# Class 9 Maths Chapter 4: Exploring Algebraic Identities - Notes, Important Questions and MCQs (2026-27)

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These Class 9 Maths Chapter 4 notes cover “Exploring Algebraic Identities” from the new NCERT textbook Ganita Manjari (Part I, 2026-27): what identities are, visualising them with squares, rectangles, cubes and algebra tiles, factorisation using identities and tiles, cube identities, using identities for quick calculations and simplifying rational expressions – with a complete identity table, solved examples, Q&A, 10 MCQs and a free PDF.

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## Chapter Overview

An identity is an equation that is true for every value of its variables, unlike an equation that holds only for particular values. Identities such as $(x + y)^2 = x^2 + 2xy + y^2$ can be seen geometrically by splitting a square into smaller squares and rectangles.

Identities make factorisation easy, help multiply and square numbers mentally, and simplify algebraic fractions. The chapter extends from square identities to three-variable squares and cube identities, visualised with cubes and cuboids.

## Important Topics and Concepts

### Identities vs Equations

- An identity holds for all values of the variables (e.g. $(x + 1)^2 = x^2 + 2x + 1$).
- An equation holds only for some values (e.g. $2x + 1 = 7$ only when $x = 3$).
- Identities can be checked by substituting several values.

### Visualising Identities

- A square of side $(a + b)$ splits into $a^2$, $b^2$ and two rectangles $ab \rightarrow (a + b)^2 = a^2 + 2ab + b^2$.
- Removing strips from a square shows $(a – b)^2$ and $a^2 – b^2 = (a + b)(a – b)$.
- A square of side $(a + b + c)$ gives $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$.
- A cube of edge $(a + b)$ splits into $a^3$, $b^3$, three cuboids $a^2b$ and three cuboids $ab^2 \rightarrow (a + b)^3$.

### Factorisation Using Identities

- Recognise patterns: $x^2 + 6x + 9 = (x + 3)^2$; $9y^2 – 16 = (3y – 4)(3y + 4)$.
- Algebra tiles: arrange $x^2$, $x$ and unit tiles into a rectangle; its sides are the factors.
- Without tiles, split the middle term: for $x^2 + 7x + 12$ find two numbers with sum 7 and product 12 $\rightarrow (x + 3)(x + 4)$.
- For $ax^2 + bx + c$, find numbers with product $ac$ and sum $b$.

### Cube Identities

- $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 = x^3 + y^3 + 3xy(x + y)$.
- $(x – y)^3 = x^3 – 3x^2y + 3xy^2 – y^3$.
- $x^3 + y^3 = (x + y)(x^2 – xy + y^2)$; $x^3 – y^3 = (x – y)(x^2 + xy + y^2)$.
- $x^3 + y^3 + z^3 – 3xyz = (x + y + z)(x^2 + y^2 + z^2 – xy – yz – zx)$; if $x + y + z = 0$ then $x^3 + y^3 + z^3 = 3xyz$.

### Quick Calculations and Rational Expressions

- $103^2 = (100 + 3)^2 = 10609$; $98^2 = (100 – 2)^2 = 9604$.
- $102 \times 98 = 100^2 – 2^2 = 9996$.
- Rational expressions like $(x^2 – 9)/(x + 3)$ simplify to $(x – 3)$ by cancelling common factors, provided $x + 3 \neq 0$.
- Never cancel a factor that could be zero.

## Solved Examples

Board-pattern practice.

- Expand $(2a – 3b)^2$. $4a^2 – 12ab + 9b^2$.
- Factorise $2x^2 + 7x + 3$. $ac = 6$, sum $7 \rightarrow 6$ and 1: $2x^2 + 6x + x + 3 = (2x + 1)(x + 3)$.
- Evaluate $99^3$. $(100 – 1)^3 = 1000000 – 30000 + 300 – 1 = 970299$.
- If $a + b + c = 0$, find $a^3 + b^3 + c^3$ for $a = 2$, $b = –5$, $c = 3$. $= 3abc = 3 \times 2 \times (–5) \times 3 = –90$.
- Simplify $(x^2 – 4)/(x^2 + 4x + 4)$. $(x – 2)(x + 2)/(x + 2)^2 = (x – 2)/(x + 2)$, $x \neq –2$.

