

Factorisation

POINTS TO REMEMBER

1. $(a + b)^2 = a^2 + b^2 + 2 ab$ or $a^2 + 2 ab + b^2$
2. $(a - b)^2 = a^2 + b^2 - 2 ab$ or $a^2 - 2 ab + b^2$
3. $a^2 - b^2 = (a + b) (a - b)$
4. $a^3 + b^3 = (a + b) (a^2 - ab + b^2)$
5. $a^3 - b^3 = (a - b) (a^2 + ab + b^2)$
6. $(x + a) (x + b) = x^2 + (a + b) x + ab$
7. $ax^2 + bx + c = ax^2 + px + qx + c$, now we have to find p and q where $pq = ac$ and $p + q = b$.

EXERCISE 5 (A)

Factorise :

Q. 1. $5x^2 - 20xy$

Sol. $5x^2 - 20xy$
 $= 5x(x - 4y)$ Ans.

Q. 2. $18a^2b - 24abc$

Sol. $18a^2b - 24abc$
 $= 6ab(3a - 4c)$ Ans.

Q. 3. $27x^3y^3 - 45x^4y^2$

Sol. $27x^3y^3 - 45x^4y^2$
 $= 9x^3y^2(3y - 5x)$ Ans.

Q. 4. $5a(b + c) - 7b(b + c)$

Sol. $5a(b + c) - 7b(b + c)$
 $= (b + c)(5a - 7b)$ Ans.

Q. 5. $2x(p^2 + q^2) + 4y(p^2 + q^2)$

Sol. $2x(p^2 + q^2) + 4y(p^2 + q^2)$
 $= (p^2 + q^2)(2x + 4y)$
 $= (p^2 + q^2)2(x + 2y)$
 $= 2(p^2 + q^2)(x + 2y)$ Ans.

Q. 6. $x(a - 5) + y(5 - a)$

Sol. $x(a - 5) + y(5 - a)$
 $= x(a - 5) - y(a - 5)$
 $= (a - 5)(x - y)$ Ans.

Q. 7. $4(x + y) - 6(x + y)^2$

Sol. $4(x + y) - 6(x + y)^2$
 $= 2(x + y)\{2 - 3(x + y)\}$
 $= 2(x + y)(2 - 3x - 3y)$ Ans.

Q. 8. $6(2a + 3b)^2 - 8(2a + 3b)$

Sol. $6(2a + 3b)^2 - 8(2a + 3b)$
 $= 2(2a + 3b)\{3(2a + 3b) - 4\}$
 $= 2(2a + 3b)(6a + 9b - 4)$ Ans.

Q. 9. $x(x + y)^3 - 3x^2y(x + y)$

Sol. $x(x + y)^3 - 3x^2y(x + y)$
 $= x(x + y)\{(x + y)^2 - 3xy\}$
 $= x(x + y)\{x^2 + y^2 + 2xy - 3xy\}$
 $= x(x + y)(x^2 + y^2 - xy)$ Ans.

Q. 10. $a^3 + 2a^2 + 5a + 10$

Sol. $a^3 + 2a^2 + 5a + 10$
 $= a^2(a + 2) + 5(a + 2)$
 $= (a + 2)(a^2 + 5)$ Ans.

Q. 11. $x^2 + xy - 2xz - 2yz$

Sol. $x^2 + xy - 2xz - 2yz$
 $= x(x + y) - 2z(x + y)$
 $= (x + y)(x - 2z)$ Ans.

Q. 12. $a^3b - a^2b + 5ab - 5b$

Sol. $a^3b - a^2b + 5ab - 5b$
 $= a^2b(a - 1) + 5b(a - 1)$
 $= (a - 1)(a^2b + 5b)$
 $= (a - 1)b(a^2 + 5)$
 $= b(a - 1)(a^2 + 5)$

Q. 13. $x^2 + y - xy - x$

Sol. $x^2 + y - xy - x$
 $= x^2 - xy - x + y$
 $= x(x - y) - 1(x - y)$
 $= (x - y)(x - 1)$ Ans.

Q. 14. $a(a + b - c) - bc$

Sol. $a(a + b - c) - bc$
 $= a^2 + ab - ac - bc$
 $= a(a + b) - c(a + b)$
 $= (a + b)(a - c)$ Ans.

Q. 15. $(4a - 1)^2 - 8a + 2$

Sol. $(4a - 1)^2 - 8a + 2$
 $= (4a - 1)^2 - 2(4a - 1)$
 $= (4a - 1)(4a - 1 - 2)$
 $= (4a - 1)(4a - 3)$ Ans.

Q. 16. $8 - 4a - 2a^3 + a^4$

Sol. $8 - 4a - 2a^3 + a^4$
 $= 4(2 - a) - a^3(2 - a)$
 $= (2 - a)(4 - a^3)$ Ans.

Q. 17. $2a^2 + bc - 2ab - ac$

Sol. $2a^2 + bc - 2ab - ac$
 $= 2a^2 - 2ab - ac + bc$
 $= 2a(a - b) - c(a - b)$
 $= (a - b)(2a - c)$ Ans.

Q. 18. $a(a - 2b - c) + 2bc$

Sol. $a(a - 2b - c) + 2bc$
 $= a^2 - 2ab - ac + 2bc$

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

$$= (a - 2b)(a - c)$$
 Ans.

Q. 19. $x^2 - (a + b)x + ab$

Sol. $x^2 - (a + b)x + ab$
 $= x^2 - ax - bx + ab$
 $= x(x - a) - b(x - a)$
 $= (x - a)(x - b)$ Ans.

Q. 20. $3ax - 6ay - 8by + 4bx$

Sol. $3ax - 6ay - 8by + 4bx$
 $= 3ax - 6ay + 4bx - 8by$
 $= 3a(x - 2y) + 4b(x - 2y)$
 $= (x - 2y)(3a + 4b)$ Ans.

Q. 21. $ab(x^2 + y^2) - xy(a^2 + b^2)$

Sol. $ab(x^2 + y^2) - xy(a^2 + b^2)$
 $= abx^2 + aby^2 - xy a^2 - xy b^2$
 $= abx^2 - xy a^2 - xy b^2 + aby^2$
 $= ax(bx - ay) - by(bx - ay)$
 $= (bx - ay)(ax - by)$ Ans.

