

CLASS VIII: Maths
Chapter 12: Factorisation

Questions and Solutions | Exercise 12.2 - NCERT Books

Q 1. Factorise 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) $a^4 + 2a^2b^2 + b^4$

Answer :

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

$= (a + 4)^2 [(x + y)^2 = x^2 + 2xy + y^2]$

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

$= (p - 5)^2 [(a - b)^2 = a^2 - 2ab + b^2]$

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

$$= (5m + 3)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

$$= (7y + 6z)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

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

$$= (2x - 2)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= [(2)(x - 1)]^2 = 4(x - 1)^2$$

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

$$= (11b - 4c)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

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

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

$$= (l - m)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

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

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

Q 2. Factorise

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

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

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

$$(iv) 16x^5 - 144x^3$$

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

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

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

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

Answer :

$$\begin{aligned} \text{(i) } 4p^2 - 9q^2 &= (2p)^2 - (3q)^2 \\ &= (2p + 3q)(2p - 3q) [a^2 - b^2 = (a - b)(a + b)] \end{aligned}$$

$$\begin{aligned} \text{(ii) } 63a^2 - 112b^2 &= 7(9a^2 - 16b^2) \\ &= 7[(3a)^2 - (4b)^2] \\ &= 7(3a + 4b)(3a - 4b) [a^2 - b^2 = (a - b)(a + b)] \end{aligned}$$

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

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

$$\text{(v) } (l + m)^2 - (l - m)^2 = [(l + m) - (l - m)][(l + m) + (l - m)]$$

$$[\text{Using identity } a^2 - b^2 = (a - b)(a + b)]$$

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

$$= 2m \times 2l$$

$$= 4ml$$

$$= 4/m$$

$$(vi) 9x^2y^2 - 16 = (3xy)^2 - (4)^2$$

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

$$(vii) (x^2 - 2xy + y^2) - z^2 = (x - y)^2 - (z)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

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

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

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

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

$$[\text{Using identity } (a - b)^2 = a^2 - 2ab + b^2]$$

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

$$[\text{Using identity } a^2 - b^2 = (a - b)(a + b)]$$

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

Q3 :

Factorise 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) $6xy - 4y + 6 - 9x$

Answer :

$$(i) ax^2 + bx = a \times x \times x + b \times x = x(ax + b)$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Q4 :

Factorise

(i) $a^4 - b^4$

(ii) $p^4 - 81$

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

(iv) $x^4 - (x - z)^4$

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

Answer :

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Q5 :

Factorise the following expressions

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

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

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

Answer :

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

It can be observed that, $8 = 4 \times 2$ and $4 + 2 = 6$

$$\therefore p^2 + 6p + 8 = p^2 + 2p + 4p + 8$$

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

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

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

It can be observed that, $21 = (-7) \times (-3)$ and $(-7) + (-3) = -10$

$$\therefore q^2 - 10q + 21 = q^2 - 7q - 3q + 21$$

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

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

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

It can be observed that, $16 = (-2) \times 8$ and $8 + (-2) = 6$

$$p^2 + 6p - 16 = p^2 + 8p - 2p - 16$$

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

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

