

Factorisation Using Identities

Unit: Algebra - Student Practice Worksheet

Overview: Meera gave Arjun 60 seconds to factorise $x^2 - 81$ before she finished tying her shoelace. Arjun reached for the $(x+a)(x+b)$ method and started hunting for two numbers that multiply to -81 and add to 0. Meera finished her laces, glanced at the problem, and said "9 and 9" without touching a pen.

Practice Questions (30 Total)

Section A - Easy

Q1. Big square x^2 minus small square 49. Factorise.



- ☐ A. $(x + 7)(x - 7)$
- ☐ B. $(x + 49)(x - 1)$
- ☐ C. $(x - 7)^2$
- ☐ D. $(x + 7)^2$

Q2. Which sign must appear between two perfect squares for the difference-of-squares identity to apply?

- ☐ A. Plus
- ☐ B. Times
- ☐ C. Minus
- ☐ D. Divide

Q3. What is the square root of 81?

- ☐ A. 8
- ☐ B. 9
- ☐ C. 18
- ☐ D. 6

Q4. Tiles for $x^2 - 10x + 25$. Factor as a perfect square.



$$x^2 - 10x + 25$$

- ☐ A. $(x - 5)^2$
- ☐ B. $(x + 5)^2$
- ☐ C. $(x + 5)(x - 5)$
- ☐ D. $(x - 25)(x + 1)$

Q5. Does $x^2 + 9$ factor using real numbers with these identities?

- ☐ A. Yes, as $(x+3)(x-3)$
- ☐ B. Yes, as $(x+3)^2$
- ☐ C. Yes, as $(x+9)(x-1)$
- ☐ D. No — it is a sum of two squares

Q6. Factorise $x^2 - 16$.

- ☐ A. $(x + 8)(x - 2)$
- ☐ B. $(x - 4)^2$
- ☐ C. $(x + 4)(x - 4)$
- ☐ D. $(x + 16)(x - 1)$

Q7. Tiles for $x^2 + 6x + 9$. Factor as a perfect square.



$$x^2 + 6x + 9$$

- ☐ A. $(x + 3)(x - 3)$
- ☐ B. $(x + 3)^2$
- ☐ C. $(x + 9)^2$
- ☐ D. $(x + 6)(x + 3)$

Q8. For $x^2 - 10x + 25$ to be a perfect square trinomial, what must 25 be?

- ☐ A. Twice a square root
- ☐ B. Half of 10
- ☐ C. The sum of the roots
- ☐ D. A perfect square, namely 5^2

Q9. Before using an identity to factorise, what should you check first?

- ☐ A. Whether the expression has a fraction
- ☐ B. Whether both ends are perfect squares
- ☐ C. Whether it has three terms only
- ☐ D. Whether x is positive

Q10. In $a^2+2ab+b^2$, what must the middle term equal, and why $2ab$?

- ☐ A. Twice the product of the square roots of the ends
- ☐ B. The sum of the ends
- ☐ C. The product of the ends
- ☐ D. Half the product of the ends

Section B - Medium

Q11. $(2x)^2$ minus 5^2 . Factorise $4x^2 - 25$.

$$(2x)^2 - 5^2$$

- ☐ A. $(2x + 5)(2x - 5)$
- ☐ B. $(4x + 5)(x - 5)$
- ☐ C. $(2x - 5)^2$
- ☐ D. $(4x - 25)(x)$

Q12. Which of these is NOT a perfect square trinomial?

- ☐ A. $x^2 + 8x + 16$
- ☐ B. $x^2 + 5x + 25$
- ☐ C. $x^2 - 12x + 36$
- ☐ D. $x^2 + 14x + 49$

Q13. Factorise $9x^2 + 12x + 4$.

- ☐ A. $(3x + 4)(3x + 1)$
- ☐ B. $(3x + 2)^2$
- ☐ C. $(9x + 2)^2$
- ☐ D. $(3x + 2)(3x - 2)$

Q14. 10^2 minus x^2 . Factorise $100 - x^2$.

$$10^2 \quad - \quad x^2$$

- ☐ A. $(x + 10)^2$
- ☐ B. $(10 - x)^2$
- ☐ C. $(x - 100)(x + 1)$
- ☐ D. $(10 + x)(10 - x)$

Q15. For $25x^2 + kx + 4$ to be a perfect square trinomial, what must k be?

- ☐ A. 10
- ☐ B. 40
- ☐ C. 25
- ☐ D. 20

Q16. Factorise $4x^2 - 20x + 25$.

- ☐ A. $(2x + 5)^2$
- ☐ B. $(4x - 5)(x - 5)$
- ☐ C. $(2x - 5)^2$
- ☐ D. $(2x - 5)(2x + 5)$

Q17. $(4x)^2$ minus 1^2 . Factorise $16x^2 - 1$.

$$(4x)^2 \quad - \quad 1^2$$

- ☐ A. $(4x + 1)(4x - 1)$
- ☐ B. $(16x + 1)(x - 1)$
- ☐ C. $(4x - 1)^2$
- ☐ D. $(8x + 1)(2x - 1)$

Q18. Factorise $x^4 - 16$ (treat x^2 as the square root's square).

