MATHEMATICS · GRADES 10-12

Expanding binomials

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you multiply out a bracket that is squared or multiplied by another bracket. A square patio that is a few metres longer on each side has an area you find by expanding the brackets. The result tells you the area in plain terms, without brackets in the way. It is the step that turns a formula into a number you can use.



Rule

Squaring a binomial (a bracket with two terms in it, like (x + 3)): $(a + b)^2 = a^2 + 2ab + b^2$, and $(a - b)^2 = a^2 - 2ab + b^2$.

Write the square as two brackets, multiply every term in one bracket by every term in the other, then collect the middle terms.

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Worked examples

EXAMPLE 1

Q Expand $(x + 3)^2$

SOLUTION

Write it as $(x + 3)(x + 3)$

Multiply: $x \times x = x^2$, $x \times 3 = 3x$, $3 \times x = 3x$, $3 \times 3 = 9$

Add the middle terms: $x^2 + 6x + 9$

EXAMPLE 2

Q Expand $(x - 4)^2$

SOLUTION

Write it as $(x - 4)(x - 4)$

Multiply: $x \times x = x^2$, $x \times -4 = -4x$, $-4 \times x = -4x$, $-4 \times -4 = 16$

Add the middle terms: $x^2 - 8x + 16$

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Practice questions

1 Expand $(x + 5)^2$

A $x^2 + 5x + 25$

B $x^2 + 10x + 5$

C $x^2 + 10x + 25$

D $x^2 - 10x + 25$

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2 Expand $(x - 2)^2$

A $x^2 + 4x + 4$

B $x^2 - 4x + 4$

C $x^2 - 2x + 4$

D $x^2 - 4x - 4$

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3 Expand $(x + 3)(x + 4)$.

A $x^2 + 7x + 12$

B $x^2 + 12x + 7$

C $x^2 + 7x + 7$

D $x^2 + 3x + 4$

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

A $x^2 - 25$

B $x^2 + 25$

C $x^2 - 10x - 25$

D $x^2 + 10x + 25$

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5 What is the middle term when $(x + 8)^2$ is expanded?

- A 8x
- B 16x
- C 64
- D 16

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6 What is the last term when $(x + 6)^2$ is expanded?

- A 6
- B 12x
- C 36
- D 12

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7 One of these squares expands to $x^2 - 10x + 25$. Which one?

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

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8 Omar expands $(x - 4)^2$ and writes $x^2 - 16$. What did he forget?

- **A** The middle term, $-8x$
- **B** The x^2 term
- **C** The -16
- **D** Nothing; $x^2 - 16$ is correct

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9 Expand $(2x + 1)^2$

- **A** $4x^2 + 2x + 1$
- **B** $2x^2 + 4x + 1$
- **C** $4x^2 - 4x + 1$
- **D** $4x^2 + 4x + 1$

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10 Three of these squares have x^2 as their first term and one does not. Which one is it?

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

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ANSWER KEY

1. $x^2 + 10x + 25$

2. $x^2 - 4x + 4$

3. $x^2 + 7x + 12$

4. $x^2 - 25$

5. 16x

6. 36

7. $(x - 5)^2$

8. The middle term, –8x

9. $4x^2 + 4x + 1$

10. $(2x + 2)^2$

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