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Expand and simplify $(x + 5)(x - 1)$.

(Total for Question 1 is 2 marks)

2 Factorise $x^2 - 4x - 12$.

(Total for Question 2 is 3 marks)

3 Expand and simplify fully: $(2x + 3)(x - 5)$.

(Total for Question 3 is 1 mark)

4 Solve $x^2 + 7x = 30$

(Total for Question 4 is 4 marks)

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5 Factorise each expression.

(a) Factorise $x^2 - 5x - 24$ **(2)**

(b) Factorise $x^2 - 13x + 40$ **(2)**

(Total for Question 5 is 4 marks)

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6 Expand and simplify $3(x - 2)(x + 1)$. Show all steps.

(Total for Question 6 is 4 marks)

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7 A rectangular lawn has length $(x + 11)$ m and width $(x - 2)$ m. The area of the lawn is 68 m².

(a) Show that $x^2 + 9x - 90 = 0$ **(3)**

(b) Solve the equation to find the value of x, given that $x > 0$ **(3)**

(c) Hence work out the perimeter of the lawn. **(2)**

(Total for Question 7 is 8 marks)

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8 Prove algebraically that $(2n + 3)^2 - (2n - 3)^2$ is always a multiple of 24, for any positive integer n.

(Total for Question 8 is 4 marks)

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9 This question has two parts.

(a) Show that $(x + 2)(x + k)$ expands to $x^2 + (k + 2)x + 2k$. **(1)**

(b) Hence find the value of k if $x^2 + 7x + 10 = (x + 2)(x + k)$. **(3)**

(Total for Question 9 is 4 marks)

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10 Three consecutive positive integers are such that the product of the smallest and the largest is 23 more than 5 times the middle integer. Find the three integers.

(Total for Question 10 is 6 marks)

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11 Solve the equation $2x^2 - 5x = 3$ by completing the square. Give answers in exact form.

(Total for Question 11 is 6 marks)

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Mark scheme · 5.7 Expanding and Factorising Quadratics: 1-hour Pack

Question 1

multiply terms correctly, e.g. x*x, x*(-1), 5*x, 5*(-1) or show full FOIL	**M1**
$x^2 + 4x - 5$ cao	**A1**

Answer: $x^2 + 4x - 5$.

Question 2

identify two numbers that multiply to -12 and add to -4 (-6 and 2) or show splitting the middle term	**M1**
(x - 6)(x + 2) cao	**A1**
correct check, e.g. expand to $x^2 - 4x - 12$ oe	**B1**

Answer: (x - 6)(x + 2).

Question 3

$2x^2 -10x +3x -15$ simplified to $2x^2 -7x -15$ cao	**B1**

Answer:$2x^2 - 7x - 15$

(Alternatively shown steps with correct simplification.)

Question 4

rearranges to $x^2 + 7x - 30 = 0$	**M1**
factorises to (x + 10)(x - 3) = 0	**M1**
x = -10	**A1**
x = 3 cao	**A1**

Answer: x = -10 or x = 3

Question 5

(a) attempts a factor pair of -24 that sums to -5, e.g. -8 and 3	**M1**
(a) (x - 8)(x + 3) cao	**A1**

(a) Answer: (x - 8)(x + 3)

(b) attempts a factor pair of 40 that sums to -13, e.g. -8 and -5	**M1**
(b) (x - 8)(x - 5) cao	**A1**

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

Question 6

expand (x - 2)(x + 1) to $x^2 - x - 2$ or show partial expansion	**M1**
multiply by 3 correctly to get $3x^2 - 3x - 6$	**M1**
$3x^2 - 3x - 6$ cao	**A1**
clear and correct working shown or check via substitution	**B1**

Answer: $3x^2 - 3x - 6$.

Question 7

(a) expands (x + 11)(x - 2) correctly, e.g. $x^2 - 2x + 11x - 22 = x^2 + 9x - 22$	**M1**
(a) sets the expansion equal to 68 and rearranges	**M1**
(a) correctly shows $x^2 + 9x - 90 = 0$ (cso)	**A1**

(a) Answer: $x^2 + 9x - 90 = 0$ (shown)

(b) factorises to (x + 15)(x - 6) = 0 (or uses a correct alternative method)	**M1**
(b) x = -15 and x = 6	**A1**
(b) selects x = 6, since x > 0 cao	**A1**

(b) Answer: x = 6

(c) finds length = 17 m and width = 4 m (ft their x)	**M1**
(c) 42 m cao	**A1**

(c) Answer: 42 m

Question 8

expands $(2n + 3)^2$ correctly to $4n^2 + 12n + 9$	**M1**
expands $(2n - 3)^2$ correctly to $4n^2 - 12n + 9$	**M1**
subtracts to obtain 24n (fully simplified)	**A1**
correct conclusion, e.g. since 24n = 24 x n, the expression is always a multiple of 24 for integer n	**B1**

Answer: $(2n+3)^2 - (2n-3)^2 = 24n$, which is always a multiple of 24

Question 9

(a) expansion shown: $x^2 + kx + 2x + 2k$ leading to $x^2 + (k+2)x + 2k$ oe	**B1**

(a) Answer: $x^2 + (k + 2)x + 2k$

(b) equate coefficients: k + 2 = 7 and 2k = 10 or using either equation	**M1**
(b) k = 5 from k + 2 = 7 cao	**A1**
(b) consistency 2k = 10 gives k = 5 cao	**A1**

(b) Answer: k = 5

Question 10

lets the middle integer be n and writes the smallest as n - 1 and the largest as n + 1 (or equivalent)	**M1**
forms the equation (n - 1)(n + 1) = 5n + 23	**M1**
expands and rearranges to the 3-term quadratic $n^2 - 5n - 24 = 0$	**M1**
factorises to (n - 8)(n + 3) = 0	**M1**
n = 8 (rejects n = -3 as not a positive integer)	**A1**
states the three integers 7, 8 and 9 cao	**A1**

Answer: 7, 8 and 9

Question 11

rearrange to $2x^2 -5x -3 = 0$ or isolate quadratic and linear terms: $2x^2 -5x = 3 \rightarrow 2x^2 -5x -3 = 0$	**M1**
divide by 2 to prepare for completing the square: $x^2 - (5/2)x - 3/2 = 0$	**M1**
complete the square: $x^2 - (5/2)x + (25/16) = 3/2 + 25/16$ or show adding $(5/4)^2$	**M1**
write $(x - 5/4)^2 = (24/16 + 25/16) = 49/16$ or equivalent arithmetic	**M1**
take square roots to get $x - 5/4 = \pm 7/4$	**A1**
x = 3 or x = -1/2 cao	**A1**

Answer:x = 3 or x = -1/2

(Exact values)

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