

PRACTICE PAPER 11 (2026-27)
CHAPTER 04 EXPLORING ALGEBRAIC IDENTITIES
(ANSWERS)

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : IX

DURATION : 1½ hrs

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Without carrying out complete expansion, which algebraic identity is most appropriate to simplify $(9x + 8)^2 - (9x - 8)^2$?

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

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

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

(d) $a^3 + b^3$

Ans: (c) $a^2 - b^2 = (a + b)(a - b)$

Observe that the expression is the difference of two perfect squares.

Let $A = (9x + 8)$, $B = (9x - 8)$

Then, $A^2 - B^2 = (A + B)(A - B)$

Hence the correct identity is $a^2 - b^2 = (a + b)(a - b)$

2. A student writes $(4x + 5)^2 = 16x^2 + \square + 25$. The missing term is

(a) $20x$

(b) $25x$

(c) $40x$

(d) $16x$

Ans: (c) $40x$

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

where, $a = 4x$, $b = 5$

Middle term = $2(4x)(5) = 40x$

3. Three students factorise $49x^2 - 16$ as follows.

Rahul: $(7x - 4)^2$

Sneha: $(7x + 4)(7x - 4)$

Aman: $(49x - 16)(49x + 16)$

Who is correct?

(a) Rahul only

(b) Sneha only

(c) Aman only

(d) Rahul and Aman

Ans: (b) Sneha only

Observe, $49x^2 = (7x)^2$, $16 = 4^2$

Hence, $49x^2 - 16 = (7x + 4)(7x - 4)$

4. Which expression expands to $x^2 - 18x + 81$?

(a) $(x + 9)^2$

(b) $(x - 9)^2$

(c) $(x + 9)(x - 9)$

(d) $(x - 18)^2$

Ans: (b) $(x - 9)^2$

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

$(x - 9)^2 = x^2 - 18x + 81$

5. A student writes $(x + 7)(x - 7) = x^2 + 49$.

Which statement is correct?

- (a) The sign of 49 should be negative.
(b) The coefficient of x^2 is incorrect.
(c) The answer should contain a middle term.
(d) The solution is correct.

Ans: (a) The sign of 49 should be negative.

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

$$(x + 7)(x - 7) = x^2 - 49$$

- 6.** A student wants to factorise $729x^3 - 64$.

Before solving, which identity should be used?

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

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

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

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

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

Observe that, $729x^3 = (9x)^3$, $64 = 4^3$

Hence, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ should be applied.

7. If $(x + \square)^2 = x^2 + 24x + 144$, the missing number is

- (a) 10 (b) 12 (c) 24 (d) 144

Ans: (b) 12

Compare with $(x + a)^2 = x^2 + 2ax + a^2$

Here, $2a = 24$

Therefore, $a = 12$

8. Which one of the following statements is always true?

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

- $$(b) \quad (a - b)^2 = a^2 - b^2$$

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

- (d) $(a + b)^3 = a^3 + b^3$

Ans: (c) $(a + b)(a - b) = a^2 - b^2$

Only $(a + b)(a - b) = a^2 - b^2$ is a correct algebraic identity.

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** If $(x + 8)^2 = x^2 + 16x + 64$, then the coefficient of x is twice the product of x and 8.

Reason (R): In the identity $(a + b)^2 = a^2 + 2ab + b^2$, the middle term is always equal to $2ab$.

Ans: (a) Both A and R are true and R is the correct explanation of A.

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

where $a = x$, $b = 8$

Middle term = $2(x)(8) = 16x$

Hence the Assertion is true.

The Reason correctly explains why the middle term is $16x$.

10. Assertion (A): $125x^3 + 27 = (5x + 3)(25x^2 - 15x + 9)$

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

Ans: (a) Both A and R are true and R is the correct explanation of A.

Observe, $125x^3 = (5x)^3$, $27 = 3^3$

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

gives $125x^3 + 27 = (5x + 3)(25x^2 - 15x + 9)$

Hence, both the Assertion and the Reason are true, and the Reason correctly explains the Assertion.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. A student starts expanding $(7x - 4)^2$ as follows: $(7x - 4)^2 = (7x)^2 - 2(7x)(4) + \square$

Complete the missing step and write the final answer.

Ans: Using the identity $(a - b)^2 = a^2 - 2ab + b^2$

The missing term is $4^2 = 16$

Therefore, $(7x - 4)^2 = 49x^2 - 56x + 16$

12. If $(x + k)^2 = x^2 + 30x + 225$, find the value of k .

Ans: Comparing with $(x + k)^2 = x^2 + 2kx + k^2$,

we get $2k = 30$

Therefore, $k = 15$

Verification: $15^2 = 225$

13. The product of two binomials is $(x + 9)(x + \square) = x^2 + 15x + 54$.

Find the missing polynomial.

