# 13. Factorisation

## EXERCISE 13(A)

**Factorise :**

**Question 1.**

15x + 5

**Solution:**

15x + 5 = 5(3x + 1)

**Question 2.**

$a^3 - a^2 + a$

**Solution:**

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

**Question 3.**

$3x^2 + 6x^3$

**Solution:**

$3x^2 + 6x^3 = 3x^2(1 + 2x)$

**Question 4.**

$4a^2 - 8ab$

**Solution:**

$4a^2 - 8ab = 4a(a - 2b)$

**Question 5.**

$2x^3b^2 - 4x^5b^4$

**Solution:**

$2x^3b^2 - 4x^5b^4 = 2x^3b^2(1 - 2x^2b^2)$

**Question 6.**

$15x^4y^3 - 20x^3y$

**Solution:**

$15x^4y^3 - 20x^3y = 5x^3y(3xy^2 - 4)$

**Question 7.**

$a^3b - a^2b^2 - b^3$

**Solution:**

$a^3b - a^2b^2 - b^3 = b(a^3 - a^2b - b^2)$

**Question 8.**

$6x^2y+9xy^2+4y^3$

**Solution:**

$6x^2y+9xy^2+4y^3 = y(6x^2+9xy+4y^2)$.

**Question 9.**

$17a^6b^8-34a^4b^6+51a^2b^4$

**Solution:**

$17a^6b^8 - 34a^4b^6 + 51a^2b^4$

$= 17a^2b^4 (a^4b^4 - 2a^2b^2+3)$

**Question 10.**

$3x^5y - 27x^4y^2+12x^3y^3$

**Solution:**

$3x^5y - 27x^4y^2+12x^3y^3$

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

**Question 11.**

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

**Solution:**

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

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

**Question 12.**

$(x+y)(a+b)+(x-y)(a+b)$

**Solution:**

$(x+y)(a+b)+(x-y)(a+b)$

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

$= (a+b)(2x)$

$= 2x(a+b)$.

**Question 13.**

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

**Solution:**

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

$= (2a+b)(2b-3c)$

**Question 14.**

$12abc - 6a^2b^2c^2 + 3a^3b^3c^3$

**Solution:**

$12abc - 6a^2b^2c^2 + 3a^3b^3c^3$

$= 3abc(4 - 2abc + a^2b^2c^2)$

**Question 15.**

$4x(3x - 2y) - 2y(3x - 2y)$

**Solution:**

$4x(3x - 2y) - 2y(3x - 2y)$

$= (3x - 2y)(4x - 2y) = (3x - 2y) \times 2(2x - y)$

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

**Question 16.**

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

**Solution:**

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

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

$= (a + 2b)(3a + 2b)$

**Question 17.**

$6xy(a^2 + b^2) + 8yz(a^2 + b^2) - 10xz(a^2 + b^2)$

**Solution:**

$6xy(a^2 + b^2) + 8yz(a^2 + b^2) - 10xz(a^2 + b^2)$

H.C.F. of 6, 8, 10 = 2, then

$2(a^2 + b^2)(3xy + 4yz - 5xz)$

## EXERCISE 13(B)

**Question 1.**
Factorise : $a^2 + ax + ab + bx$
**Solution:**

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

**Question 2.**
Factorise : $a^2 - ab - ca + bc$
**Solution:**

$$a^2-ab-ca+bc$$
$$= a(a-b) - c(a-b)$$
$$= (a-b)\quad (a-c)$$

**Question 3.**
Factorise : $ab - 2b + a^2 - 2a$
**Solution:**

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

**Question 4.**
Factorise : $a^3 - a^2 + a - 1$
**Solution:**

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

**Question 5.**
Factorise : $2a - 4b - xa + 2bx$
**Solution:**

$$2a-4b-xa+2bx$$
$$= 2(a-2b) - x(a-2b)$$
$$= (a-2b)\ (2-x)$$

**Question 6.**

Factorise : $xy-ay-ax+a^2+bx-ab$

**Solution:**

$$\begin{aligned} & xy-ay-ax+a^2+bx-ab \\ &= y(x-a)-a(x-a)+b(x-a) \\ &= (x-a)\ (y-a+b) \end{aligned}$$

