



Class 9 Maths – Ganita Manjari



Chapter 4: Exploring Algebraic Identities



Important Questions with Answer Key

I've kept these **exam-oriented and aligned with the new Ganita Manjari Chapter 4**, which covers visualising identities, factorisation using identities and algebra tiles, splitting the middle term, cube identities, deriving new identities, and simplifying rational expressions.



A. BASIC CONCEPTS

1. What is an algebraic identity? Give one example.
 2. What is the difference between an equation and an algebraic identity?
 3. State the identity for $(a + b)^2$.
 4. State the identity for $(a - b)^2$.
 5. State the identity for $(a + b + c)^2$.
 6. State the identity for $a^2 - b^2$.
 7. Write the identities for $(a + b)^3$ and $(a - b)^3$.
 8. Write the identities for $a^3 + b^3$ and $a^3 - b^3$.
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B. EXPANSION USING IDENTITIES

9. Expand:

$$(7x + 4y)^2$$

10. Expand:

$$(7x/5 + 3y/2)^2$$

11. Expand:

$$(5a - 3b)^2$$

12. Expand:

$$(2x + 3y - z)^2$$

13. Expand:

$$(p + 3q + 7r)^2$$

14. Expand:

$$(3x - 2y + 4z)^2$$

15. Expand:

$$(2a - b + 3c)^2$$



C. USING IDENTITIES FOR CALCULATIONS

16. Find 35^2 using a suitable identity.

17. Find 65^2 using a suitable identity.

18. Find 85^2 using a suitable identity.

19. Find 105^2 using a suitable identity.

20. Find 117^2 using a suitable identity.

21. Find 78^2 using a suitable identity.

22. Find 198^2 using a suitable identity.

23. Find 214^2 using a suitable identity.

D. DIFFERENCE OF SQUARES

24. Simplify:

$$(x + 5)(x - 5)$$

25. Simplify:

$$(3x + 2y)(3x - 2y)$$

26. Factorise:

$$x^2 - 25$$

27. Factorise:

$$9x^2 - 16y^2$$

28. Factorise:

$$25a^2 - 49b^2$$

29. Find using an identity:

$$105^2 - 95^2$$

E. FACTORISATION

30. Factorise:

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

31. Factorise:

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

32. Factorise:

$$4x^2 + 12x + 9$$

33. Factorise:

$$9a^2 - 24ab + 16b^2$$

34. Factorise:

$$x^2 + 7x + 12$$

35. Factorise:

$$x^2 - x - 12$$

36. Factorise:

$$2x^2 + 7x + 3$$

37. Factorise:

$$3x^2 + 10x + 8$$

📌 Questions 34–37 are particularly useful for practising **factorisation by splitting the middle term**, a specific part of the new chapter.

F. CUBE IDENTITIES

38. Expand:

$$(x + 2)^3$$

39. Expand:

$$(2a - 3b)^3$$

40. Factorise:

$$x^3 + 8$$

41. Factorise:

$$27a^3 - 8b^3$$

42. Factorise:

$$125x^3 + 64y^3$$

43. Factorise:

$$64p^3 - 27q^3$$

G. SPECIAL IDENTITIES

44. Simplify:

$$x^3 + y^3 + z^3 - 3xyz$$

$$\text{given } x + y + z = 0.$$

45. If $a + b + c = 0$, find the value of:

$$a^3 + b^3 + c^3 - 3abc$$

46. Verify the identity:

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

47. Show that:

$$(a + b)^2 - (a - b)^2 = 4ab$$

H. FINDING UNKNOWN VALUES

48. If $a + b = 10$ and $ab = 21$, find $a^2 + b^2$.

49. If $a - b = 6$ and $ab = 8$, find $a^2 + b^2$.

50. If $x + y = 8$ and $xy = 15$, find $x^2 + y^2$.

51. If $x + 1/x = 5$, find:

$$x^2 + 1/x^2$$

52. If $x - 1/x = 4$, find:

$$x^2 + 1/x^2$$

53. If $a + b = 7$ and $a^2 + b^2 = 29$, find ab .



I. THINK & REFLECT / REASONING

54. What can you say about a and b if:

$$(a + b)^2 < a^2 + b^2?$$

55. What can you say about a and b if:

$$(a + b)^2 > a^2 + b^2?$$

56. When will:

$$(a + b)^2 = a^2 + b^2?$$

57. Explain geometrically why:

$$(a + b)^2 = a^2 + 2ab + b^2.$$

58. Explain how algebra tiles can be used to factorise:

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



J. SIMPLIFY RATIONAL EXPRESSIONS

59. Simplify:

$$(x^2 - y^2)/(x - y)$$

60. Simplify:

$$(x^2 - 4)/(x + 2)$$

61. Simplify:

$$(a^2 - b^2)/(a + b)$$

62. Simplify:

$$(x^2 + 2xy + y^2)/(x + y)$$

63. Simplify:

$$(x^3 + 8)/(x + 2)$$

📌 When simplifying rational expressions, remember that the denominator must not be zero. The chapter explicitly includes this topic.