Q. 22. $ab(x^2 + 1) + x(a^2 + b^2)$

Sol. $ab(x^2 + 1) + x(a^2 + b^2)$
 $= abx^2 + ab + a^2x + b^2x$
 $= abx^2 + a^2x + b^2x + ab$
 $= ax(bx + a) + b(bx + a)$
 $= (bx + a)(ax + b)$ Ans.

Q. 23. $a^3 + ab(1 - 2a) - 2b^2$

Sol. $a^3 + ab(1 - 2a) - 2b^2$
 $= a^3 + ab - 2a^2b - 2b^2$
 $= a(a^2 + b) - 2b(a^2 + b)$
 $= (a^2 + b)(a - 2b)$ Ans.

Q. 24. $x^2 + \frac{1}{x^2} - 2 - 3x + \frac{3}{x}$

Sol. $x^2 + \frac{1}{x^2} - 2 - 3x + \frac{3}{x}$
 $= \left(x - \frac{1}{x}\right)^2 - 3\left(x - \frac{1}{x}\right)$
 $= \left(x - \frac{1}{x}\right)\left(x - \frac{1}{x} - 3\right)$
 $= \left(x - \frac{1}{x}\right)\left(x - 3 - \frac{1}{x}\right)$ Ans.

EXERCISE 5 (B)

Factorise :

Q. 1. $x^2 - 49$

$$\begin{aligned} \text{Sol. } x^2 - 49 &= (x)^2 - (7)^2 \\ &= (x + 7)(x - 7) \quad \text{Ans.} \end{aligned}$$

Q. 2. $25x^2 - 64y^2$

$$\begin{aligned} \text{Sol. } 25x^2 - 64y^2 &= (5x)^2 - (8y)^2 \\ &= (5x + 8y)(5x - 8y) \quad \text{Ans.} \end{aligned}$$

Q. 3. $100 - 9p^2$

$$\begin{aligned} \text{Sol. } 100 - 9p^2 &= (10)^2 - (3p)^2 \\ &= (10 + 3p)(10 - 3p) \quad \text{Ans.} \end{aligned}$$

Q. 4. $80 - 5a^2$

$$\begin{aligned} \text{Sol. } 80 - 5a^2 &= 5(16 - a^2) \\ &= 5\{(4)^2 - (a)^2\} \\ &= 5(4 + a)(4 - a) \quad \text{Ans.} \end{aligned}$$

Q. 5. $32x^2 - 18y^2$

$$\begin{aligned} \text{Sol. } 32x^2 - 18y^2 &= 2(16x^2 - 9y^2) \\ &= 2\{(4x)^2 - (3y)^2\} \\ &= 2(4x + 3y)(4x - 3y) \quad \text{Ans.} \end{aligned}$$

Q. 6. $3x^3 - 48x$

$$\begin{aligned} \text{Sol. } 3x^3 - 48x &= 3x(x^2 - 16) \\ &= 3x\{(x)^2 - (4)^2\} \\ &= 3x(x + 4)(x - 4) \quad \text{Ans.} \end{aligned}$$

Q. 7. $x^4 - 81$

$$\begin{aligned} \text{Sol. } x^4 - 81 &= (x^2)^2 - (9)^2 \\ &= (x^2 + 9)(x^2 - 9) \\ &= (x^2 + 9)\{(x)^2 - (3)^2\} \\ &= (x^2 + 9)(x + 3)(x - 3) \quad \text{Ans.} \end{aligned}$$

Q. 8. $2x^4 - 32$

$$\begin{aligned} \text{Sol. } 2x^4 - 32 &= 2(x^4 - 16) \\ &= 2\{(x^2)^2 - (4)^2\} \\ &= 2(x^2 + 4)(x^2 - 4) \\ &= 2(x^2 + 4)\{(x)^2 - (2)^2\} \\ &= 2(x^2 + 4)(x + 2)(x - 2) \quad \text{Ans.} \end{aligned}$$

Q. 9. $x^3 - 5x^2 - x + 5$

$$\begin{aligned} \text{Sol. } x^3 - 5x^2 - x + 5 &= x^3 - x - 5x^2 + 5 \end{aligned}$$

$$\begin{aligned} &= x(x^2 - 1) - 5(x^2 - 1) \\ &= (x^2 - 1)(x - 5) \\ &= \{(x)^2 - (1)^2\}(x - 5) \\ &= (x + 1)(x - 1)(x - 5) \quad \text{Ans.} \end{aligned}$$

Q. 10. $9(x + a)^2 - 4x^2$

$$\begin{aligned} \text{Sol. } 9(x + a)^2 - 4x^2 &= [3(x + a)]^2 - (2x)^2 \\ &= [3(x + a) + 2x][3(x + a) - 2x] \\ &= (3x + 3a + 2x)(3x + 3a - 2x) \\ &= (5x + 3a)(x + 3a) \quad \text{Ans.} \end{aligned}$$

Q. 11. $9(b + 2a)^2 - 4a^2$

$$\begin{aligned} \text{Sol. } 9(b + 2a)^2 - 4a^2 &= [3(b + 2a)]^2 - (2a)^2 \\ &= [3(b + 2a) + 2a][3(b + 2a) - 2a] \\ &= (3b + 6a + 2a)(3b + 6a - 2a) \\ &= (3b + 8a)(3b + 4a) \quad \text{Ans.} \end{aligned}$$

Q. 12. $3 - 12(a - b)^2$

$$\begin{aligned} \text{Sol. } 3 - 12(a - b)^2 &= 3[1 - 4(a - b)^2] \\ &= 3\{(1)^2 - \{2(a - b)\}^2\} \\ &= 3\{1 + 2(a - b)\}\{1 - 2(a - b)\} \\ &= 3(1 + 2a - 2b)(1 - 2a + 2b) \quad \text{Ans.} \end{aligned}$$

Q. 13. $50a^2 - 2(b - c)^2$

$$\begin{aligned} \text{Sol. } 50a^2 - 2(b - c)^2 &= 2[25a^2 - (b - c)^2] \\ &= 2\{(5a)^2 - (b - c)^2\} \\ &= 2(5a + b - c)(5a - b + c) \quad \text{Ans.} \end{aligned}$$

Q. 14. $2(x - 3)^2 - 32$

$$\begin{aligned} \text{Sol. } 2(x - 3)^2 - 32 &= 2[(x - 3)^2 - 16] \\ &= 2[(x - 3)^2 - (4)^2] \\ &= 2[x - 3 + 4][x - 3 - 4] \\ &= 2(x + 1)(x - 7) \quad \text{Ans.} \end{aligned}$$

