

Ex 14.1

Q.1 Find the common factors of the given term :-

(i)  $12x, 36$

$12x = 2 \times 2 \times 3 \times x$

$36 = 2 \times 2 \times 3 \times 3$

$C.F = 2 \times 2 \times 3 = 12$

(ii)  $2y, 22xy$

$2y = 2 \times y$

$22xy = 2 \times 11 \times x \times y$

$C.F = 2y$

(iii)  $14pq, 28p^2q^2$

$14pq = 2 \times 7 \times p \times q$

$28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$

$C.F = 2 \times 7pq = 14pq$

(iv)  $2x, 3x^2, 4$

$2x = 2 \times x$

$3x^2 = 3 \times x \times x$

$4 = 2 \times 2$

$C.F = 1$

(iv)  $6abc, 24ab^2, 12a^2b$   
 $6abc = 2 \times 3 \times a \times b \times c$   
 $24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$   
 $12a^2b = 2 \times 2 \times 3 \times a \times a \times b$   
 C.F =  $2 \times 3ab = 6ab$

(v)  $16x^3, -4x^2, 32x$   
 $16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$   
 $-4x^2 = -2 \times 2 \times x \times x$   
 $32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$   
 C.F =  $2 \times 2 \times x = 4x$

(vi)  $10pq, 20qr, 30rp$   
 $10pq = 2 \times 5 \times p \times q$   
 $20qr = 2 \times 2 \times 5 \times q \times r$   
 $30rp = 2 \times 3 \times 5 \times r \times p$   
 C.F =  $2 \times 5 = 10$

(vii)  $3x^2y^2, 10x^3y^2, 6x^2y^2z$   
 $3x^2y^2 = 3 \times x \times x \times y \times y$   
 $10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$   
 $6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$   
 C.F =  $xxyy$   
 $\Delta xy^2$

Q.2 Factorize the following :-

(i)  $7x - 42$

$$= (7 \times x) - (2 \times 3 \times 7)$$

$$= 7[x - 2 \times 3] = 7(x - 6)$$

(ii)  $6p - 12q$

$$= (2 \times 3p) - (2 \times 2 \times 3q)$$

$$= 2 \times 3[p - (2 \times q)]$$

$$= 6(p - 2q)$$

(iii)  $7a^2 + 14a$

$$= (7 \times a \times a) + (2 \times 7 \times a)$$

$$= 7a[a + 2]$$

(iv)  $-16z + 20z^3$

$$= -[2 \times 2 \times 2 \times 2 \times z] + (2 \times 2 \times 5 \times z \times z \times z)$$

$$= -2 \times 2 \times 2 [2 \times 2 + (5 \times z \times z)]$$

$$= -4z [4 + 5z^2]$$

(v)  $20d^2m + 30adm$

$$= (2 \times 2 \times 5 \times d \times d \times m) + (2 \times 3 \times 5 \times a \times d \times m)$$

$$= 2 \times 5 \times d \times m [2d + 3a]$$

$$= 10dm (2d + 3a)$$

$$\begin{aligned}
 \text{(vi)} \quad & 5x^2y - 15xy^2 \\
 &= (5 \times x \times x \times y) - (3 \times 5 \times x \times y \times y) \\
 &= 5xy(x - 3y)
 \end{aligned}$$

$$\begin{aligned}
 \text{(vii)} \quad & 10a^2 - 15b^2 + 20c^2 \\
 &= (2 \times 5 \times a \times a) - (3 \times 5 \times b \times b) + (2 \times 2 \times 5 \times c \times c) \\
 &= 5[2a^2 - 3b^2 + 4c^2]
 \end{aligned}$$

$$\begin{aligned}
 \text{(viii)} \quad & -4a^2 + 4ab - 4ca \\
 &= -4a(a + b + c)
 \end{aligned}$$

$$\begin{aligned}
 \text{(ix)} \quad & x^2yz + xy^2z + xyz^2 \\
 &= xyz(x + y + z)
 \end{aligned}$$

$$\begin{aligned}
 \text{(x)} \quad & ax^2y + bxy^2 + cxyz \\
 &= xy(ax + by + cz)
 \end{aligned}$$

