MATHEMATICS · GRADES 7-9

Expanding binomials

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you multiply out a formula that comes in brackets. A garden that is a few metres longer on each side has an area you find by expanding the brackets. The expanded form shows you the area as a sum of simple pieces. It is how you get from a compact formula to an answer you can measure and build.



Rule

Expanding binomials: multiply every term in the first bracket by every term in the second bracket, then collect the like terms.

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

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Worked examples

EXAMPLE 1

Q **Expand $(x + 3)(x + 2)$.**

SOLUTION

This is a product of two binomials, so pair every term in the first bracket with every term in the second: first, outer, inner, last.

$x \times x = x^2$, $x \times 2 = 2x$, $3 \times x = 3x$, and $3 \times 2 = 6$

Collect the like terms: $2x + 3x = 5x$, so the answer is $x^2 + 5x + 6$

EXAMPLE 2

Q **Expand $(x - 4)(x + 1)$.**

SOLUTION

First, outer, inner, last: $x \times x = x^2$, $x \times 1 = x$, $-4 \times x = -4x$, and $-4 \times 1 = -4$

Collect the like terms: $x - 4x = -3x$

So the answer is $x^2 - 3x - 4$

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Practice questions

1 Expand $(x + 5)(x + 4)$.

- **A** $x^2 + 7x + 20$
- **B** $x^2 + 9x + 9$
- **C** $x^2 + 9x + 20$
- **D** $x^2 + 20$

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

- **A** $x^2 + 3x - 18$
- **B** $x^2 - 3x - 18$
- **C** $x^2 + 3x + 18$
- **D** $x^2 - 18$

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3 Expand $(5x + 2)(4x - 3)$.

- **A** $20x^2 + 7x - 6$
- **B** $20x^2 - 7x + 6$
- **C** $20x^2 - 23x - 6$
- **D** $20x^2 - 7x - 6$

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4 Expand $(x + 4)(x - 4)$.

- **A** $x^2 + 16$
- **B** $x^2 - 16$
- **C** $x^2 - 8x - 16$
- **D** $x^2 + 8x + 16$

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5 Expand $(x + 3)^2$

A $x^2 + 9$

B $x^2 - 6x + 9$

C $x^2 + 6x + 9$

D $x^2 + 3x + 9$

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6 Expand $(2x - 5)(x + 4)$.

A $2x^2 + 3x - 20$

B $2x^2 - 3x - 20$

C $2x^2 + 3x + 20$

D $2x^2 + 13x - 20$

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7 A square tile has side $x + 1$ cm. Write its area as an expanded expression.

- **A** $x^2 + 1$
- **B** $x^2 - 2x + 1$
- **C** $x^2 + 2x + 2$
- **D** $x^2 + 2x + 1$

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8 Which of these products expands to $x^2 + 9x + 20$?

- **A** $(x + 2)(x + 10)$
- **B** $(x + 4)(x + 5)$
- **C** $(x + 5)(x + 5)$

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9 **Nia writes $(x + 3)(x + 3) = x^2 + 9$. What is missing from her answer?**

- **A** Nothing is missing; $x^2 + 9$ is correct
- **B** The middle term, $6x$; $x^2 + 6x + 9$
- **C** The x^2 term
- **D** The 9

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10 **A rectangle has length $x + 5$ cm and width $x - 2$ cm. Write its area as an expanded expression.**

- **A** $x^2 + 3x - 10$
- **B** $x^2 - 3x - 10$
- **C** $x^2 + 3x + 10$
- **D** $x^2 + 7x - 10$

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ANSWER KEY

1. $x^2 + 9x + 20$

2. $x^2 + 3x - 18$

3. $20x^2 - 7x - 6$

4. $x^2 - 16$

5. $x^2 + 6x + 9$

6. $2x^2 + 3x - 20$

7. $x^2 + 2x + 1$

8. $(x + 4)(x + 5)$

9. The middle term, $6x$; $x^2 + 6x + 9$

10. $x^2 + 3x - 10$

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