Q. 15. $a^2(b + c) - (b + c)^3$

$$\begin{aligned} \text{Sol. } a^2(b + c) - (b + c)^3 &= (b + c)[a^2 - (b + c)^2] \\ &= (b + c)(a + b + c)(a - b - c) \quad \text{Ans.} \end{aligned}$$

Q. 16. $x^2 - 1 - 2a - a^2$

Sol. $x^2 - 1 - 2a - a^2$
 $= x^2 - (a^2 + 2a + 1)$
 $= (x)^2 - (a + 1)^2$
 $= (x + a + 1)(x - a - 1)$ **Ans.**

Q. 17. $x^2 - y^2 + 2yz - z^2$

Sol. $x^2 - y^2 + 2yz - z^2$
 $= x^2 - (y^2 - 2yz + z^2)$
 $= (x)^2 - (y - z)^2$
 $= (x + y - z)(x - y + z)$ **Ans.**

Q. 18. $x^2 - y^2 - 4xz + 4z^2$

Sol. $x^2 - y^2 - 4xz + 4z^2$
 $= x^2 - 4xz + 4z^2 - y^2$
 $= (x)^2 - 2 \times x \times 2z + (2z)^2 - (y)^2$
 $= (x - 2z)^2 - (y)^2$
 $= (x - 2z + y)(x - 2z - y)$
 $= (x + y - 2z)(x - y - 2z)$ **Ans.**

Q. 19. $x^2 - 4x + 4y - y^2$

Sol. $x^2 - 4x + 4y - y^2$
 $= x^2 - y^2 - 4x + 4y$
 $= (x)^2 - (y)^2 - 4(x - y)$
 $= (x + y)(x - y) - 4(x - y)$
 $= (x - y)(x + y - 4)$ **Ans.**

Q. 20. $x - y - x^2 + y^2$

Sol. $x - y - x^2 + y^2$
 $= (x - y) - (x^2 - y^2)$
 $= (x - y) - (x + y)(x - y)$
 $= (x - y)(1 - x - y)$ **Ans.**

Q. 21. $x(x + z) - y(y + z)$

Sol. $x(x + z) - y(y + z)$
 $= x^2 + xz - y^2 - yz$
 $= x^2 - y^2 + xz - yz$
 $= (x + y)(x - y) + z(x - y)$
 $= (x - y)(x + y + z)$ **Ans.**

Q. 22. $x(x - 2) - y(y - 2)$

Sol. $x(x - 2) - y(y - 2)$
 $= x^2 - 2x - y^2 + 2y$

$= x^2 - y^2 - 2x + 2y$
 $= (x + y)(x - y) - 2(x - y)$
 $= (x - y)(x + y - 2)$ **Ans.**

Q. 23. $4x^2y - 9y^3$

Sol. $4x^2y - 9y^3$
 $= y[4x^2 - 9y^2]$
 $= y[(2x)^2 - (3y)^2]$
 $= y(2x + 3y)(2x - 3y)$ **Ans.**

Q. 24. $9x^4 - x^2 - 12x - 36$

Sol. $9x^4 - x^2 - 12x - 36$
 $= 9x^4 - (x^2 + 12x + 36)$
 $= (3x^2)^2 - \{(x)^2 + 2 \times x \times 6 + (6)^2\}$
 $= (3x^2)^2 - (x + 6)^2$
 $= (3x^2 + x + 6)(3x^2 - x - 6)$ **Ans.**

Q. 25. $x^2 + \frac{1}{x^2} - 11$

Sol. $x^2 + \frac{1}{x^2} - 11$
 $= \left(x^2 + \frac{1}{x^2} - 2\right) - 9$
 $= \left(x - \frac{1}{x}\right)^2 - (3)^2$
 $= \left(x - \frac{1}{x} + 3\right)\left(x - \frac{1}{x} - 3\right)$ **Ans.**

Q. 26. $x^4 + 5x^2 + 9$

Sol. $x^4 + 5x^2 + 9 = x^4 + 6x^2 + 9 - x^2$
[Add and subtract x^2]
 $= (x^2)^2 + 2 \times x^2 \times 3 + (3)^2 - (x)^2$
 $= (x^2 + 3)^2 - (x)^2$
 $= (x^2 + 3 + x)(x^2 + 3 - x)$
 $= (x^2 + x + 3)(x^2 - x + 3)$ **Ans.**

Q. 27. $a^2 + b^2 - c^2 - d^2 + 2ab - 2cd$

Sol. $a^2 + b^2 - c^2 - d^2 + 2ab - 2cd$
 $= a^2 + b^2 + 2ab - c^2 - d^2 - 2cd$
 $= (a^2 + b^2 + 2ab) - (c^2 + d^2 + 2cd)$
 $= (a + b)^2 - (c + d)^2$
 $= (a + b + c + d)(a + b - c - d)$ **Ans.**

Q. 28. $(a^2 - b^2)(c^2 - d^2) - 4abcd$

Sol. $(a^2 - b^2)(c^2 - d^2) - 4abcd$
 $= a^2c^2 - a^2d^2 - b^2c^2 + b^2d^2 - 4abcd$
 $= a^2c^2 + b^2d^2 - 2abcd - a^2d^2$
 $\quad - b^2c^2 - 2abcd$
 $= [(ac)^2 + (bd)^2 - 2 \times ac \times bd]$
 $\quad - [(ad)^2 + (bc)^2 + 2 \times ad \times bc]$
 $= (ac - bd)^2 - (ad + bc)^2$
 $= (ac - bd + ad + bc)$
 $\quad (ac - bd - ad - bc)$ **Ans.**

Q. 29. $4x^2 - 12ax - y^2 - z^2 - 2yz + 9a^2$
 $= (4x^2 - 12ax + 9a^2) - (y^2 + z^2 + 2yz)$
 $= \{(2x)^2 - 2 \times 2x \times 3a + (3a)^2\}$
 $\quad - (y + z)^2$
 $= (2x - 3a)^2 - (y + z)^2$
 $= (2x - 3a + y + z)$
 $\quad (2x - 3a - y - z)$ **Ans.**

Q. 30. $9a^2 + 3a - 8b - 64b^2$
Sol. $9a^2 + 3a - 8b - 64b^2$
 $= 9a^2 - 64b^2 + 3a - 8b$
 $= \{(3a)^2 - (8b)^2\} + 1(3a - 8b)$
 $= (3a + 8b)(3a - 8b) + 1(3a - 8b)$
 $= (3a - 8b)(3a + 8b + 1)$ **Ans.**