Q3 Factorise

$$\begin{aligned}
 \text{(i)} \quad & x^2 + xy + 8x + 8y \\
 &= x(x + y) + 8(x + y) \\
 &= (x + y)(x + 8)
 \end{aligned}$$

$$\begin{aligned} & 15xy - 6x + 5y - 2 \\ \text{(i)} \quad & 3x(5y-2) + 1(5y-2) \\ & = (5y-2)(3x+1) \end{aligned}$$

$$\begin{aligned} & ax + bx - ay - by \\ \text{(ii)} \quad & x(a+b) - y(a+b) \\ & = (a+b)(x-y) \end{aligned}$$

$$\begin{aligned} & 15pq + 15 + 9q + 25p \\ \text{(v)} \quad & 15pq + 9q + 25p + 15 \\ & = 3q(5p+3) + 5(5p+3) \\ & = (5p+3)(3q+5) \end{aligned}$$

$$\begin{aligned} & z - 7 + 7xy - xyz \\ \text{(vi)} \quad & z - 7 - xyz + 7xy \\ & = 1(z-7) - xy(z-7) \\ & = (z-7)(1-xy) \end{aligned}$$

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Ex 14.2

Q.1 Factorise the following expression

$$\begin{aligned} \text{(i)} & a^2 + 8a + 16 \\ &= [a]^2 + [2 \times a \times 4] + [4]^2 \\ &= [a+4]^2 \end{aligned}$$

$$\begin{aligned} \text{(ii)} & p^2 - 10p + 25 \\ &= [p]^2 - [2 \times p \times 5] + [5]^2 \\ &= [p-5]^2 \end{aligned}$$

$$\begin{aligned} \text{(iii)} & 25m^2 + 30m + 9 \\ &= [5m]^2 + 2[5m][3] + [3]^2 \\ &= [5m+3]^2 \end{aligned}$$

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

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

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

$$\begin{aligned} \text{(vii)} \quad & (l+m)^2 - 4lm \\ &= l^2 + 2lm + m^2 - 4lm \\ &= l^2 - 2lm + m^2 \\ &= (l-m)^2 \end{aligned}$$

$$\begin{aligned} \text{(viii)} \quad & a^4 + 2a^2b^2 + b^4 \\ &= [a^2]^2 + 2[a^2][b^2] + [b^2]^2 \\ &= [a^2 + b^2]^2 \end{aligned}$$

Q.2      Factorise

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

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

$$\begin{aligned} \textcircled{iii} & 49x^2 - 36 \\ &= (7x)^2 - (6)^2 \\ &= (7x+6)(7x-6) \end{aligned}$$

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

~~$$\begin{aligned} \textcircled{v} & (d+m)^2 - (d-m)^2 \\ &= [(d+m) + (d-m)] [(d+m) - (d-m)] \\ &= [d+m+d-m] [d+m-d+m] \\ &= 2d \times 2m \end{aligned}$$~~

$$\begin{aligned} \textcircled{vi} & (d+m)^2 - (d-m)^2 \\ &= [(d+m) + (d-m)] [(d+m) - (d-m)] \\ &= [d+m+d-m] [d+m-d+m] \\ &= 2d \times 2m = 4dm \end{aligned}$$

$$\begin{aligned} \textcircled{vii} & 9x^2y^2 - 16 \\ &= (3xy)^2 - (4)^2 = (3xy+4)(3xy-4) \end{aligned}$$

$$\begin{aligned} \textcircled{viii} & (x^2 - 2xy + y^2) - z^2 \\ &= (x-y)^2 - (z)^2 \end{aligned}$$