**Question 7.**

Factorise : $3x^5-6x^4-2x^3+4x^2+x-2$

**Solution:**

$$\begin{aligned} & 3x^5-6x^4-2x^3+4x^2+x-2 \\ &= 3x^4(x-2)-2x^2(x-2)+1(x-2) \\ &= (x-2)\ (3x^4-2x^2+1) \end{aligned}$$

**Question 8.**

Factorise : $-x^2y - x + 3xy + 3$

**Solution:**

$-x^2y - x + 3xy + 3$

$= 3 - x + 3xy - x^2y$ (By grouping)

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

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

**Question 9.**

Factorise : $6a^2 - 3a^2b - bc^2 + 2c^2$

**Solution:**

$6a^2 - 3a^2b - bc^2 + 2c^2$

$= 6a^2 - 3a^2b + 2c^2 - bc^2$ (By grouping)

$= 3a^2(2 - b) + c^2(2 - b)$

$= (2 - b)\ (3a^2 + c^2)$

**Question 10.**

Factorise : $3a^2b - 12a^2 - 9b + 36$

**Solution:**

$3a^2b - 12a^2 - 9b + 36$

$= 3a^2(b - 4) - 9(b - 4)$ (By grouping)

$= (b - 4)(3a^2 - 9) = (b - 4)\,3(a^2 - 3)$

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

**Question 11.**

Factorise : $x^2-(a-3)x-3a$

**Solution:**

$x^2 - (a-3)x - 3a$

$= x^2-ax+3x-3a$

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

$= (x-a)\ (x+3)$

**Question 12.**

Factorise : $x^2 - (b-2)x - 2b$

**Solution:**

$x^2 - (b-2)x - 2b$

$= x^2-bx+2x-2b$

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

$= (x-b)\ (x+2)$

**Question 13.**

Factorise : $a(b-c)-d(c-b)$

**Solution:**

$a(b-c)-d(c-b)$

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

$= (b-c)\ (a+d)$

**Question 14.**

Factorise : $ab^2 - (a - c)\,b - c$

**Solution:**

$ab^2 - (a - c)\, b - c$

$= ab^2 - ab + bc - c$

$= ab\,(b - 1) + c\,(b - 1)$

$= (b - 1)\,(ab + c)$

**Question 15.**

Factorise : $(a^2 - b^2)\, c + (b^2 - c^2)\, a$

**Solution:**

$(a^2 - b^2)\, c + (b^2 - c^2)\, a$

$= a^2c - b^2c + ab^2 - ac^2$

$= a^2c - ac^2 + ab^2 - b^2c$

$= ac\,(a - c) + b^2\,(a - c)$

$= (a - c)\,(ac + b^2)$

**Question 16.**

Factorise : $a^3 - a^2 - ab + a + b - 1$

**Solution:**

$a^3 - a^2 - ab + a + b - 1$

$= a^3 - a^2 - ab + b + a - 1$

$= a^2\,(a - 1) - b\,(a - 1) + 1\,(a - 1)$

$= (a - 1)\,(a^2 - b + 1)$

**Question 17.**

Factorise : $ab\,(c^2 + d^2) - a^2cd - b^2cd$

**Solution:**

$ab\,(c^2 + d^2) - a^2cd - b^2cd$

$= abc^2 + abd^2 - a^2cd - b^2cd$

$= abc^2 - a^2cd - b^2cd + abd^2$

$= ac\,(bc - ad) - bd\,(bc - ad)$

$= (bc - ad)\,(ac - bd)$

**Question 18.**

Factorise : $2ab^2 - aby + 2cby - cy^2$

**Solution:**

$= 2ab^2 + 2cby - aby - cy^2$

$= 2b\,(ab + cy) - y\,(ab + cy)$

$= (ab + cy)\,(2b - y)$

**Question 19.**

Factorise : $ax + 2bx + 3cx - 3a - 6b - 9c$

**Solution:**

$ax + 2bx + 3cx - 3a - 6b - 9c$

$= x(a + 2b + 3c) - 3(a + 2b + 3c)$

(By grouping)