Q. 31. Express $(x^2 + 8x - 15)(x^2 - 8x - 15)$ as the difference of two squares.

Sol. $(x^2 + 8x + 15)(x^2 - 8x - 15)$
 $= \{(x^2) + (8x + 15)\} \{(x^2) - (8x + 15)\}$
 $= (x^2)^2 - (8x + 15)^2$ **Ans.**

Q. 32. Evaluate :

(i) $[(674)^2 - (326)^2]$ (ii) $[(18.6)^2 - (1.4)^2]$

Sol. (i) $(674)^2 - (326)^2$
 $= (674 + 326)(674 - 326)$
 $\{\because a^2 - b^2 = (a + b)(a - b)\}$
 $= 1000 \times 348 = 348000$ **Ans.**

(ii) $(18.6)^2 - (1.4)^2$
 $= (18.6 + 1.4)(18.6 - 1.4)$
 $\{\because a^2 - b^2 = (a + b)(a - b)\}$

$$= 20.0 \times 17.2$$

$$= 344$$
 Ans.

Q. 33. Factorise : $(x^4 + x^2y^2 + y^4)$

Sol. $x^4 + x^2y^2 + y^4$
 $= x^4 + 2x^2y^2 + y^4 - x^2y^2$
 (Adding and subtracting x^2y^2)
 $= [(x^2)^2 + 2x^2y^2 + (y^2)^2] - (xy)^2$
 $= (x^2 + y^2)^2 - (xy)^2$
 $= (x^2 + y^2 + xy)(x^2 + y^2 - xy)$
 $= (x^2 + xy + y^2)(x^2 - xy + y^2)$ **Ans.**

EXERCISE 5 (C)

Factorise :

Q. 1. $x^3 + 64$

Sol. $x^3 + 64$
 $= (x)^3 + (4)^3$
 $= (x + 4) \{(x)^2 - x \times 4 + (4)^2\}$
 $= (x + 4)(x^2 - 4x + 16)$ **Ans.**

Q. 2. $8a^3 + 27b^3$

Sol. $8a^3 + 27b^3$
 $= (2a)^3 + (3b)^3$
 $= (2a + 3b) \{(2a)^2 - 2a \times 3b + (3b)^2\}$
 $= (2a + 3b)(4a^2 - 6ab + 9b^2)$ **Ans.**

Q. 3. $7a^3 + 56b^3$

Sol. $7a^3 + 56b^3$
 $= 7(a^3 + 8b^3) = 7\{(a)^3 + (2b)^3\}$
 $= 7(a + 2b) \{(a)^2 - a \times 2b + (2b)^2\}$
 $= 7(a + 2b)(a^2 - 2ab + 4b^2)$ **Ans.**

Q. 4. $x^5 + x^2$

Sol. $x^5 + x^2$
 $= x^2(x^3 + 1) = x^2\{(x)^3 + (1)^3\}$
 $= x^2(x + 1) \{(x)^2 - x \times 1 + (1)^2\}$
 $= x^2(x + 1)(x^2 - x + 1)$ **Ans.**

Q. 5. $16x^4 + 54x$

Sol. $16x^4 + 54x$
 $= 2x\{8x^3 + 27\} = 2x\{(2x)^3 + (3)^3\}$
 $= 2x(2x + 3) \{(2x)^2 - 2x \times 3 + (3)^2\}$
 $= 2x(2x + 3)(4x^2 - 6x + 9)$ **Ans.**

Q. 6. $216x^3 + \frac{1}{27}$

Sol. $216x^3 + \frac{1}{27} = (6x)^3 + \left(\frac{1}{3}\right)^3$
 $= \left(6x + \frac{1}{3}\right) \left\{ (6x)^2 - 6x \times \frac{1}{3} + \left(\frac{1}{3}\right)^2 \right\}$
 $= \left(6x + \frac{1}{3}\right) \left(36x^2 - 2x + \frac{1}{9}\right)$ **Ans.**

Q. 7. $a^6 + b^6$

Sol. $a^6 + b^6$
 $= (a^2)^3 + (b^2)^3$
 $= (a^2 + b^2) \{ (a^2)^2 - a^2 \times b^2 + (b^2)^2 \}$
 $= (a^2 + b^2) (a^4 - a^2 b^2 + b^4)$ **Ans.**

Q. 8. $a^4 + 343a$

Sol. $a^4 + 343a$
 $= a(a^3 + 343) = a \{ (a)^3 + (7)^3 \}$
 $= a(a + 7) \{ (a^2) - a \times 7 + (7)^2 \}$
 $= a(a + 7) (a^2 - 7a + 49)$ **Ans.**

Q. 9. $125x^3 + 1$

Sol. $125x^3 + 1$
 $= (5x)^3 + (1)^3$
 $= (5x + 1) \{ (5x)^2 - 5x \times 1 + (1)^2 \}$
 $= (5x + 1) (25x^2 - 5x + 1)$ **Ans.**

Q. 10. $2a^3 + 16b^3 - 3a - 6b$

Sol. $2a^3 + 16b^3 - 3a - 6b$
 $= 2(a^3 + 8b^3) - 3(a + 2b)$
 $= 2 \{ (a)^3 + (2b)^3 \} - 3(a + 2b)$
 $= 2(a + 2b) \{ (a)^2 - a \times 2b + (2b)^2 \} - 3(a + 2b)$
 $= 2(a + 2b) (a^2 - 2ab + 4b^2) - 3(a + 2b)$
 $= (a + 2b) \{ 2(a^2 - 2ab + 4b^2) - 3 \}$
 $= (a + 2b) (2a^2 - 4ab + 8b^2 - 3)$ **Ans.**

Q. 11. $a^3 - 125 - 2a + 10$

Sol. $a^3 - 125 - 2a + 10$
 $= \{ (a)^3 - (5)^3 \} - 2(a - 5)$

$$= (a - 5) \{ (a)^2 + a \times 5 + (5)^2 \} - 2(a - 5)$$

$$= (a - 5) (a^2 + 5a + 25) - 2(a - 5)$$

$$= (a - 5) (a^2 + 5a + 25 - 2)$$

$$= (a - 5) (a^2 + 5a + 23)$$
 Ans.