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

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

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

$$= 25a^2 - [4b^2 - 28bc + 49c^2]$$

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

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

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

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

Q.3 factorise

(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)  $am^2 + bm^2 + bn^2 + an^2$   
 $= am^2 + bm^2 + an^2 + bn^2$   
 $\Rightarrow m^2(a+b) + n^2(a+b)$   
 $\Rightarrow (a+b)(m^2 + n^2)$

$$\begin{aligned}
 & \textcircled{v} \quad (m+1) + m+1 \\
 & = 2m + 2 + m + 1 \\
 & = 2(m+1) + 1(m+1) \\
 & = (m+1)(2+1)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{vi} \quad y(y+2) + 9(y+2) \\
 & = (y+2)(y+9)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{vii} \quad 5y^2 - 20y - 8z + 2yz \\
 & = 3y^2 - 20y + 2yz - 8z \\
 & = 5y(y-4) + 2z(y-4) \\
 & = (y-4)(5y+2z)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{viii} \quad 10ab + 4a + 5b + 2 \\
 & = 2a(5b+2) + 1(5b+2) \\
 & = (5b+2)(2a+1)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{ix} \quad 6xy - 4y + 6 - 9x \\
 & = 6xy - 4y - 9x + 6 \\
 & = 2y(3x-2) - 3(3x-2) \\
 & = (3x-2)(2y-3)
 \end{aligned}$$

Factorise

(4)

$$\begin{aligned} & a^4 - b^4 \\ &= (a^2)^2 - (b^2)^2 \\ &= (a^2 + b^2)(a^2 - b^2) \\ &= (a^2 + b^2)(a + b)(a - b) \end{aligned}$$

(i)

$$\begin{aligned} & p^4 - 81 \\ &= (p^2)^2 - (9)^2 \\ &= (p^2 + 9)(p^2 - 9) \\ &= (p^2 + 9)(p - 3)^2 \\ &= (p^2 + 9)(p + 3)(p - 3) \end{aligned}$$

(ii)

$$\begin{aligned} & x^4 - (y+z)^4 \\ &= (x^2)^2 - [(y+z)^2]^2 \\ &= [x^2 + (y+z)][x^2 - (y+z)] \end{aligned}$$

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

(iv)

$$\begin{aligned} & x^4 - (x-z)^4 \\ &= (x^2)^2 - [(x-z)^2]^2 \\ &= [x^2 + (x-z)^2][x^2 - (x-z)^2] \\ &= [x^2 + x^2 - 2xz + z^2](x + (x-z))[x - (x-z)] \\ &= (2x^2 - 2xz + z^2)(x + x - z)(x - x + z) \end{aligned}$$

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

$$\textcircled{9} \quad a^4 - 2a^2b^2 + b^4$$

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

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

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

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

3) Factorise

$$\textcircled{10} \quad p^2 + 6p + 8$$

$$= p^2 + 4p + 2p + 8$$

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

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

$$\textcircled{11} \quad q^2 - 10q + 21$$

$$= q^2 - 3q - 7q + 21$$

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

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

$$\textcircled{11} \quad p^2 + 6p - 16$$

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

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

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

Extra Qno.

$$\begin{aligned} \textcircled{i} & x^2 + 5x + 6 \\ &= x^2 + 2x + 3x + 6 \\ &= x(x+2) + 3(x+2) \\ &= (x+2)(x+3) \end{aligned}$$

$$\begin{aligned} \textcircled{ii} & x^2 + 15x + 56 \\ &= x^2 + 7x + 8x + 56 \\ &= x(x+7) + 8(x+7) \\ &= (x+7)(x+8) \end{aligned}$$

$$\begin{aligned} \textcircled{iii} & x^2 - 19x + 60 \\ &= x^2 - 4x - 15x + 60 \\ &= x(x-4) - 15(x-4) \\ &= (x-4)(x-15) \end{aligned}$$

$$\begin{aligned} \textcircled{iv} & x^2 - x - 72 \\ &= x^2 + 8x - 9x - 72 \\ &= x(x+8) - 9(x+8) \\ &= (x+8)(x-9) \end{aligned}$$

$$\begin{aligned} \textcircled{v} & m^2 - 6m - 27 \\ &= m^2 + 3m - 9m - 27 \\ &= m(m+3) - 9(m+3) \\ &= (m+3)(m-9) \end{aligned}$$