Ans: Using the identity, $(x + a)(x + b) = x^2 + (a + b)x + ab$

Here, $a = 9$

Let the missing number be b .

Comparing coefficients, $9 + b = 15 \Rightarrow b = 6$

14. A student factorises $343x^3 - 125$ as $(7x - 5)(49x^2 - 35x + 25)$.

Is the factorisation correct? If not, write the correct factorisation.

Ans: The given expression is $(7x)^3 - 5^3$

Using the identity, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$,

we get $343x^3 - 125 = (7x - 5)(49x^2 + 35x + 25)$.

Hence, the student has written the middle term incorrectly.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Prove that: $(x + 4)^2 - (x - 4)^2 = 16x$.

Ans: Using the identity, $a^2 - b^2 = (a + b)(a - b)$

Let $a = x + 4$, $b = x - 4$

Then, $(x + 4)^2 - (x - 4)^2$

$= [(x + 4) + (x - 4)] \times [(x + 4) - (x - 4)]$

$= (2x)(8)$

$= 16x$

16. Without expanding completely, determine which is greater: $(1002)^2$ or $(998)^2$.

Justify your answer using algebraic identities.

Ans: Using, $1002 = 1000 + 2$ and $998 = 1000 - 2$
 Now, $(1000 + 2)^2 = 1000000 + 4000 + 4 = 1004004$
 and $(1000 - 2)^2 = 1000000 - 4000 + 4 = 996004$
 Therefore, $1004004 > 996004$
 Hence, $1002^2 > 998^2$

17. A rectangular park has length $(x + 12)$ m and breadth $(x - 12)$ m.

Without multiplying directly, find: (i) the algebraic expression for its area (ii) the area when $x = 20$.

Ans: (i) Area = $(x + 12)(x - 12)$

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

Area = $(x + 12)(x - 12) = x^2 - 144$

(ii) Now, $x = 20$

Area = $20^2 - 144 = 400 - 144 = 256$ sq. m

SECTION – D

Questions 18 carry 5 marks each.

18. A city authority is developing a Smart Sports Complex. The chief engineer has prepared three alternative designs for the central play zone.

Design A is a square with side $(x + 8)$ metres.

Design B is a square with side $(x - 8)$ metres.

Design C is a rectangular practice arena having length $(x + 8)$ metres and breadth $(x - 8)$ metres.

The planning committee wants to compare the three designs without carrying out lengthy multiplication.

Using suitable algebraic identities, answer the following questions.

(a) Write the algebraic expression for the area of Design A.

(b) Write the algebraic expression for the area of Design B.

(c) Find the algebraic expression for the area of Design C.

(d) If $x = 18$, determine: Area of Design A, Area of Design B and Area of Design C

Ans: (a) Area of Design A

Side = $x + 8$

Using $(a + b)^2 = a^2 + 2ab + b^2$, we get

$(x + 8)^2 = x^2 + 16x + 64$

(b) Area of Design B

Side = $x - 8$

Using $(a - b)^2 = a^2 - 2ab + b^2$, we get

$(x - 8)^2 = x^2 - 16x + 64$

(c) Area of Design C

Area = $(x + 8)(x - 8)$

Using, $(a + b)(a - b) = a^2 - b^2$, we get

$(x + 8)(x - 8) = x^2 - 64$

(d) For $x = 18$

Area of Design A = $18^2 + 16(18) + 64 = 324 + 288 + 64 = 676 \text{ m}^2$

Area of Design B = $324 - 288 + 64 = 100 \text{ m}^2$

Area of Design C = $324 - 64 = 260 \text{ m}^2$

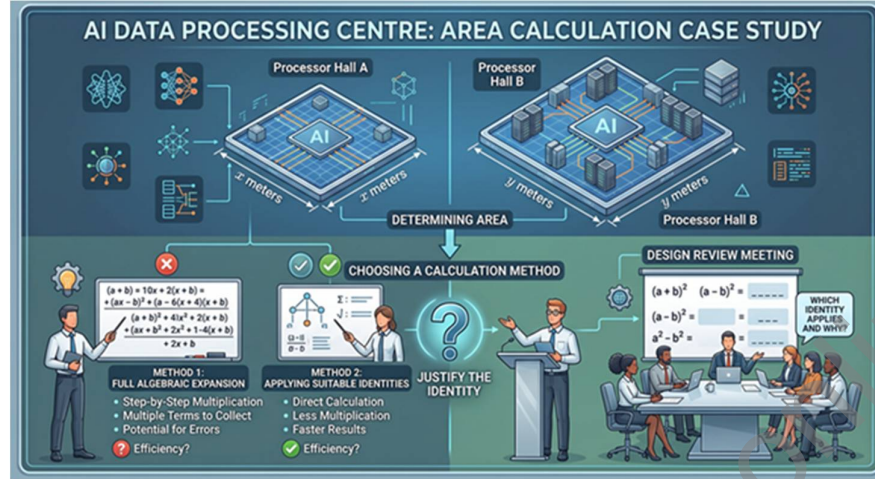
SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. **Case Study – 1: Artificial Intelligence Data Centre**

