4.8 Expanding and Factorising: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 65 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Expand and simplify: 3(2x + 4).

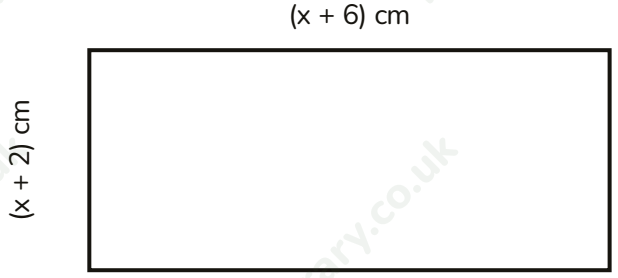
(Total for Question 1 is 2 marks)

2 Expand 6(x + 4)

(Total for Question 2 is 1 mark)

3 A rectangle has length (x + 6) cm and width (x + 2) cm. Find an expression, in its simplest form, for the area of the rectangle.

Diagram NOT accurately drawn



(Total for Question 3 is 3 marks)

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4 Factorise fully $9x^2 - 15x$

(Total for Question 4 is 2 marks)

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5 A rectangular label has length $(3x + 2)$ cm and width $(x - 1)$ cm. Find an expression for the area of the label and then expand and simplify it.

(a) Write an expression for the area of the rectangle. **(2)**

(b) Expand and simplify the expression from part (a). **(4)**

(Total for Question 5 is 6 marks)

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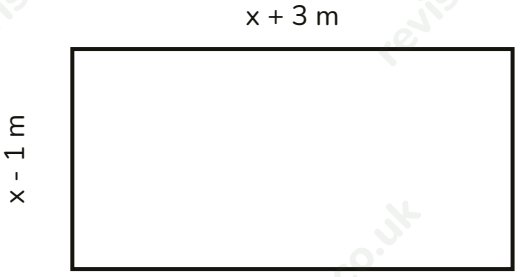
6 Factorise $x^2 + 3x - 40$

(Total for Question 6 is 2 marks)

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7 A rectangular garden has length (x + 3) metres and width (x - 1) metres. The area of the garden is 45 m².

Diagram NOT accurately drawn



(a) Show that $x^2 + 2x - 48 = 0$ **(2)**

(b) By factorising, solve the equation to find the width of the garden. **(3)**

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(Total for Question 7 is 5 marks)

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8 Nadia is solving the equation $x^2 + 2x - 15 = 0$ by factorising. Solve the equation, giving both solutions.

(Total for Question 8 is 3 marks)

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9 Expand and simplify. Give your answer in the form $ax^2 + bx + c$.

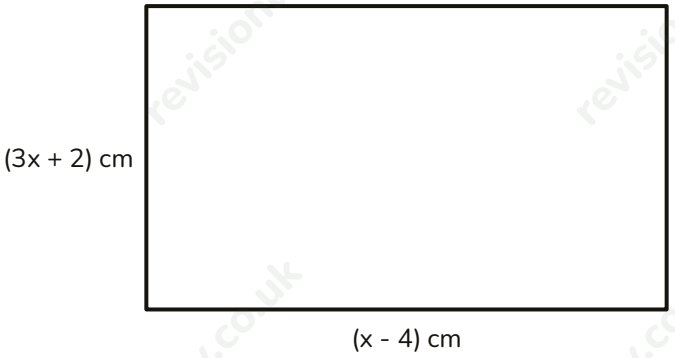
$0.5x(x - 6) + x(2x + 1)$

(Total for Question 9 is 3 marks)

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10 A rectangle has length $(3x + 2)$ cm and width $(x - 4)$ cm. The area is given by $A = (3x + 2)(x - 4)$.

Diagram NOT accurately drawn



(a) Expand and simplify A in the form $ax^2 + bx + c$. **(3)**

(b) Hence factorise the expression from part (a) and use your factorised form to work out the value of the expression when $x = 6$. **(2)**

(Total for Question 10 is 5 marks)

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11 Prove algebraically that the difference between the squares of any two consecutive even numbers is always a multiple of 4.

(Total for Question 11 is 3 marks)

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12 Simplify fully $(x^2 + 3x - 10) / (x^2 - 4)$

(Total for Question 12 is 3 marks)

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13 Completely factorise: $x^3 + 2x^2 - 9x - 18$.

