HIGHER

6.5 Expanding Triple Brackets: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Expand and simplify $(x + 5)^3$
Give your answer in the form $x^3 + ax^2 + bx + c$

(Total for Question 1 is 4 marks)

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2 Expand and simplify $(x - 3)^3$
Give your answer in the form $x^3 + ax^2 + bx + c$

(Total for Question 2 is 4 marks)

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3 Expand and simplify $(2x - 1)(x + 3)(3x - 2)$.

(Total for Question 3 is 4 marks)

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4 Expand and simplify $(2x + 3)^3$.

(Total for Question 4 is 3 marks)

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

(Total for Question 5 is 3 marks)

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6 Expand and simplify $(x + 2)(2x - 3)(x + 2)$.

(Total for Question 6 is 3 marks)

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7 Expand and simplify $(x + 6)(x - 6)(x - 1)$.

(Total for Question 7 is 3 marks)

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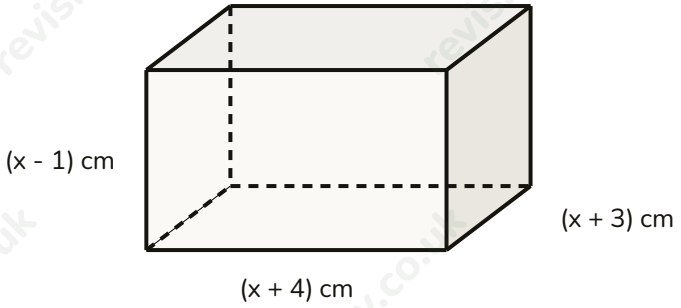
8 Expand and simplify $(x + 5)(x - 1)(4x + 2)$.

(Total for Question 8 is 3 marks)

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9 A cuboid has length (x + 4) cm, width (x + 3) cm and height (x - 1) cm. Find an expression for the volume of the cuboid in the form $ax^3 + bx^2 + cx + d$.

Diagram NOT accurately drawn



(Total for Question 9 is 3 marks)

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10 Work out the coefficient of x in the expansion of (x - 2)(x - 3)(x - 3).

(Total for Question 10 is 3 marks)

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11 Show that $(x + 4)(x - 4)(x + 2) = x^3 + 2x^2 - 16x - 32$

(Total for Question 11 is 3 marks)

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

(Total for Question 12 is 4 marks)

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13 Given that $(x + 2)(x + a)(x - 1) = x^3 + 4x^2 + x - 6$ for all values of x, find the value of a.

(Total for Question 13 is 3 marks)

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14 Prove that $n(n + 1)(n + 2)$ is a multiple of 6 for every positive integer n.

(Total for Question 14 is 3 marks)

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Mark scheme · 6.5 Expanding Triple Brackets: 1-hour Pack

Question 1

writes $(x + 5)^3$ as $(x + 5)(x + 5)(x + 5)$, or expands $(x+5)(x+5)$ correctly, $x^2 + 10x + 25$ (oe)	**M1**
multiplies their quadratic by the third $(x + 5)$, with at least 4 of the 6 terms correct	**M1**
$x^3 + 15x^2 + 75x + 125$ (oe unsimplified form)	**A1**
fully simplified $x^3 + 15x^2 + 75x + 125$ (cao)	**A1**

Answer: $x^3 + 15x^2 + 75x + 125$

Question 2

writes $(x - 3)^3$ as $(x - 3)(x - 3)(x - 3)$, or expands $(x-3)(x-3)$ correctly, $x^2 - 6x + 9$ (oe)	**M1**
multiplies their quadratic by the third $(x - 3)$, with at least 4 of the 6 terms correct	**M1**
$x^3 - 9x^2 + 27x - 27$ (oe unsimplified form)	**A1**
fully simplified $x^3 - 9x^2 + 27x - 27$ (cao)	**A1**