An Artificial Intelligence (AI) company is setting up a **Data Processing Centre** to handle large-scale machine learning computations. The engineers are designing two square processor halls. The

first hall has side $(x + 15)$ metres, while the second hall has side $(x - 15)$ metres. To compare the construction cost quickly, they decide to use algebraic identities instead of ordinary multiplication. During the design review meeting, one engineer suggests expanding both expressions completely, whereas another recommends applying suitable identities directly to obtain faster results. The project manager asks the team to justify the choice of identity before calculating the required areas.



(a) Which algebraic identity is most suitable to compare the areas of the two halls without complete expansion? (1)

(b) Find: $(x + 15)^2 - (x - 15)^2$. (2)

(c) If $x = 25$, find the difference between the areas. (1)

Ans: (a) The suitable identity is $a^2 - b^2 = (a + b)(a - b)$

because the comparison involves the difference of two squared expressions.

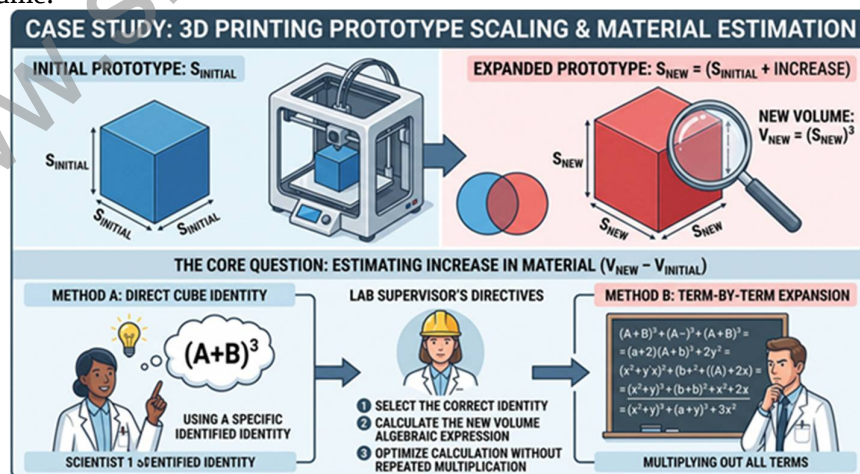
(b) Using, $A^2 - B^2 = (A + B)(A - B)$

$(x + 15)^2 - (x - 15)^2 = (2x)(30) = 60x$

(c) $60(25) = 1500$ sq. m.

20. Case Study – 2: 3D Printing Laboratory

A research laboratory manufactures **cube-shaped prototypes** using advanced 3D printers. Initially, each prototype has side x cm. To test improved designs, the side is increased to $(x + 3)$ cm. The research team wants to estimate the increase in material required without performing repeated multiplication. One scientist recommends using the cube identity directly, while another suggests first expanding the expression term by term. The laboratory supervisor asks the team to identify the correct identity and then calculate the algebraic expression representing the new volume.



(a) Which algebraic identity should be used to expand $(x + 3)^3$? (1)

(b) Expand $(x + 3)^3$. (2)

(c) If $x = 7$, find the volume of the new cube. (1)

Ans: (a) The suitable identity is $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

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

$$(x + 3)^3 = x^3 + 9x^2 + 27x + 27$$

(c) Using the expression,

$$7^3 + 9(7^2) + 27(7) + 27$$

$$= 343 + 441 + 189 + 27$$

$$= 1000$$

Alternatively, $(7 + 3)^3 = 10^3 = 1000$

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SECTION – A

Questions 1 to 10 carry 1 mark each.