Q. 12. $x^3 - 125$

Sol. $x^3 - 125 = (x)^3 - (5)^3$
 $= (x - 5) \{ (x)^2 + x \times 5 + (5)^2 \}$
 $= (x - 5) (x^2 + 5x + 25)$ **Ans.**

Q. 13. $8a^3 - \frac{1}{27b^3}$

Sol. $8a^3 - \frac{1}{27b^3}$
 $= (2a)^3 - \left(\frac{1}{3b}\right)^3$
 $= \left(2a - \frac{1}{3b}\right) \left\{ (2a)^2 + 2a \times \frac{1}{3b} + \left(\frac{1}{3b}\right)^2 \right\}$
 $= \left(2a - \frac{1}{3b}\right) \left(4a^2 + \frac{2a}{3b} + \frac{1}{9b^2}\right)$ **Ans.**

Q. 14. $\frac{8a^3}{27} - \frac{b^3}{8}$

Sol. $\frac{8a^3}{27} - \frac{b^3}{8}$
 $= \left(\frac{2a}{3}\right)^3 - \left(\frac{b}{2}\right)^3$
 $= \left(\frac{2a}{3} - \frac{b}{2}\right) \left\{ \left(\frac{2a}{3}\right)^2 + \frac{2a}{3} \times \frac{b}{2} + \left(\frac{b}{2}\right)^2 \right\}$
 $= \left(\frac{2a}{3} - \frac{b}{2}\right) \left(\frac{4a^2}{9} + \frac{ab}{3} + \frac{b^2}{4}\right)$ **Ans.**

Q. 15. $a - 8ab^3$

Sol. $a - 8ab^3 = a(1 - 8b^3)$
 $= a \{ (1)^3 - (2b)^3 \}$
 $= a(1 - 2b) \{ (1)^2 + 1 \times 2b + (2b)^2 \}$
 $= a(1 - 2b) (1 + 2b + 4b^2)$ **Ans.**

Q. 16. $x^6 - 1$

Sol. $x^6 - 1 = (x^3)^2 - (1)^2$
 $= (x^3 + 1)(x^3 - 1)$
 $= \{(x)^3 + (1)^3\} \{(x)^3 - (1)^3\}$
 $= (x + 1)(x^2 - x + 1)(x - 1)(x^2 + x + 1)$
 $= (x + 1)(x - 1)(x^2 - x + 1)(x^2 + x + 1)$ **Ans.**

Q. 17. $a^3 - 0.064$

Sol. $a^3 - 0.064$
 $= (a)^3 - (0.4)^3$
 $= (a - 0.4) \{(a)^2 + a \times (0.4) + (0.4)^2\}$
 $= (a - 0.4)(a^2 + 0.4a + 0.16)$ **Ans.**

Q. 18. $24x^4 - 375x$

Sol. $24x^4 - 375x$
 $= 3x(8x^3 - 125) = 3x \{(2x)^3 - (5)^3\}$
 $= 3x(2x - 5) \{(2x)^2 + 2x + 5 + (5)^2\}$
 $= 3x(2x - 5)(4x^2 + 10x + 25)$ **Ans.**

Q. 19. $3a^7b - 81a^4b^4$

Sol. $3a^7b - 81a^4b^4$
 $= 3a^4b(a^3 - 27b^3)$
 $= 3a^4b \{(a)^3 - (3b)^3\}$
 $= 3a^4b(a - 3b) \{(a)^2 + a \times 3b + (3b)^2\}$
 $= 3a^4b(a - 3b)(a^2 + 3ab + 9b^2)$ **Ans.**

Q. 20. $a^3 - \frac{1}{a^3} - 2a + \frac{2}{a}$

Sol. $a^3 - \frac{1}{a^3} - 2a + \frac{2}{a}$
 $= \left\{ (a)^3 - \left(\frac{1}{a}\right)^3 \right\} - 2 \left(a - \frac{1}{a} \right)$
 $= \left(a - \frac{1}{a} \right) \left\{ (a)^2 + a \times \frac{1}{a} + \left(\frac{1}{a}\right)^2 \right\} - 2 \left(a - \frac{1}{a} \right)$
 $= \left(a - \frac{1}{a} \right) \left(a^2 + 1 + \frac{1}{a^2} \right) - 2 \left(a - \frac{1}{a} \right)$

$$= \left(a - \frac{1}{a} \right) \left(a^2 + 1 + \frac{1}{a^2} - 2 \right)$$

$$= \left(a - \frac{1}{a} \right) \left(a^2 - 1 + \frac{1}{a^2} \right)$$
 Ans.

Q. 21. $2x^7 - 128x$

Sol. $2x^7 - 128x$
 $= 2x(x^6 - 64)$
 $= 2x \{(x^3)^2 - (8)^2\}$
 $= 2x(x^3 + 8)(x^3 - 8)$
 $= 2x \{(x)^3 + (2)^3\} \{(x)^3 - (2)^3\}$
 $= 2x(x + 2) \{(x)^2 - x \times 2 + (2)^2\}$
 $\quad (x - 2) \{(x)^2 + x \times 2 + (2)^2\}$
 $= 2x(x + 2)(x^2 - 2x + 4)(x - 2)$
 $\quad (x^2 + 2x + 4)$
 $= 2x(x + 2)(x - 2)(x^2 - 2x + 4)$
 $\quad (x^2 + 2x + 4)$ **Ans.**

Q. 22. $250(a - b)^3 + 2$

Sol. $250(a - b)^3 + 2$
 $= 2 \{125(a - b)^3 + 1\}$
 $= 2 \{ \{5(a - b)\}^3 + (1)^3 \}$
 $= 2 \{5(a - b) + 1\}$
 $\quad \{ \{5(a - b)\}^2 - 5(a - b) \times 1 + (1)^2 \}$
 $= 2(5a - 5b + 1)$
 $\quad \{25(a - b)^2 - 5(a - b) + 1\}$
 $= 2(5a - 5b + 1)$
 $\quad \{25(a^2 + b^2 - 2ab) - 5a + 5b + 1\}$
 $= 2(5a - 5b + 1)(25a^2 + 25b^2$
 $\quad - 50ab - 5a + 5b + 1)$ **Ans.**