K. MOST IMPORTANT QUESTIONS

If you want to highlight a smaller set on your website with ★, I recommend:

- ★ 1. Difference between an equation and an identity.
- ★ 2. Expand $(a + b + c)^2$.
- ★ 3. Expand $(3x - 2y + 4z)^2$.
- ★ 4. Calculate 35^2 , 65^2 , 85^2 and 105^2 using identities.
- ★ 5. Factorise expressions using perfect-square identities.
- ★ 6. Factorise using $a^2 - b^2$.
- ★ 7. Factorise by splitting the middle term.
- ★ 8. Apply cube identities to factorise expressions.
- ★ 9. Prove/use $a^3 + b^3 + c^3 - 3abc$.
- ★ 10. Find $a^2 + b^2$ when $a + b$ and ab are given.
- ★ 11. Find $x^2 + 1/x^2$ when $x + 1/x$ is given.

★ 12. Simplify rational algebraic expressions using identities.

ANSWER KEY

Basic Concepts

1. An identity is an equality true for **all values** of its variables. Example: $(a+b)^2 = a^2+2ab+b^2$.

2. Equation $\rightarrow$ true for particular values; Identity $\rightarrow$ true for all values.

3. $(a+b)^2 = a^2 + 2ab + b^2$

4. $(a-b)^2 = a^2 - 2ab + b^2$

5. $(a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca$

6. $a^2-b^2 = (a+b)(a-b)$

7.

$$(a+b)^3 = a^3+3a^2b+3ab^2+b^3$$

$$(a-b)^3 = a^3-3a^2b+3ab^2-b^3$$

8.

$$a^3+b^3 = (a+b)(a^2-ab+b^2)$$

$$a^3-b^3 = (a-b)(a^2+ab+b^2)$$

Expansion

9. $49x^2 + 56xy + 16y^2$

10. $49x^2/25 + 21xy/5 + 9y^2/4$

11. $25a^2 - 30ab + 9b^2$

12. $4x^2 + 9y^2 + z^2 + 12xy - 4xz - 6yz$

13. $p^2 + 9q^2 + 49r^2 + 6pq + 42pr + 42qr$

14. $9x^2 + 4y^2 + 16z^2 - 12xy + 24xz - 16yz$

15. $4a^2 + b^2 + 9c^2 - 4ab + 12ac - 6bc$

Calculations

16. 1225

17. 4225

18. 7225

19. 11025

20. 13689

21. 6084

22. 39204

23. 45796

Difference of Squares

24. $x^2 - 25$

25. $9x^2 - 4y^2$

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

27. $(3x+4y)(3x-4y)$

28. $(5a+7b)(5a-7b)$

29. 2000

Factorisation

30. $(x+3)^2$

31. $(x-5)^2$

32. $(2x+3)^2$

33. $(3a-4b)^2$

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

35. $(x-4)(x+3)$

36. $(2x+1)(x+3)$

37. $(3x+4)(x+2)$

Cube Identities

38. $x^3 + 6x^2 + 12x + 8$

39. $8a^3 - 36a^2b + 54ab^2 - 27b^3$

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

41. $(3a-2b)(9a^2+6ab+4b^2)$

42. $(5x+4y)(25x^2-20xy+16y^2)$

43. $(4p-3q)(16p^2+12pq+9q^2)$

Special Identities

44. $\emptyset$

45. $\emptyset$

46. Identity verified.

47. $4ab$

Unknown Values

48. 58

49. 52

50. 34

51. 23

52. 18

53. 10

Reasoning

54. a and b have **opposite signs**.

55. a and b have the **same sign**.

56. When $a = 0$ or $b = 0$.

57. Area of the square of side $(a+b)$ = area a^2 + area b^2 + two rectangles of area ab .

58. $x^2 + 7x + 12 = (x+3)(x+4)$.

Rational Expressions

59. $x + y$, where $x \neq y$

60. $x - 2$, where $x \neq -2$

61. $a - b$, where $a \neq -b$

62. $x + y$, where $x + y \neq 0$

63. $x^2 - 2x + 4$, where $x \neq -2$

Important Formula Box

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$a^2 - b^2 = (a+b)(a-b)$$

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

These identities and the factorisation/simplification applications are central to the new Chapter 4.