## Identities at a Glance

| # | Identity |
|---|---|
| 1 | $(x + y)^2 = x^2 + 2xy + y^2$ |
| 2 | $(x – y)^2 = x^2 – 2xy + y^2$ |

| # | Identity |
|---|---|
| 3 | $(x + y)(x – y) = x^2 – y^2$ |
| 4 | $(x + a)(x + b) = x^2 + (a + b)x + ab$ |
| 5 | $(ax + b)(cx + d) = acx^2 + (ad + bc)x + bd$ |
| 6 | $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$ |
| 7 | $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$ |
| 8 | $(x – y)^3 = x^3 – 3x^2y + 3xy^2 – y^3$ |
| 9 | $x^3 + y^3 = (x + y)(x^2 – xy + y^2)$ |
| 10 | $x^3 – y^3 = (x – y)(x^2 + xy + y^2)$ |
| 11 | $x^3 + y^3 + z^3 – 3xyz = (x + y + z)(x^2 + y^2 + z^2 – xy – yz – zx)$ |

## Important Terms and Formulas

| Term | Meaning |
|---|---|
| Identity | Equation true for all values of variables |
| Factorisation | Writing an expression as a product of factors |
| Algebra tiles | Area models for $x^2$, x and 1 |
| Splitting the middle term | Writing bx as a sum using factors of ac |
| Perfect square | Expression equal to $(a \pm b)^2$ |
| Difference of squares | $a^2 – b^2 = (a + b)(a – b)$ |
| Sum of cubes | $x^3 + y^3 = (x + y)(x^2 – xy + y^2)$ |
| Difference of cubes | $x^3 – y^3 = (x – y)(x^2 + xy + y^2)$ |
| Rational expression | Fraction of two polynomials |
| Special case | $x + y + z = 0 \Rightarrow x^3 + y^3 + z^3 = 3xyz$ |

## Short Answer Questions

Q1. What is an algebraic identity?

An equation that is true for all values of the variables.

Q2. Expand $(x + 5)(x – 5)$.

$x^2 – 25$.

Q3. Factorise $x^2 – 10x + 25$.

$(x – 5)^2$.

Q4. Evaluate $105 \times 95$ using an identity.

$100^2 – 5^2 = 9975$.

Q5. Factorise $x^2 + 5x + 6$.

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

Q6. Expand $(a + b)^3$.

Q7. Factorise $8x^3 – 27$.

$(2x – 3)(4x^2 + 6x + 9)$.

Q8. When can a factor be cancelled in a rational expression?

Only if it is common to numerator and denominator and not equal to zero.

## Long Answer Questions

Q1. Show geometrically that $(a + b)^2 = a^2 + 2ab + b^2$.

Draw a square of side a + b.

Divide each side into a and b and draw lines.

We get a square $a^2$, a square $b^2$ and two rectangles ab.

Total area = $a^2 + b^2 + 2ab$.

Area of the big square is $(a + b)^2$, hence the identity.

Q2. Factorise $6x^2 – 5x – 6$ by splitting the middle term.

Product ac = $6 \times (–6) = –36$, sum = –5.

Numbers: –9 and 4.

$6x^2 – 9x + 4x – 6$.

$3x(2x – 3) + 2(2x – 3)$.

$= (2x – 3)(3x + 2)$.

Q3. Prove that if $x + y + z = 0$ then $x^3 + y^3 + z^3 = 3xyz$, and use it for $(–12)^3 + 7^3 + 5^3$.

$x^3 + y^3 + z^3 – 3xyz = (x + y + z)(…)$.

If $x + y + z = 0$ the right side is 0.

So $x^3 + y^3 + z^3 = 3xyz$.

For –12, 7, 5: sum = 0.