Q. 23. $8a^3 - b^3 - 4ax + 2bx$

Sol. $8a^3 - b^3 - 4ax + 2bx$
 $= \{(2a)^3 - (b)^3\} - 2x(2a - b)$
 $= (2a - b) \{(2a)^2 + 2a \times b + (b)^2\}$
 $\quad - 2x(2a - b)$
 $= (2a - b)(4a^2 + 2ab + b^2)$
 $\quad - 2x(2a - b)$
 $= (2a - b)(4a^2 + 2ab + b^2 - 2x)$ **Ans.**

Q. 24. $a^3 - 27b^3 + 2a^2b - 6ab^2$

Sol. $a^3 - 27b^3 + 2a^2b - 6ab^2$

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

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

$$= (a - 3b)(a^2 + 3ab + 9b^2)$$

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

$$= (a - 3b)(a^2 + 3ab + 9b^2 + 2ab)$$

$$= (a - 3b)(a^2 + 5ab + 9b^2) \text{ Ans.}$$

Q. 25. $32a^2x^3 - 8b^2x^3$

Sol. $32a^2x^3 - 8b^2x^3$

$$= 8x^3(4a^2 - b^2)$$

$$= 8x^3\{(2a)^2 - (b)^2\}$$

$$= 8x^3(2a + b)(2a - b) \text{ Ans.}$$

Q. 26. $(a + b)^3 + (a - b)^3$

Sol. $(a + b)^3 + (a - b)^3$

Let $a + b = x$ and $a - b = y$

$$(a + b)^3 + (a - b)^3 = x^3 + y^3$$

$$= (x + y)(x^2 - xy + y^2)$$

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

$$\{(a + b)^2 - (a + b)(a - b) + (a - b)^2\}$$

$$= 2a\{(a + b)^2 + (a - b)^2 - (a^2 - b^2)\}$$

$$= 2a\{2(a^2 + b^2) - (a^2 - b^2)\}$$

$$= 2a\{2a^2 + 2b^2 - a^2 + b^2\}$$

$$= 2a(a^2 + 3b^2) \text{ Ans.}$$

EXERCISE 5 (D)

Factorise :

Q. 1. $x^2 + 9x + 18$

Sol. $x^2 + 9x + 18$

$$= x^2 + 3x + 6x + 18$$

$$\left\{ \begin{array}{l} \because 9 = 3 + 6 \\ 18 = 3 \times 6 \end{array} \right\}$$

$$= x(x + 3) + 6(x + 3)$$

$$= (x + 3)(x + 6) \text{ Ans.}$$

Q. 2. $x^2 - 5x - 6$

Sol. $x^2 - 5x - 6 = x^2 - 6x + x - 6$

$$\left\{ \begin{array}{l} \because -5 = -6 + 1 \\ -6 = -6 \times 1 \end{array} \right\}$$

$$= x(x - 6) + 1(x - 6)$$

$$= (x - 6)(x + 1) \text{ Ans.}$$

Q. 3. $x^2 + 6x - 7$

Sol. $x^2 + 6x - 7 = x^2 + 7x - x - 7$

$$\left\{ \begin{array}{l} \because 6 = 7 - 1 \\ -7 = 7 \times (-1) \end{array} \right\}$$

$$= x(x + 7) - 1(x + 7)$$

$$= (x + 7)(x - 1) \text{ Ans.}$$

Q. 4. $x^2 + 7x - 18$

Sol. $x^2 + 7x - 18$

$$= x^2 + 9x - 2x - 18$$

$$\left\{ \begin{array}{l} \because 7 = 9 - 2 \\ -18 = 9 \times (-2) \end{array} \right\}$$

$$= x(x + 9) - 2(x + 9)$$

$$= (x + 9)(x - 2) \text{ Ans.}$$

Q. 5. $x^2 - 3x - 54$

Sol. $x^2 - 3x - 54$

$$= x^2 - 9x + 6x - 54$$

$$\left\{ \begin{array}{l} \because -3 = -9 + 6 \\ -54 = -9 \times 6 \end{array} \right\}$$

$$= x(x - 9) + 6(x - 9)$$

$$= (x - 9)(x + 6) \text{ Ans.}$$

Q. 6. $x^2 - 17x - 84$

Sol. $x^2 - 17x - 84$

$$= x^2 - 21x + 4x - 84$$

$$\left\{ \begin{array}{l} \because -17 = -21 + 4 \\ -84 = -21 \times 4 \end{array} \right\}$$

$$= x(x - 21) + 4(x - 21)$$

$$= (x - 21)(x + 4) \text{ Ans.}$$

Q. 7. $6x^2 + 11x - 10$

Sol. $6x^2 + 11x - 10$

$$= 6x^2 + 15x - 4x - 10$$

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

$$= (2x + 5)(3x - 2) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 6 \times (-10) = -60 \\ \because 11 = 15 - 4 \\ -60 = 15 \times (-4) \end{array} \right\}$$

Q. 8. $3x^2 - 4x - 7$

Sol. $3x^2 - 4x - 7$

$$= 3x^2 - 7x + 3x - 7$$

$$= x(3x - 7) + 1(3x - 7)$$

$$= (3x - 7)(x + 1) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 3 \times (-7) = -21 \\ \therefore -4 = -7 + 3 \\ -21 = -7 \times 3 \end{array} \right\}$$

Q. 9. $2x^2 - 7x - 39$

Sol. $2x^2 - 7x - 39$

$$= 2x^2 - 13x + 6x - 39$$

$$= x(2x - 13) + 3(2x - 13)$$

$$= (2x - 13)(x + 3) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 2 \times (-39) = -78 \\ \therefore -7 = -13 + 6 \\ -78 = -13 \times 6 \end{array} \right\}$$

Q. 10. $2x^2 + 3x - 90$

Sol. $2x^2 + 3x - 90$

$$= 2x^2 + 15x - 12x - 90$$

$$= x(2x + 15) - 6(2x + 15)$$

$$= (2x + 15)(x - 6) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 2 \times (-90) = -180 \\ \therefore 3 = 15 - 12 \\ -180 = 15 \times (-12) \end{array} \right\}$$

Q. 11. $2x^2 + 5x - 3$

Sol. $2x^2 + 5x - 3$

$$= 2x^2 + 6x - x - 3$$

$$= 2x(x + 3) - 1(x + 3)$$

$$= (x + 3)(2x - 1) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 2 \times (-3) = -6 \\ \therefore 5 = 6 - 1 \\ -6 = 6 \times (-1) \end{array} \right\}$$