(Total for Question 13 is 6 marks)

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14 Factorise fully $x^4 - 16$

(Total for Question 14 is 3 marks)

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Mark scheme · 4.8 Expanding and Factorising: Test Pack

Question 1

multiply each term by 3: 3*2x and 3*4 shown **M1**

6x + 12 cao **A1**

Answer: 6x + 12

Question 2

6x + 24 cao **B1**

Answer: 6x + 24

Question 3

sets up area = length x width, (x+6)(x+2) **M1**

at least 3 of the 4 terms correct, x^2, 2x, 6x, 12 **M1**

$x^2 + 8x + 12$ cm² oe cao, with units **A1**

Answer: $x^2 + 8x + 12$ cm^2

Question 4

correct HCF 3x identified oe **M1**

3x(3x - 5) cao **A1**

Answer: 3x(3x - 5)

Question 5

(a) area = length * width shown: (3x + 2)(x - 1) **M1**

(a) (3x + 2)(x - 1) cao **A1**

(a) Answer: (3x + 2)(x - 1)

(b) multiply out brackets correctly: 3x*x, 3x*(-1), 2*x, 2*(-1) shown **M1**

(b) write each term found: $3x^2$, -3x, 2x, -2 **M1**

(b) combine like terms correctly to give $3x^2 - x - 2$ cao **A1**

(b) final simplified form presented as $3x^2 - x - 2$ oe **B1**

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

Question 6

two numbers with sum 3 and product -40 identified (8 and -5) oe **M1**

(x + 8)(x - 5) cao **A1**

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

Question 7

(a) correct area expression, (x+3)(x-1) = 45 oe, expanded to $x^2 + 2x - 3 = 45$ **M1**

(a) cso, correctly rearranged to $x^2 + 2x - 48 = 0$ with all steps shown **A1**

(a) Answer: $x^2 + 2x - 48 = 0$ (shown)

(b) correct factorisation, (x+8)(x-6) = 0 oe, or valid alternative method **M1**

(b) x = -8 or x = 6 both found **A1**

(b) width = 5 m selected (dep), with reason that x = -8 is rejected as a length cannot be negative **A1**

(b) Answer: width = 5 m

Question 8

correctly factorises to (x + 5)(x - 3) oe **M1**

sets each factor equal to zero, x + 5 = 0 or x - 3 = 0, oe **M1**

x = -5 and x = 3 cao (both values) **A1**

Answer: x = -5 or x = 3

Question 9

expand 0.5x(x - 6) to $0.5x^2 - 3x$ and expand x(2x + 1) to $2x^2 + x$ **M1**

combine like terms correctly **M1**

$2.5x^2 - 2x + 0$ cao **A1**

Answer: $2.5x^2 - 2x$

Question 10

(a) multiply out brackets: 3x*x, 3x*(-4), 2*x, 2*(-4) **M1**

(a) combine like terms correctly **M1**

(a) $3x^2 - 10x - 8$ cao **A1**

(a) Answer: $3x^2 - 10x - 8$

(b) factorise $3x^2 - 10x - 8$ to (3x + 2)(x - 4) or equivalent **M1**

(b) substitute x = 6 into the factorised form: (3*6 + 2)(6 - 4) = 20 * 2 = 40 cao **A1**

(b) Answer: Factorised form (3x + 2)(x - 4); when x = 6 the expression equals 40

Question 11

lets the two consecutive even numbers be 2n and 2n + 2 (or equivalent) oe **M1**

expands and simplifies $(2n + 2)^2 - (2n)^2$ to reach 8n + 4 oe **M1**

factorises to 4(2n + 1) and concludes this is a multiple of 4 for all integer n, cso **C1**

Answer: $(2n + 2)^2 - (2n)^2 = 4(2n + 1)$, which is a multiple of 4 for every integer n

Question 12

factorises the numerator to (x + 5)(x - 2) oe **M1**

factorises the denominator to (x - 2)(x + 2) oe **M1**

(x + 5)/(x + 2) cao, with (x - 2) cancelled **A1**

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

Question 13

attempt factorisation by grouping or test integer roots (e.g. x = -3) to find a linear factor **M1**

divide polynomial by (x + 3) or use grouping to obtain quadratic $x^2 - x - 6$ **M1**

factor quadratic $x^2 - x - 6$ into (x + 2)(x - 3) **M1**

state intermediate factorisation $(x + 3)(x^2 - x - 6)$ cao **A1**

complete factorisation (x + 3)(x + 2)(x - 3) cao **A1**

final answer fully factorised cao **A1**

Answer: (x + 3)(x + 2)(x - 3)

Question 14

recognises difference of two squares, $x^4 - 16 = (x^2 - 4)(x^2 + 4)$ oe **M1**

factorises $x^2 - 4$ further as (x - 2)(x + 2) oe **dM1**

$(x - 2)(x + 2)(x^2 + 4)$ cao, fully factorised ($x^2 + 4$ does not factorise further) **A1**

Answer: $(x - 2)(x + 2)(x^2 + 4)$

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