$= (a + 2b + 3c)\,(x - 3)$

**Question 20.**

Factorise : $2ab^2c - 2a + 3b^3c - 3b - 4b^2c^2 + 4c$

**Solution:**

$2ab^2c - 2a + 3b^3c - 3b - 4b^2c^2 + 4c$

$= 2a(b^2c - 1) + 3b(b^2c - 1) - 4c(b^2c - 1)$

$= (b^2c - 1)\,(2a + 3b - 4c)$

## EXERCISE 13(C)

**Note : $a^2 - b^2 = (a + b)\,(a - b)$**

**Question 1.**

Factorise : $16 - 9x^2$

**Solution:**

$16 - 9x^2 = (4)^2 - (3x)^2 = (4 + 3x)\,(4 - 3x)$

**Question 2.**

Factorise : $1 - 100a^2$

**Solution:**

$1 - 100a^2 = (1)^2 - (10a)^2 = (1 + 10a)\,(1 - 10a)$

**Question 3.**

Factorise : $4x^2 - 81y^2$

**Solution:**

$4x^2 - 81y^2 = (2x)^2 - (9y)^2 = (2x + 9y)\,(2x - 9y)$

**Question 4.**

Factorise : $\frac{4}{25} - 25b^2$

**Solution:**

$$\frac{4}{25} - 25b^2 = \left(\frac{2}{5}\right)^2 - (5b)^2$$

$$= \left(\frac{2}{5} + 5b\right)\left(\frac{2}{5} - 5b\right)$$

**Question 5.**

Factorise : $(a+2b)^2 - a^2$

**Solution:**

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

**Question 6.**

Factorise : $(5a-3b)^2 - 16b^2$

**Solution:**

$$\begin{aligned}&(5a-3b)^2 - 16b^2 \\ &= (5a-3b)^2 - (4b)^2 \\ &= (5a-3b+4b)\ (5a-3b-4b) \\ &= (5a+b)\ (5a-7b)\end{aligned}$$

**Question 7.**

Factorise : $a^4 - (a^2 - 3b^2)^2$

**Solution:**

$a^4-(a^2-3b^2)^2$

$= (a^2)^2-(a^2-3b^2)^2$

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

$= (2a^2-3b^2)\ (3b)^2$

$= 3b^2\ (2a^2-3b^2)$

**Question 8.**

Factorise : $(5a-2b)^2-(2a-b)^2$

**Solution:**

$(5a-2b)^2-(2a-b)^2$

$= (5a-2b+2a-b)\ (5a-2b-2a+b)$

$= (7a-3b)\ (3a-b)$

**Question 9.**

Factorise : $1-25\ (a+b)^2$

**Solution:**

$1-25(a+b)^2$

$= (1)^2-[5(a+b)]^2$

$= [1+5(a+b)]\ [1-5(a+b)]$

$= (1+5a+5b)\ (1-5a-5b)$

**Question 10.**

Factorise : $4\ (2a+b)^2-(a-b)^2$

**Solution:**

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

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

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

$-a+b]$

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

$= (5a+b)\ (3a+3b)$

$= (5a+b)\ 3(a+b)$

$= 3(5a+b)\ (a+b)$

**Question 11.**

Factorise : $25(2x+y)^2\ -\ 16(x-y)^2$

**Solution:**

$$25(2x+y)^2 - 16(x-y)^2$$
$$= [5(2x+y)]^2 - [4(x-y)]^2$$
$$= (10x+5y)^2 - (4x-4y)^2$$
$$= (10x+5y+4x-4y)\,(10x+5y - 4x+4y)$$
$$= (14x+y)\,(6x+9y)$$
$$= (14x+y)\,3(2x+3y)$$
$$= 3\,(14x+y)\,(2x+3y)$$

