

CBSE Class –VIII Mathematics
NCERT Solutions
CHAPTER - 14
Factorisation (Ex. 14.2)

1. Factorize the following expressions:

(i) $a^2 + 8a + 16$

(ii) $p^2 - 10p + 25$

(iii) $25m^2 + 30m + 9$

(iv) $49y^2 + 84yz + 36z^2$

(v) $4x^2 - 8x + 4$

(vi) $121b^2 - 88bc + 16c^2$

(vii) $(l + m)^2 - 4lm$

[Hint: Expand $(l + m)^2$ first]

(viii) $a^4 + 2a^2b^2 + b^4$

Ans. (i) $a^2 + 8a + 16 = a^2 + (4 + 4)a + 4 \times 4$

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

Here $x = a$, $a = 4$ and $b = 4$

$$a^2 + 8a + 16 = (a + 4)(a + 4) = (a + 4)^2$$

(ii) $p^2 - 10p + 25 = p^2 + (-5 - 5)p + (-5)(-5)$

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

Here $x = p$, $a = -5$ and $b = -5$

$$p^2 - 10p + 25 = (p - 5)(p - 5) = (p - 5)^2$$

(iii) $25m^2 + 30m + 9 = (5m)^2 + 2 \times 5m \times 3 + (3)^2$

Using identity $a^2 + 2ab + b^2 = (a + b)^2$, here $a = 5m$, $b = 3$

$$25m^2 + 30m + 9 = (5m + 3)^2$$

(iv) $49y^2 + 84yz + 36z^2 = (7y)^2 + 2 \times 7y \times 6z + (6z)^2$

Using identity $a^2 + 2ab + b^2 = (a + b)^2$, here $a = 7y$, $b = 6z$

$$49y^2 + 84yz + 36z^2 = (7y + 6z)^2$$

(v) $4x^2 - 8x + 4 = (2x)^2 - 2 \times 2x \times 2 + (2)^2$

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

$$\begin{aligned} 4x^2 - 8x + 4 &= (2x - 2)^2 \\ &= (2)^2 (x - 1)^2 = 4(x - 1)^2 \end{aligned}$$

(vi) $121b^2 - 88bc + 16c^2 = (11b)^2 - 2 \times 11b \times 4c + (4c)^2$

Using identity $a^2 - 2ab + b^2 = (a - b)^2$, here $a = 11b$, $b = 4c$

$$121b^2 - 88bc + 16c^2 = (11b - 4c)^2$$

(vii) $(l + m)^2 - 4lm$

$$= l^2 + 2 \times l \times m + m^2 - 4lm \left[\because (a + b)^2 = a^2 + 2ab + b^2 \right]$$

$$= l^2 + 2lm + m^2 - 4lm$$

$$= l^2 - 2lm + m^2$$

$$= (l-m)^2 \quad \left[\because (a-b)^2 = a^2 - 2ab + b^2 \right]$$

$$\text{(viii)} \quad a^4 + 2a^2b^2 + b^4 = (a^2)^2 + 2 \times a^2 \times b^2 + (b^2)^2$$

$$= (a^2 + b^2)^2 \quad \left[\because (a+b)^2 = a^2 + 2ab + b^2 \right]$$

2. Factorize:

$$\text{(i)} \quad 4p^2 - 9q^2$$

$$\text{(ii)} \quad 63a^2 - 112b^2$$

$$\text{(iii)} \quad 49x^2 - 36$$

$$\text{(iv)} \quad 16x^5 - 144x^2$$

$$\text{(v)} \quad (l+m)^2 - (l-m)^2$$

$$\text{(vi)} \quad 9x^2y^2 - 16$$

$$\text{(vii)} \quad (x^2 - 2xy + y^2) - z^2$$

$$\text{(viii)} \quad 25a^2 - 4b^2 + 28bc - 49c^2$$

$$\text{Ans. (i)} \quad 4p^2 - 9q^2 = (2p)^2 - (3q)^2$$

$$= (2p-3q)(2p+3q) \quad \left[\because a^2 - b^2 = (a-b)(a+b) \right]$$

$$\text{(ii)} \quad 63a^2 - 112b^2 = 7(9a^2 - 16b^2)$$

$$= 7[(3a)^2 - (4b)^2]$$

$$= 7(3a-4b)(3a+4b) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$\text{(iii)} \quad 49x^2 - 36 = (7x)^2 - (6)^2$$

$$= (7x-6)(7x+6) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$\text{(iv)} \quad 16x^5 - 144x^3 = 16x^3(x^2 - 9)$$

$$= 16x^3[(x)^2 - (3)^2]$$

$$= 16x^3(x-3)(x+3) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$\text{(v)} \quad (l+m)^2 - (l-m)^2$$

$$= [(l+m) + (l-m)][(l+m) - (l-m)] \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= (l+m+l-m)(l+m-l+m)$$

$$= (2l)(2m) = 4lm$$

$$\text{(vi)} \quad 9x^2y^2 - 16 = (3xy)^2 - (4)^2$$

$$= (3xy-4)(3xy+4) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$\text{(vii)} \quad (x^2 - 2xy + y^2) - z^2 = (x-y)^2 - z^2 \quad [\because (a-b)^2 = a^2 - 2ab + b^2]$$

$$= (x-y-z)(x-y+z) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$\text{(viii)} \quad 25a^2 - 4b^2 + 28bc - 49c^2$$

$$= 25a^2 - (4b^2 - 28bc + 49c^2)$$

$$= 25a^2 - [(2b)^2 - 2 \times 2b \times 7c + (7c)^2]$$

$$\begin{aligned} &= 25a^2 - (2b - 7c)^2 \quad \left[\because (a - b)^2 = a^2 - 2ab + b^2 \right] \\ &= (5a)^2 - (2b - 7c)^2 \\ &= [5a - (2b - 7c)][5a + (2b - 7c)] \quad \left[\because a^2 - b^2 = (a - b)(a + b) \right] \\ &= (5a - 2b + 7c)(5a + 2b - 7c) \end{aligned}$$