Answer: $x^3 - 9x^2 + 27x - 27$

Question 3

expands $(2x - 1)(x + 3)$ correctly, $2x^2 + 5x - 3$ (oe)	**M1**
correct method to multiply their quadratic by $(3x - 2)$	**M1**
at least 4 of the 6 resulting terms correct, ft their quadratic	**A1**
$6x^3 + 11x^2 - 19x + 6$ (cao)	**A1**

Answer: $6x^3 + 11x^2 - 19x + 6$

Question 4

expands two brackets: $4x^2 + 12x + 9$	**M1**
multiplies by the third bracket	**M1**
$8x^3 + 36x^2 + 54x + 27$ cao	**A1**

Answer: $8x^3 + 36x^2 + 54x + 27$

Question 5

expands two brackets: $x^2 + 7x + 10$ (at least 3 terms correct)	**M1**
multiplies by the third bracket (at least 6 terms, at most 1 error)	**M1**
$x^3 + 10x^2 + 31x + 30$ cao	**A1**

Answer: $x^3 + 10x^2 + 31x + 30$

Question 6

expands two brackets (at least 3 terms correct)	**M1**
multiplies by the third bracket (at least 6 terms, at most 1 error)	**M1**
$2x^3 + 5x^2 - 4x - 12$ cao	**A1**

Answer: $2x^3 + 5x^2 - 4x - 12$

Question 7

expands the first two brackets: $x^2 - 36$	**M1**
multiplies by the third bracket	**M1**
$x^3 - x^2 - 36x + 36$ cao	**A1**

Answer: $x^3 - x^2 - 36x + 36$

Question 8

expands two brackets (at least 3 terms correct)	**M1**
multiplies by the third bracket (at least 6 terms, at most 1 error)	**M1**
$4x^3 + 18x^2 - 12x - 10$ cao	**A1**

Answer: $4x^3 + 18x^2 - 12x - 10$

Question 9

multiplies two of the expressions	**M1**
multiplies by the third expression	**M1**
$x^3 + 6x^2 + 5x - 12$ cm³ cao	**A1**

Answer: $x^3 + 6x^2 + 5x - 12$ cm^3

Question 10

expands two brackets correctly	**M1**
identifies the terms of the cubic giving x	**M1**
21 cao	**A1**

Answer: 21

Question 11

uses the difference of two squares on the first pair of brackets, $x^2 - 16$ (oe)	**M1**
multiplies $(x^2 - 16)$ by $(x + 2)$, with at least 3 of the 4 terms correct	**M1**
$x^3 + 2x^2 - 16x - 32$ shown correctly with no errors (cso)	**A1**

Answer: $x^3 + 2x^2 - 16x - 32$ (shown)

Question 12

expands $(x+3)(x+4)$ correctly to get $x^2+7x+12$ oe	**M1**
(dep) multiplies their quadratic by $(2x+1)$, with at least 4 of the 6 terms correct	**M1**
correct unsimplified expansion, e.g. $2x^3+14x^2+24x+x^2+7x+12$ oe	**A1**
$2x^3 + 15x^2 + 31x + 12$ cao	**A1**

Answer: $2x^3 + 15x^2 + 31x + 12$

Question 13

expands $(x + 2)(x + a)(x - 1)$ in terms of a, e.g. via $(x+2)(x+a) = x^2 + (a+2)x + 2a$	**M1**
forms and uses a correct equation by comparing coefficients (e.g. constant term $-2a = -6$, or coefficient of x^2: $a + 1 = 4$)	**M1**
$a = 3$ (cao)	**A1**

Answer: $a = 3$

Question 14

correctly identifies that n, n+1 and n+2 are three consecutive integers, so at least one is a multiple of 2 and exactly one is a multiple of 3	**B1**
expands $n(n+1)(n+2) = n^3 + 3n^2 + 2n$ oe, or otherwise sets up the product to support a valid argument	**M1**
cso - complete, correctly reasoned argument that the product must be divisible by both 2 and 3, and hence by 6, with no gaps	**A1**

Answer: $n(n+1)(n+2) = n^3 + 3n^2 + 2n$, which is always a multiple of 6 (proof required)

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