- ☐ A. $(x^2 - 4)^2$
- ☐ B. $(x + 4)(x - 4)$
- ☐ C. $(x^2 + 4)(x^2 - 4)$

☐ **D.** $(x^2 + 4)^2$

Q19. Is $x^2 + 4x + 4$ a perfect square trinomial? If so, factorise it.

☐ **A.** No, it does not fit the shape

☐ **B.** Yes, $(x + 2)^2$

☐ **C.** Yes, $(x + 4)^2$

☐ **D.** Yes, $(x + 2)(x - 2)$

Q20. Treat $(x+1)$ as one square root: factorise $(x+1)^2 - 4$.

☐ **A.** $(x + 3)(x - 1)$

☐ **B.** $(x + 1 + 4)(x + 1 - 4)$

☐ **C.** $(x - 1)(x + 1)$

☐ **D.** $(x + 3)^2$

Section C - Challenge

Q21. Factorise $9x^2 - 30x + 25$ and name the identity shape.

$$9x^2 - 30x + 25$$

☐ **A.** $(3x - 5)^2$, a perfect square trinomial

☐ **B.** $(3x + 5)(3x - 5)$, a difference of squares

☐ **C.** $(9x - 5)(x - 5)$

☐ **D.** $(3x - 5)(3x + 25)$

Q22. If $x^2 + kx + 49$ is a perfect square trinomial with a POSITIVE middle term, what is k ?

☐ **A.** 49

☐ **B.** 14

☐ **C.** 7

☐ **D.** -14

Q23. Factorise $x^3 - 81$ completely, using the difference-of-squares identity twice.

☐ **A.** $(x^2 - 9)^2$

☐ **B.** $(x^2 + 9)(x + 3)(x - 3)$

☐ **C.** $(x + 3)^2(x - 3)^2$

☐ D. $(x^2 + 9)(x^2 - 9)$

Q24. Square field area $x^2+20x+100$. Side length?



area $x^2+20x+100$

☐ A. $(x + 20)$ m

☐ B. $(x + 100)$ m

☐ C. $(x + 10)$ m

☐ D. $(x + 10)(x - 10)$ m

Q25. Factorise $x^2 - (y + 3)^2$ using the difference-of-squares identity with a compound second term.

☐ A. $(x + y - 3)(x - y + 3)$

☐ B. $(x - y)(x - 3)$

☐ C. $(x + y)(x - 3)$

☐ D. $(x + y + 3)(x - y - 3)$

Q26. Simplify $(x + 5)^2 - (x - 5)^2$ using identities, without fully expanding either bracket first.

☐ A. 0

☐ B. $10x$

☐ C. 50

☐ D. $20x$

Q27. GCF 3 from $3x^2-27$, then factor x^2-9 .



$x^2 - 9$

from $3x^2-27$

☐ A. $3(x + 3)(x - 3)$

☐ B. $3(x - 3)^2$

☐ C. $(3x + 9)(x - 3)$

☐ D. $3(x^2 - 9)^2$

Q28. Evaluate $97^2 - 3^2$ using the difference-of-squares identity, without squaring either number directly.

- ☐ A. 9409
- ☐ B. 9391
- ☐ C. 9400
- ☐ D. 94

Q29. Factorise $x^2 - 2x + 1 - y^2$ completely, grouping the perfect square trinomial first.

- ☐ A. $(x + y - 1)(x - y - 1)$
- ☐ B. $(x - 1 + y)(x - 1 - y)$
- ☐ C. $(x - 1)^2(y)$
- ☐ D. $(x - y)(x + y - 1)$

Q30. Choose k so $4x^2 + 20x + k$ is a square, and write the factored form.

- ☐ A. $k=25$, giving $(2x+5)^2$
- ☐ B. $k=100$, giving $(2x+10)^2$
- ☐ C. $k=10$, giving $(2x+5)(2x+2)$
- ☐ D. $k=5$, giving $(2x+5)(2x+1)$

Answer Key

Q1: (A) (a) $(x + 7)(x - 7)$. Both x^2 and 49 are perfect squares ($49 = 7^2$) with a minus between them, matching $a^2 - b^2$.

Q2: (C) (c) Minus. $a^2 - b^2$ factors neatly; $a^2 + b^2$, a genuine sum of two squares, does not factor using real numbers.

Q3: (B) (b) 9, since $9 \times 9 = 81$ — this is exactly why $x^2 - 81$ becomes $(x+9)(x-9)$.

Q4: (A) (a) $(x - 5)^2$. The middle term is negative, matching $a^2 - 2ab + b^2$, so the bracket carries a minus sign.

Q5: (D) (d) No — it is a sum of two squares. There is a plus sign, not a minus, so the difference-of-squares identity does not apply.