Q. 12. $10 + 3x - x^2$

Sol. $10 + 3x - x^2$

$$= 10 + 5x - 2x - x^2$$

$$= 5(2 + x) - x(2 + x)$$

$$= (2 + x)(5 - x) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 10 \times (-1) = -10 \\ \therefore 3 = 5 - 2 \\ -10 = 5 \times (-2) \end{array} \right\}$$

Q. 13. $7 - 12x - 4x^2$

Sol. $7 - 12x - 4x^2$

$$= 7 - 14x + 2x - 4x^2$$

$$= 7(1 - 2x) + 2x(1 - 2x)$$

$$= (1 - 2x)(7 + 2x) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 7 \times (-4) = -28 \\ \therefore -12 = -14 + 2 \\ -28 = -14 \times 2 \end{array} \right\}$$

Q. 14. $5 - 4y - 12y^2$

Sol. $5 - 4y - 12y^2$

$$= 5 - 10y + 6y - 12y^2$$

$$= 5(1 - 2y) + 6y(1 - 2y)$$

$$= (1 - 2y)(5 + 6y) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 5 \times (-12) = -60 \\ \therefore -4 = -10 + 6 \\ -60 = -10 \times 6 \end{array} \right\}$$

Q. 15. $1 - 18z - 63z^2$

Sol. $1 - 18z - 63z^2$

$$= 1 - 21z + 3z - 63z^2$$

$$= 1(1 - 21z) + 3z(1 - 21z)$$

$$= (1 - 21z)(1 + 3z) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 1 \times (-63) = -63 \\ \therefore -18 = -21 + 3 \\ -63 = -21 \times 3 \end{array} \right\}$$

Q. 16. $x^2 - 3ax - 88a^2$

Sol. $x^2 - 3ax - 88a^2$

$$= x^2 - 11ax + 8ax - 88a^2$$

$$= x(x - 11a) + 8a(x - 11a)$$

$$= (x - 11a)(x + 8a) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because -3 = -11 + 8 \\ -88 = -11 \times 8 \end{array} \right\}$$

Q. 17. $3 - x(4 + 7x)$

Sol. $3 - x(4 + 7x)$

$$= 3 - 4x - 7x^2$$

$$= 3 - 7x + 3x - 7x^2$$

$$= 1(3 - 7x + x(3 - 7x))$$

$$= (3 - 7x)(1 + x) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 3 \times (-7) = -21 \\ \therefore -4 = -7 + 3 \\ -21 = -7 \times 3 \end{array} \right.$$

Q. 18. $24x^3 + 37x^2 - 5x$

Sol. $24x^3 + 37x^2 - 5x$

$$= x(24x^2 + 37x - 5)$$

$$= x(24x^2 + 40x - 3x - 5)$$

$$= x\{8x(3x + 5) - 1(3x + 5)\}$$

$$= x(3x + 5)(8x - 1) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 24 \times (-5) = -120 \\ \therefore 37 = 40 - 3 \\ -120 = 40 \times (-3) \end{array} \right.$$

Q. 19. $x^2y^2 - 12xy - 45$

Sol. $x^2y^2 - 12xy - 45$

$$= x^2y^2 - 15xy + 3xy - 45$$

$$= xy(xy - 15) + 3(xy - 15)$$

$$= (xy - 15)(xy + 3) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 12 = -15 + 3 \\ -45 = -15 \times 3 \end{array} \right.$$

Q. 20. $x(2x - y) - y^2$

Sol. $x(2x - y) - y^2$

$$= 2x^2 - xy - y^2$$

$$= 2x^2 - 2xy + xy - y^2$$

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

$$= (x - y)(2x + y) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 2 \times (-1) = -2 \\ -1 = -2 + 1 \\ -2 = -2 \times 1 \end{array} \right.$$

Q. 21. $5x^2 + 17xy - 12y^2$

Sol. $5x^2 + 17xy - 12y^2$

$$= 5x^2 + 20xy - 3xy - 12y^2$$

$$= 5x(x + 4y) - 3y(x + 4y)$$

$$= (x + 4y)(5x - 3y) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 5 \times (-12) = -60 \\ \therefore 17 = 20 - 3 \\ -60 = 20 \times (-3) \end{array} \right.$$

Q. 22. $5(3a + b)^2 + 6(3a + b) - 8$

Sol. $5(3a + b)^2 + 6(3a + b) - 8$

Let $3a + b = x$, then

$$5(3a + b)^2 + 6(3a + b) - 8$$

$$= 5x^2 + 6x - 8$$

$$= 5x^2 + 10x - 4x - 8$$

$$= 5x(x + 2) - 4(x + 2)$$

$$= (x + 2)(5x - 4)$$

Substituting the value of x ,

$$= (3a + b + 2)\{5(3a + b) - 4\}$$

$$= (3a + b + 2)(15a + 5b - 4) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 5 \times (-8) = -40 \\ \therefore 6 = 10 - 4 \\ -40 = 10 \times (-4) \end{array} \right.$$

Q. 23. $3(2a - b)^2 - 19(2a - b) + 28$

Sol. Let $2a - b = x$, then

$$3(2a - b)^2 - 19(2a - b) + 28$$

$$= 3x^2 - 19x + 28$$

$$= 3x^2 - 12x - 7x + 28$$

$$= 3x(x - 4) - 7(x - 4)$$

$$= (x - 4)(3x - 7)$$

Now substituting the value of x ,

$$= (2a - b - 4)\{3(2a - b) - 7\}$$

$$= (2a - b - 4)(6a - 3b - 7) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 3 \times 28 = 84 \\ \therefore -19 = -12 - 7 \\ 84 = (-12)(-7) \end{array} \right.$$

Q. 24. $1 - 2(a + 2b) - 3(a + 2b)^2$

Sol. $1 - 2(a + 2b) - 3(a + 2b)^2$

Let $a + 2b = x$, then

$$1 - 2(a + 2b) - 3(a + 2b)^2$$

$$= 1 - 2x - 3x^2$$

$$= 1 - 3x + x - 3x^2$$

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

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

Now substituting the value of x ,

$$= \{1 - 3(a + 2b)\} \{1 + (a + 2b)\}$$

$$= (1 - 3a - 6b)(1 + a + 2b) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 1 \times (-3) = -3 \\ \therefore -2 = -3 + 1 \\ -3 = -3 \times 1 \end{array} \right\}$$