1. Without carrying out complete expansion, which algebraic identity is most appropriate to simplify $(9x + 8)^2 - (9x - 8)^2$?
(a) $(a + b)^2$ (b) $(a - b)^2$
(c) $a^2 - b^2 = (a + b)(a - b)$ (d) $a^3 + b^3$
2. A student writes $(4x + 5)^2 = 16x^2 + \square + 25$. The missing term is
(a) $20x$ (b) $25x$ (c) $40x$ (d) $16x$
3. Three students factorise $49x^2 - 16$ as follows.
Rahul: $(7x - 4)^2$
Sneha: $(7x + 4)(7x - 4)$
Aman: $(49x - 16)(49x + 16)$
Who is correct?
(a) Rahul only (b) Sneha only (c) Aman only (d) Rahul and Aman
4. Which expression expands to $x^2 - 18x + 81$?
(a) $(x + 9)^2$ (b) $(x - 9)^2$ (c) $(x + 9)(x - 9)$ (d) $(x - 18)^2$
5. A student writes $(x + 7)(x - 7) = x^2 + 49$. Which statement is correct?
(a) The sign of 49 should be negative.
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6. A student wants to factorise $729x^3 - 64$. Before solving, which identity should be used?
(a) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
(b) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
(c) $a^2 - b^2 = (a + b)(a - b)$
(d) $(a + b)^2$
7. If $(x + \square)^2 = x^2 + 24x + 144$, the missing number is
(a) 10 (b) 12 (c) 24 (d) 144

8. Which one of the following statements is always true?

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

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

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Reason (R): In the identity $(a + b)^2 = a^2 + 2ab + b^2$, the middle term is always equal to $2ab$.

10. **Assertion (A):** $125x^3 + 27 = (5x + 3)(25x^2 - 15x + 9)$

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

SECTION – B

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13. The product of two binomials is $(x + 9)(x + \square) = x^2 + 15x + 54$.
Find the missing polynomial.

14. A student factorises $343x^3 - 125$ as $(7x - 5)(49x^2 - 35x + 25)$.
Is the factorisation correct? If not, write the correct factorisation.

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16. Without expanding completely, determine which is greater: $(1002)^2$ or $(998)^2$.
Justify your answer using algebraic identities.

17. A rectangular park has length $(x + 12)$ m and breadth $(x - 12)$ m.
Without multiplying directly, find: (i) the algebraic expression for its area (ii) the area when $x = 20$.

SECTION – D

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Using suitable algebraic identities, answer the following questions.

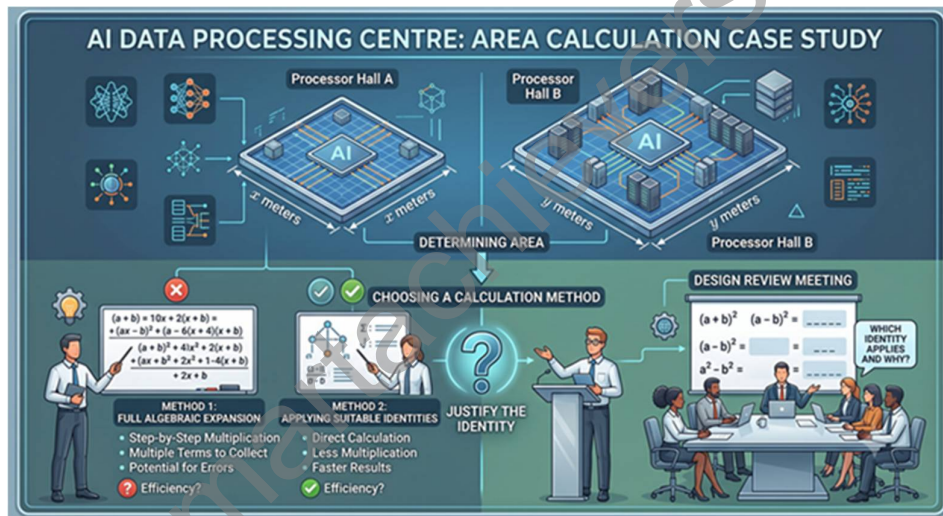
- Write the algebraic expression for the area of Design A.
- Write the algebraic expression for the area of Design B.
- Find the algebraic expression for the area of Design C.
- If $x = 18$, determine: Area of Design A, Area of Design B and Area of Design C

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. Case Study – 1: Artificial Intelligence Data Centre

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- Which algebraic identity is most suitable to compare the areas of the two halls without complete expansion? (1)
- Find: $(x + 15)^2 - (x - 15)^2$. (2)
- If $x = 25$, find the difference between the areas. (1)

20. Case Study – 2: 3D Printing Laboratory

A research laboratory manufactures **cube-shaped prototypes** using advanced 3D printers. Initially, each prototype has side x cm. To test improved designs, the side is increased to $(x + 3)$ cm. The research team wants to estimate the increase in material required without performing repeated multiplication. One scientist recommends using the cube identity directly, while another suggests first expanding the expression term by term. The laboratory supervisor asks the team to identify the correct identity and then calculate the algebraic expression representing the new volume.

