

Expanding Triple Brackets

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

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

Step 1 · First two brackets

$$(x + 2)(x + 3) = x^2 + 5x + 6$$

Step 2 · Multiply each term by $(x + 4)$

$$x^3 + 4x^2 + 5x^2 + 20x + 6x + 24$$

Step 3 · Collect like terms

$$x^3 + 9x^2 + 26x + 24$$

Answer: $x^3 + 9x^2 + 26x + 24$

Check: $x = 1$: $3 \times 4 \times 5 = 60$ and $1 + 9 + 26 + 24 = 60$ ✓

2. Now try one with the steps

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

Step 1 · First two brackets

Step 2 · Multiply by $(2x + 3)$

Step 3 · Collect

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Is $x(x + 2) = x^2 + 2x$ an equation or an identity? [1]

2. Show that $(x + 4)^2 - 16 \equiv x(x + 8)$. [2]

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

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

5. Expand and simplify $(x + 5)(x - 5)(x + 1)$. [3]

6. Expand $(x + 2)^3$. [3]

7. Expand $(x - 1)^3$. [3]

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

9. Expand $(2x - 1)^3$. [3]

10. Find the coefficient of x^2 in the expansion of $(x + 4)(x - 1)(x + 3)$. [1]

11. Find the constant term in the expansion of $(x - 2)(x + 5)(x - 3)$. [1]

12. $(x + a)(x + 5) \equiv x^2 + 8x + b$. Find a and b . [2]

13. Show that $(x + 1)(x + 2)(x + 3) - x^3 \equiv 6x^2 + 11x + 6$. [2]

14. Expand and simplify $(x + 2)(x + 3)(x + 4) - (x + 1)(x + 2)(x + 3)$. [4]

15. A cuboid has edges $(x + 1)$ cm, $(x + 2)$ cm and $(2x - 1)$ cm. Write its volume expanded expression. [3]

4. Before you hand it in

$(x + 2)^3 = x^3 + 8$

A power of a bracket must be multiplied out: $(x + 2)(x + 2)(x + 2) = x^3 + 6x^2 + 12x + 8$.

$(x + 1)(x + 2)(x + 3)$: multiplying $(x + 3)$ only by the x^2 term

All three terms of $x^2 + 3x + 2$ must be multiplied by both x and 3 — six products in total.

Sign slips such as $(-2) \times (-3) = -6$ in the constant

Check the constant separately: it is the product of the three numbers. Then test $x = 1$ in both forms.

Writing an identity with $=$ and solving it for x

An identity is true for all x , so there is nothing to solve. Compare coefficients instead to find unknown constants.