**Question 12.**

Factorise : $49\,(x-y)^2 - 9\,(2x+y)^2$

**Solution:**

$$= [7(x-y)]^2 - [3(2x+y)]^2$$
$$= (7x-7y)^2 - (6x+3y)^2$$
$$= (7x-7y+6x+3y)\,(7x - 7y - 6x - 3y)$$
$$= (13x - 4y)\,(x-10y)$$

**Question 13.**

Evaluate : $\left(6\frac{2}{3}\right)^2 - \left(2\frac{1}{3}\right)^2$

**Solution:**

$$\left(6\frac{2}{3}\right)^2 - \left(2\frac{1}{3}\right)^2 = \left(\frac{20}{3}\right)^2 - \left(\frac{7}{3}\right)^2$$
$$= \left(\frac{20}{3}+\frac{7}{3}\right)\left(\frac{20}{3}-\frac{7}{3}\right)$$
$$= \left(\frac{27}{3}\right)\left(\frac{13}{3}\right) = 9\times\frac{13}{3} = 39$$

**Question 14.**

Evaluate :

$$\left(7\frac{3}{10}\right)^2-\left(2\frac{1}{10}\right)^2$$

**Solution:**

$$\left(7\frac{3}{10}\right)^2-\left(2\frac{1}{10}\right)^2$$

$$=\left(\frac{73}{10}\right)^2-\left(\frac{21}{10}\right)^2$$

$$=\left(\frac{73}{10}+\frac{21}{10}\right)\left(\frac{73}{10}-\frac{21}{10}\right)$$

$$=\left(\frac{94}{10}\right)\left(\frac{52}{10}\right)$$

$$=\left(\frac{47}{5}\right)\left(\frac{26}{5}\right)=\frac{1222}{25}=48\frac{22}{25}$$

**Question 15.**

Evaluate :

$(0.7)^2 - (0.3)^2$

**Solution:**

$$(0\cdot7)^2-(0\cdot3)^2$$

$$=(0\cdot7+0\cdot3)\ (0\cdot7-0\cdot3)$$

$$=1\times0\cdot4=0\cdot4$$

**Question 16.**

Evaluate :

$(4.5)^2 - (1.5)^2$

**Solution:**

$$(4\cdot5)^2-(1\cdot5)^2$$

$$=(4\cdot5+1\cdot5)\ (4\cdot5-1\cdot5)$$

$$=6\times3=18$$

**Question 17.**

Factorise : $75(x+y)^2-48(x-y)^2$

**Solution:**

$75(x+y)^2 - 48(x-y)^2$

$= 3[25(x+y)^2 - 16(x-y)^2]$

$= 3[\{5(x+y)^2\} - \{4(x-y)\}^2]$

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

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

$= 3[5x + 5y + 4x - 4y][5x + 5y - 4x + 4y]$

$= 3(9x + y)(x + 9y)$

**Question 18.**

Factorise : $a^2 + 4a + 4 - b^2$

**Solution:**

$a^2 + 4a + 4 - b^2$

$$\left\{\begin{array}{l} \because (a+b)^2 = a^2 + 2ab + b^2 \\ a^2 - b^2 = (a+b)(a-b) \end{array}\right\}$$

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

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

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

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

**Question 19.**

Factorise : $a^2 - b^2 - 2b - 1$

**Solution:**

$a^2 - b^2 - 2b - 1$

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

$$\left\{\begin{array}{l} \because (a+b)^2 = a^2 + b^2 + 2ab \\ a^2 - b^2 = (a+b)(a-b) \end{array}\right\}$$

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

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

**Question 20.**

Factorise : $x^2 + 6x + 9 - 4y^2$

**Solution:**

$x^2 + 6x + 9 - 4y^2$

$= (x)^2 + 2 \times x \times 3 + (3)^2 - (2y)^2$

$$\left\{\because (a+b)^2 = a^2 + 2ab + b^2 \right\}$$
$$\left\{ a^2 - b^2 = (a+b)(a-b) \right\}$$