Value = $3 \times (–12) \times 7 \times 5 = –1260$.

## MCQs with Answers

1. $(x – y)^2$ equals(a) $x^2 – y^2$ (b) $x^2 – 2xy + y^2$ (c) $x^2 + y^2$ (d) $x^2 + 2xy – y^2$Answer: (b) $x^2 – 2xy + y^2$

2. $101 \times 99$ =(a) 9999 (b) 10001 (c) 9899 (d) 10099Answer: (a) 9999

3. Factors of $x^2 – 49$(a) $(x – 7)^2$ (b) $(x + 7)(x – 7)$ (c) $(x + 49)(x – 1)$ (d) $x(x – 49)$Answer: (b) $(x + 7)(x – 7)$

4. $(x + 2)(x + 3)$ =(a) $x^2 + 5x + 6$ (b) $x^2 + 6x + 5$ (c) $x^2 + 5x + 5$ (d) $x^2 + 6$Answer: (a) $x^2 + 5x + 6$

5. $x^3 + y^3$ =(a) $(x + y)^3$ (b) $(x + y)(x^2 – xy + y^2)$ (c) $(x – y)(x^2 + xy + y^2)$ (d) $x^2 + y^2$Answer: (b) $(x + y)(x^2 – xy + y^2)$

7. Coefficient of xy in $(x + y + z)^2$(a) 1 (b) 2 (c) 3 (d) 0Answer: (b) 2

8. $(2x + 1)^2$ =(a) $4x^2 + 1$ (b) $4x^2 + 4x + 1$ (c) $2x^2 + 4x + 1$ (d) $4x^2 + 2x + 1$Answer: (b) $4x^2 + 4x + 1$

9. Factorise $x^2 + 8x + 15$(a) $(x + 3)(x + 5)$ (b) $(x + 1)(x + 15)$ (c) $(x – 3)(x – 5)$ (d) $(x + 8)(x + 15)$Answer: (a) $(x + 3)(x + 5)$

10. An identity is true for(a) one value (b) some values (c) all values (d) no valueAnswer: (c) all values

## Quick Revision Points

- Identity ≠ equation.
- Square identities (1–3), product (4–5), three-term square (6).
- Cube identities (7–10), special case (11).
- Factorise by identities, tiles, splitting middle term.
- Quick squares and products.
- Simplify rational expressions; never cancel zero.

## Chapter Summary

Algebraic identities are equations true for all values of their variables. They can be visualised with squares, rectangles, cubes and algebra tiles, and include square, product, three-variable and cube identities.

Identities help factorise quadratic and cubic expressions, speed up calculations like $103^2$ or $102 \times 98$, and simplify rational expressions by cancelling non-zero common factors. The identity $x^3 + y^3 + z^3 – 3xyz = (x + y + z)(\ldots)$ gives a useful shortcut when $x + y + z = 0$.

## Exam Tips and PYQ Pattern

- Memorise the identity table and practise daily.
- Check expansions by substituting a small value.
- Use splitting the middle term systematically.
- State restrictions ($\neq 0$) when simplifying fractions.
- Use identities in mental-maths questions for speed.

## Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the new NCERT Class 9 Maths textbook “Ganita Manjari” (Part I), prescribed for the 2026-27 session.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

How many identities are in Class 9 Exploring Algebraic Identities?

Eleven key identities, including square, product, three-variable square and cube identities, plus

How do algebra tiles help in factorisation?

Tiles for $x^2$, x and 1 are arranged into a rectangle; its length and breadth give the factors.

## Conclusion

Exploring Algebraic Identities gives powerful tools for algebra. Learn the identity table, practise the solved examples here and save the free PDF for revision.

More Notes: Class 9 Maths Chapter 3: The World of Numbers notes | Class 9 Maths Chapter 5: I'm Up and Down, and Round and Round notes | All Class 9 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 9 Maths textbook, Ganita Manjari (Parts I and II, first edition 2026, NCF-SE 2023), and the CBSE syllabus for the 2026-27 session. Last checked on 24 November 2026.