Q6: (C) (c) $(x + 4)(x - 4)$. $16 = 4^2$, and there's no middle term, matching the difference-of-squares shape exactly.

Q7: (B) (b) $(x + 3)^2$. $9 = 3^2$, and the middle term $6x$ equals $2 \times x \times 3$, matching the perfect square trinomial shape $a^2 + 2ab + b^2$.

Q8: (D) (d) A perfect square, namely 5^2 . Then check the middle term: $2 \times x \times 5 = 10x$, which matches, confirming $(x-5)^2$.

Q9: (B) (b) Whether both ends are perfect squares — that, plus checking the middle term (if any) fits, is the whole identity-spotting checklist.

Q10: (A) (a) Twice the product of the square roots of the ends. This is exactly what $2ab$ means once a and b are the square roots of the two outer terms.

Q11: (A) (a) $(2x + 5)(2x - 5)$. $4x^2 = (2x)^2$ and $25 = 5^2$, with no middle term — a genuine difference of squares.

Q12: (B) (b) $x^2 + 5x + 25$ is not a perfect square trinomial — for that shape the middle term would need to be $2 \times x \times 5 = 10x$, not $5x$.

Q13: (B) (b) $(3x + 2)^2$. $9x^2 = (3x)^2$, $4 = 2^2$, and $2 \times 3x \times 2 = 12x$ matches the middle term exactly.

Q14: (D) (d) $(10 + x)(10 - x)$. Reorder as a difference of squares with $a = 10$, $b = x$ — the identity works regardless of which perfect square is written first.

Q15: (D) (d) 20. Since $25x^2 = (5x)^2$ and $4 = 2^2$, the middle term must be $2 \times 5x \times 2 = 20x$, so $k = 20$.

Q16: (C) (c) $(2x - 5)^2$. $4x^2 = (2x)^2$, $25 = 5^2$, and $2 \times 2x \times 5 = 20x$ matches with a minus sign throughout.

Q17: (A) (a) $(4x + 1)(4x - 1)$. $16x^2 = (4x)^2$ and $1 = 1^2$, with no middle term.

Q18: (C) (c) $(x^2 + 4)(x^2 - 4)$. $x^4 = (x^2)^2$ and $16 = 4^2$, so the same identity applies with $a = x^2$, $b = 4$ — this can even factor further into $(x^2+4)(x+2)(x-2)$.

Q19: (B) (b) Yes, $(x + 2)^2$. $4 = 2^2$, and $2 \times x \times 2 = 4x$ matches the middle term — a genuine perfect square trinomial.

Q20: (A) (a) $(x + 3)(x - 1)$. Treat $(x+1)$ as a single square root: $(x+1)^2 - 2^2 = ((x+1)+2)((x+1)-2) = (x+3)(x-1)$.

Q21: (A) (a) $(3x - 5)^2$, a perfect square trinomial. $9x^2 = (3x)^2$, $25 = 5^2$, and $2 \times 3x \times 5 = 30x$ matches the middle term with a minus sign.

Q22: (B) (b) 14. $49=7^2$, so the middle term must be $2 \times x \times 7=14x$ for a positive middle term, giving $(x+7)^2$.

Q23: (B) (b) $(x^2 + 9)(x + 3)(x - 3)$. First $x^2 - 81 = (x^2+9)(x^2-9)$, then x^2-9 factors again as $(x+3)(x-3)$ — option (d) stops one step too early.

Q24: (C) (c) $(x + 10)$ m. The area is a perfect square trinomial: $100=10^2$, and $2 \times x \times 10=20x$ matches, so the area is $(x+10)^2$, making the side length $(x+10)$.

Q25: (D) (d) $(x + y + 3)(x - y - 3)$. Treat $(y+3)$ as a single b : $x^2-b^2 = (x+b)(x-b) = (x+(y+3))(x-(y+3))$.

Q26: (D) (d) $20x$. Using a^2-b^2 with $a=(x+5)$, $b=(x-5)$: $[(x+5)+(x-5)][(x+5)-(x-5)] = (2x)(10) = 20x$.

Q27: (A) (a) $3(x + 3)(x - 3)$. First pull out GCF 3 to get $3(x^2-9)$, then apply the difference-of-squares identity to x^2-9 .

Q28: (C) (c) 9400. $(97+3)(97-3) = 100 \times 94 = 9400$ — far quicker than squaring 97 directly.

Q29: (B) (b) $(x - 1 + y)(x - 1 - y)$. First $x^2-2x+1 = (x-1)^2$, then $(x-1)^2 - y^2$ is a difference of squares: $((x-1)+y)((x-1)-y)$.

Q30: (A) (a) $k=25$, giving $(2x+5)^2$. Since $4x^2=(2x)^2$, and the middle term $20x=2 \times 2x \times 5$ forces the missing root to be 5, so $k=5^2=25$.

You've got this! Keep learning and shining! - Ruchi Math Coaching