



NCERT solutions for class 8 maths 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  $b = -5$

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

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

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

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

$$\begin{aligned} \text{(iv)} \quad & 49y^2 + 84yz + 36z^2 \\ &= (7y)^2 + 2 \times 7y \times 6z + (6z)^2 \end{aligned}$$

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

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

$$\text{(v)} \quad 4x^2 - 8x + 4 = (2x)^2 - 2 \times 2x \times 2 + (2)^2$$

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

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

$$\begin{aligned} \text{(vi)} \quad & 121b^2 - 88bc + 16c^2 \\ &= (11b)^2 - 2 \times 11b \times 4c + (4c)^2 \end{aligned}$$

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

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

$$\textbf{(vii)} \quad (l+m)^2 - 4lm$$

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

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

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

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

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

$$\textbf{(viii)}$$

$$a^4 + 2a^2b^2 + b^4 = (a^2)^2 + 2 \times a^2 \times b^2 + (b^2)^2$$

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

**Q2.** Factorize:

**(i)**  $4p^2 - 9q^2$

**(ii)**  $63a^2 - 112b^2$

**(iii)**  $49x^2 - 36$

**(iv)**  $16x^5 - 144x^2$

**(v)**  $(l+m)^2 - (l-m)^2$

**(vi)**  $9x^2y^2 - 16$

**(vii)**  $(x^2 - 2xy + y^2) - z^2$

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

**Ans. (i)**  $4p^2 - 9q^2 = (2p)^2 - (3q)^2$

$$= (2p - 3q)(2p + 3q)$$

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

**(ii)**  $63a^2 - 112b^2 = 7(9a^2 - 16b^2)$

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

$$= 7(3a - 4b)(3a + 4b)$$

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

**(iii)**  $49x^2 - 36 = (7x)^2 - (6)^2$

$$\begin{aligned} \text{(iii)} \quad & 49x^2 - 36 = (7x)^2 - (6)^2 \\ & = (7x - 6)(7x + 6) \left[ \because a^2 - b^2 = (a - b)(a + b) \right] \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad & 16x^5 - 144x^3 = 16x^3(x^2 - 9) \\ & = 16x^3[(x)^2 - (3)^2] \\ & = 16x^3(x - 3)(x + 3) \\ & \left[ \because a^2 - b^2 = (a - b)(a + b) \right] \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad & (l + m)^2 - (l - m)^2 \\ & = [(l + m) + (l - m)][(l + m) - (l - m)] \\ & \left[ \because a^2 - b^2 = (a - b)(a + b) \right] \\ & = (l + m + l - m)(l + m - l + m) \\ & = (2m)(2l) = 4lm \end{aligned}$$

$$\begin{aligned} \text{(vi)} \quad & 9x^2y^2 - 16 = (3xy)^2 - (4)^2 \\ & = (3xy - 4)(3xy + 4) \\ & \left[ \because a^2 - b^2 = (a - b)(a + b) \right] \end{aligned}$$

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

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

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

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

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

$$= 25a^2 - (2b - 7c)^2$$

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

$$= (5a)^2 - (2b - 7c)^2$$

$$= [5a - (2b - 7c)][5a + (2b - 7c)]$$

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

$$= (5a - 2b + 7c)(5a + 2b - 7c)$$

**Q3.** Factorize the expressions:

$$\text{(i)} \quad ax^2 + bx$$

$$\text{(ii)} \quad 7p^2 + 21q^2$$

$$\text{(iii)} \quad 2x^3 + 2xy^2 + 2xz^2$$

$$\text{(iv)} \quad am^2 + bm^2 + bn^2 + an^2$$

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

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

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

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

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

$$\text{Ans. (i)} \quad ax^2 + bx = x(ax + b)$$

$$\text{(ii)} \quad 7p^2 + 21q^2 = 7(p^2 + 3q^2)$$

$$\text{(iii)} \quad 2x^3 + 2xy^2 + 2xz^2 = 2x(x^2 + y^2 + z^2)$$

$$\text{(iv)} \quad am^2 + bm^2 + bn^2 + an^2$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Q4.** Factorize:

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

$$\textbf{(iii)} \quad x^4 - (y+z)^4 \quad \textbf{(iv)} \quad x^4 - (x-z)^4$$

$$\textbf{(v)} \quad a^4 - 2a^2b^2 + b^4$$

$$\textbf{Ans. (i)} \quad a^4 - b^4 = (a^2)^2 - (b^2)^2$$

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

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

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

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

$$\textbf{(ii)} \quad p^4 - 81 = (p^2)^2 - (9)^2$$

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

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



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

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

$$\textbf{(iii)} \quad x^4 - (y+z)^4 = (x^2)^2 - [(y+z)^2]^2$$

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

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

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

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

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

$$\textbf{(iv)} \quad x^4 - (x-z)^4 = (x^2)^2 - [(x-z)^2]^2$$

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

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

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

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

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

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

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

$$\textbf{(v)} \quad a^4 - 2a^2b^2 + b^4 = (a^2)^2 - 2a^2b^2 + (b^2)^2$$

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

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

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

**Q5.** 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)**  $q^2 - 10q + 21 = q^2 - (7 + 3)q + 7 \times 3$

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

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

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

**(iii)**  $p^2 + 6p - 16 = p^2 + (8 - 2)p - 8 \times 2$

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

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

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

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