MATHEMATICS · GRADES 10-12

Difference of squares

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is a shortcut for working out an area that is a square with a square cut out of it. A picture frame is a big square minus a smaller square, and so is a garden path around a lawn. Instead of working out both areas and subtracting, the shortcut gives you the answer in one step. It turns a two-step job into a single multiplication.



Rule

Difference of squares: $a^2 - b^2 = (a - b) \times (a + b)$.

Write each term as a square, then use the pattern with those two numbers. The pattern works for any a and b.

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Worked examples

EXAMPLE 1

Q Factor $x^2 - 16$

SOLUTION

Write each term as a square: x^2 is $(x)^2$ and 16 is $(4)^2$

Apply the pattern $a^2 - b^2 = (a - b)(a + b)$ with $a = x$ and $b = 4$

Write the result: $(x - 4)(x + 4)$

EXAMPLE 2

Q Factor $9x^2 - 25$

SOLUTION

Write each term as a square: $9x^2$ is $(3x)^2$ and 25 is $(5)^2$

Apply the pattern with $a = 3x$ and $b = 5$

Write the result: $(3x - 5)(3x + 5)$

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Practice questions

1 Factor $x^2 - 9$

A $(x - 3)(x - 3)$

B $(x - 3)(x + 3)$

C $(x + 3)(x + 3)$

D $(x - 9)(x + 9)$

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2 Expand $(x - 7)(x + 7)$.

A $x^2 - 49$

B $x^2 + 49$

C $x^2 - 14x + 49$

D $x^2 + 14x - 49$

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3 Factor $4x^2 - 25$

A (2x - 5)(2x - 5)

B (x - 5)(x + 5)

C (2x - 5)(2x + 5)

D (4x - 5)(4x + 5)

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4 Factor $25 - x^2$.

A (5 - x)(5 + x)

B (x - 5)(x + 5)

C (5 - x)(5 - x)

D (x - 5)(x - 5)

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5 Factor $x^4 - 16$ completely.

- **A** $(x - 2)(x + 2)(x^2 + 4)$
- **B** $(x^2 - 4)(x^2 + 4)$
- **C** $(x - 4)(x + 4)$
- **D** $(x^2 - 16)(x^2 + 16)$

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6 The area of a square garden with a square pond cut out is $x^2 - 36$. What are the side lengths of the two squares?

- **A** x and 6
- **B** 6 and 36
- **C** x^2 and 36
- **D** x and 36

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7 The factored form is $(x - 8)(x + 8)$. What was the original expression?

- **A** $x^2 + 64$
- **B** $x^2 - 16$
- **C** $x^2 - 64$
- **D** $x^2 - 8$

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8 Why is $x^2 + 9$ not a difference of squares?

- **A** It is a difference, but 9 is not a square.
- **B** It factors as $(x - 3)(x + 3)$.
- **C** It is a sum, not a difference; a sum of squares does not factor over the real numbers
- **D** It is a sum, so it factors as $(x + 3)(x + 3)$.

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9 Which difference of squares has the factor (x - 7)?

- A $x^2 - 25$
- B $x^2 - 36$
- C $x^2 - 49$
- D $x^2 - 64$

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10 Which one is not a difference of squares?

- A $x^2 - 16$
- B $x^2 - 25$
- C $x^2 - 36$
- D $x^2 - 20$

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ANSWER KEY

1. $(x - 3)(x + 3)$

2. $x^2 - 49$

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

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

5. $(x - 2)(x + 2)(x^2 + 4)$

6. x and 6

7. $x^2 - 64$

8. It is a sum, not a difference; a sum of squares does not factor over the real numbers

9. $x^2 - 49$

10. $x^2 - 20$

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