Q. 25. $(a + 4)^2 - 5ab - 20b - 6b^2$

Sol. $(a + 4)^2 - 5ab - 20b - 6b^2$

$$= (a + 4)^2 - 5b(a + 4) - 6b^2$$

$$= (a + 4)^2 - 6b(a + 4) + b(a + 4) - 6b^2$$

$$= (a + 4)(a + 4 - 6b) + b(a + 4 - 6b)$$

$$= (a + 4 - 6b)(a + 4 + b) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because -5 = -6 + 1 \\ -6 = -6 \times 1 \end{array} \right\}$$

Q. 26. $8(a - 2b)^2 - 2a + 4b - 1$

Sol. $8(a - 2b)^2 - 2a + 4b - 1$

$$= 8(a - 2b)^2 - 2(a - 2b) - 1$$

$$= 8(a - 2b)^2 - 4(a - 2b) + 2(a - 2b) - 1$$

$$= 4(a - 2b) \{2(a - 2b) - 1\} + 1 \{2(a - 2b) - 1\}$$

$$= 4(a - 2b)(2a - 4b - 1) + 1(2a - 4b - 1)$$

$$= (2a - 4b - 1) \{4(a - 2b) + 1\}$$

$$= (2a - 4b - 1)(4a - 8b + 1) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 8 \times (-1) = -8 \\ \therefore -2 = -4 + 2 \\ -8 = -4 \times 2 \end{array} \right\}$$

Q. 27. $4(2a - 3)^2 - 3(2a - 3)(a - 1) - 7(a - 1)^2$

Sol. $4(2a - 3)^2 - 3(2a - 3)(a - 1) - 7(a - 1)^2$

Let $2a - 3 = x$ and $a - 1 = y$, then

Given expression = $4x^2 - 3xy - 7y^2$

$$= 4x^2 - 7xy + 4xy - 7y^2$$

$$= x(4x - 7y) + y(4x - 7y)$$

$$= (4x - 7y)(x + y)$$

Now substituting the values of x and y

$$= \{4(2a - 3) - 7(a - 1)\} \{(2a - 3) + (a - 1)\}$$

$$= (8a - 12 - 7a + 7)(2a - 3 + a - 1)$$

$$= (a - 5)(3a - 4) \text{ Ans.}$$

$$\left\{ \begin{array}{l} \because 4 \times (-7) = -28 \\ \therefore -3 = -7 + 4 \\ -28 = -7 \times 4 \end{array} \right\}$$

Q. 28. $(a^2 - 3a)(a^2 - 3a + 7) + 10$

Sol. $(a^2 - 3a)(a^2 - 3a + 7) + 10$

$$= (a^2 - 3a)(a^2 - 3a) + 7(a^2 - 3a) + 10$$

$$= (a^2 - 3a)^2 + 7(a^2 - 3a) + 10$$

Let $a^2 - 3a = x$, then

$$= x^2 + 7x + 10$$

$$= x^2 + 5x + 2x + 10$$

$$\left\{ \begin{array}{l} \because 7 = 5 + 2 \\ 10 = 5 \times 2 \end{array} \right\}$$

$$= x(x + 5) + 2(x + 5)$$

$$= (x + 5)(x + 2)$$

Now substituting the value of x

$$= (a^2 - 3a + 5)(a^2 - 3a + 2)$$

$$= (a^2 - 3a + 5) \{a^2 - 2a - a + 2\}$$

$$\left\{ \begin{array}{l} \because -3 = -2 - 1 \\ 2 = (-2) \times (-1) \end{array} \right\}$$

$$= (a^2 - 3a + 5) \{a(a - 2) - 1(a - 2)\}$$

$$= (a^2 - 3a + 5)(a - 2)(a - 1) \text{ Ans.}$$

Q. 29. $(a^2 - a)(4a^2 - 4a - 5) - 6$

Sol. $(a^2 - a)(4a^2 - 4a - 5) - 6$

$$= (a^2 - a) \{4(a^2 - a) - 5\} - 6$$

$$= 4(a^2 - a)^2 - 5(a^2 - a) - 6$$

Let $a^2 - a = x$, then

Given expression = $4x^2 - 5x - 6$

$$= 4x^2 - 8x + 3x - 6$$

$$= 4x(x - 2) + 3(x - 2)$$

$$= (x - 2)(4x + 3)$$

$$\left\{ \begin{array}{l} \because 4 \times (-6) = -24 \\ \therefore -5 = -8 + 3 \\ -24 = -8 \times 3 \end{array} \right\}$$

Now substituting the value of x

$$\begin{aligned} &= (a^2 - a - 2) (4a^2 - 4a + 3) \\ &= \{a^2 - 2a + a - 2\} \{4a^2 - 4a + 3\} \\ &= \{a(a-2) + 1(a-2)\} (4a^2 - 4a + 3) \\ &= (a-2)(a+1)(4a^2 - 4a + 3) \quad \text{Ans.} \end{aligned}$$

Q. 30. $a^4 - 11a^2 + 10$

Sol. $a^4 - 11a^2 + 10$

$$\begin{aligned} &= a^4 - 10a^2 - a^2 + 10 \\ &= a^2(a^2 - 10) - 1(a^2 - 10) \\ &= (a^2 - 10)(a^2 - 1) \\ &= (a^2 - 10)(a+1)(a-1) \quad \text{Ans.} \end{aligned}$$

Q. 31. $5 - (3x^2 - 2x)(6 - 3x^2 + 2x)$

Sol. $5 - (3x^2 - 2x)(6 - 3x^2 + 2x)$

Let $3x^2 - 2x = y$, then

$$\begin{aligned} 5 - (y)(6 - y) &= 5 - (6y - y^2) \\ &= 5 - 6y + y^2 \\ &= 5 - 5y - y + y^2 \\ &= 5(1 - y) - y(1 - y) \\ &= (1 - y)(5 - y) \end{aligned}$$

Substituting the value of y ,

$$\begin{aligned} &= (1 - 3x^2 + 2x)(5 - 3x^2 + 2x) \\ &= (1 + 2x - 3x^2)(5 + 2x - 3x^2) \\ &= (1 + 3x - x - 3x^2) \\ &\quad (5 + 5x - 3x - 3x^2) \\ &= \{1(1 + 3x) - x(1 + 3x)\} \\ &\quad \{5(1 + x) - 3x(1 + x)\} \\ &= (1 + 3x)(1 - x)(1 + x)(5 - 3x) \quad \text{Ans.} \end{aligned}$$