3. Factorize the expressions:

(i) $ax^2 + bx$

(ii) $7p^2 + 21q^2$

(iii) $2x^3 + 2xy^2 + 2xz^2$

(iv) $am^2 + bm^2 + bn^2 + an^2$

(v) $(lm + l) + m + 1$

(vi) $y(y + z) + 9(y + z)$

(vii) $5y^2 - 20y - 8z + 2yz$

(viii) $10ab + 4a + 5b + 2$

(ix) $6xy - 4y + 6 - 9x$

Ans. (i) $ax^2 + bx = x(ax + b)$

(ii) $7p^2 + 21q^2 = 7(p^2 + 3q^2)$

(iii) $2x^3 + 2xy^2 + 2xz^2 = 2x(x^2 + y^2 + z^2)$

(iv) $am^2 + bm^2 + bn^2 + an^2$

$$= m^2(a+b) + n^2(a+b)$$

$$= (a+b)(m^2 + n^2)$$

$$\text{(v)} \quad (lm+l) + m+1 = l(m+1) + 1(m+1)$$

$$= (m+1)(l+1)$$

$$\text{(vi)} \quad y(y+z) + 9(y+z) = (y+z)(y+9)$$

$$\text{(vii)} \quad 5y^2 - 20y - 8z + 2yz$$

$$= 5y^2 - 20y + 2yz - 8z$$

$$= 5y(y-4) + 2z(y-4)$$

$$= (y-4)(5y+2z)$$

$$\text{(viii)} \quad 10ab + 4a + 5b + 2$$

$$= 2a(5b+2) + 1(5b+2)$$

$$= (5b+2)(2a+1)$$

$$\text{(ix)} \quad 6xy - 4y + 6 - 9x$$

$$= 6xy - 9x - 4y + 6$$

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

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

4. Factorize:

$$\text{(i)} \quad a^4 - b^4 \quad \text{(ii)} \quad p^4 - 81$$

(iii) $x^4 - (y+z)^4$ (iv) $x^4 - (x-z)^4$

(v) $a^4 - 2a^2b^2 + b^4$

Ans. (i) $a^4 - b^4 = (a^2)^2 - (b^2)^2$

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

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

(ii) $p^4 - 81 = (p^2)^2 - (9)^2$

$$= (p^2 - 9)(p^2 + 9) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= (p^2 - 3^2)(p^2 + 9)$$

$$= (p-3)(p+3)(p^2 + 9) \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

(iii) $x^4 - (y+z)^4 = (x^2)^2 - [(y+z)^2]^2$

$$= [x^2 - (y+z)^2][x^2 + (y+z)^2] \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= [x - (y+z)][x + (y+z)][x^2 + (y+z)^2] \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= (x - y - z)(x + y + z)[x^2 + (y+z)^2]$$

(iv) $x^4 - (x-z)^4 = (x^2)^2 - [(x-z)^2]^2$

$$= [x^2 - (x-z)^2][x^2 + (x-z)^2] \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= [x - (x-z)][x + (x-z)][x^2 + (x-z)^2] \quad [\because a^2 - b^2 = (a-b)(a+b)]$$

$$= [x - x + z] [x + x - z] [x^2 + x^2 - 2xz + z^2] \left[\because (a-b)^2 = a^2 - 2ab + b^2 \right]$$

$$= z (2x - z) (2x^2 - 2xz + z^2)$$

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

$$= (a^2 - b^2)^2 \left[\because (a-b)^2 = a^2 - 2ab + b^2 \right]$$

$$= [(a-b)(a+b)]^2 \left[\because a^2 - b^2 = (a-b)(a+b) \right]$$

$$= (a-b)^2 (a+b)^2 \left[\because (xy)^m = x^m \cdot y^m \right]$$

5. Factorize the following expressions:

(i) $p^2 + 6p + 8$

(ii) $q^2 - 10q + 21$

(iii) $p^2 + 6p - 16$

Ans.

(i) $p^2 + 6p + 8 = p^2 + (4+2)p + 4 \times 2$

$$= p^2 + 4p + 2p + 4 \times 2$$

$$= p(p+4) + 2(p+4)$$

$$= (p+4)(p+2)$$

(ii) $q^2 - 10q + 21 = q^2 - (7+3)q + 7 \times 3$

$$= q^2 - 7q - 3q + 7 \times 3$$

$$= q(q-7) - 3(q-7)$$

$$= (q-7)(q-3)$$

$$\text{(iii)} \quad p^2 + 6p - 16 = p^2 + (8-2)p - 8 \times 2$$

$$= p^2 + 8p - 2p - 8 \times 2$$

$$= p(p+8) - 2(p+8)$$

$$= (p+8)(p-2)$$