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

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

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

## EXERCISE 13(D)

**Question 1.**

Factorise : $x^2+6x+8$

**Solution:**

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

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

= (x+4) (x+2)

**Question 2.**

Factorise : $x^2+4x+3$

**Solution:**

$x^2+4x+3 = x^2+3x+x+3$

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

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

**Question 3.**

Factorise : $a^2+5a+6$

**Solution:**

$a^2+5a+6 = a^2+3a+2a+6$

$= a(a+3)+2(a+3)$

$= (a+3)\ (a+2)$

**Question 4.**

Factorise : $a^2-5a+6$

**Solution:**

$$\begin{aligned} a^2-5a+6 &= a^2-3a-2a+6 \\ &= a(a-3)-2(a-3) \\ &= (a-3)\ (a-2) \end{aligned}$$

**Question 5.**

Factorise : $a^2+5a-6$

**Solution:**

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

**Question 6.**

Factorise : $x^2+5xy+4y^2$

**Solution:**

$$\begin{aligned} x^2+5xy+4y^2 &= x^2+4xy+xy+4y^2 \\ &= x(x+4y)+y(x+4y) \\ &= (x+4y)\ (x+y) \end{aligned}$$

**Question 7.**

Factorise : $a^2-3a-40$

**Solution:**

$$\begin{aligned} a^2-3a-40 &= a^2-8a+5a-40 \\ &= a(a-8)+5(a-8) \\ &= (a-8)\ (a+5) \end{aligned}$$

**Question 8.**

Factorise : $x^2-x-72$

**Solution:**

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

**Question 9.**

Factorise : $x^2-10xy+24y^2$

**Solution:**

$$x^2-10xy+24y^2 = x^2-6xy-4xy+24y^2$$
$$= x(x-6y) - 4y(x-6y)$$
$$= (x-6y)\ (x-4y)$$

**Question 10.**

Factorise : $2a^2+7a+6$

**Solution:**

$$2a^2+7a+6 = 2a^2+4a+3a+6$$
$$= 2a(a+2)+3(a+2)$$
$$= (a+2)\ (2a+3)$$

**Question 11.**

Factorise : $3a^2-5a+2$

**Solution:**

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

= (a – 1)(3a – 2)

**Question 12.**

Factorise : $7b^2-8b+1$

**Solution:**

$$7b^2-8b+1 = 7b^2-7b-b+1$$
$$= 7b(b-1)-1(b-1)$$
$$= (b-1)(7b-1)$$

**Question 13.**

Factorise : $2a^2-17ab+26b^2$

**Solution:**

$$2a^2-17ab+26b^2$$
$$= 2a^2-13ab-4ab+26b^2$$
$$= a(2a-13b)-2b(2a-13b)$$
$$= (2a-13b)\ (a-2b)$$

**Question 14.**

Factorise : $2x^2+xy-6y^2$

**Solution:**

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

**Question 15.**

Factorise : $4c^2+3c-10$

**Solution:**

$$\begin{aligned} 4c^2+3c-10 &= 4c^2+8c-5c-10 \\ &= 4c(c+2)-5(c+2) \\ &= (c+2)\ (4c-5) \end{aligned}$$

**Question 16.**

Factorise : $14x^2+x-3$

**Solution:**

$$\begin{aligned} 14x^2+x-3 &= 14x^2+7x-6x-3 \\ &= 7x(2x+1)-3(2x+1) \\ &= (2x+1)\ (7x-3) \end{aligned}$$

**Question 17.**

Factorise : $6+7b-3b^2$

**Solution:**

$$\begin{aligned} 6+7b-3b^2 &= 6+9b-2b-3b^2 \\ &= 3(2+3b)\ -b(2+3b) \\ &= (2+3b)(3-b) \end{aligned}$$

**Question 18.**

Factorise : $5+7x-6x^2$

**Solution:**

$$\begin{aligned} 5+7x-6x^2 &= 5+10x-3x-6x^2 \\ &= 5(1+2x)-3x(1+2x) \\ &= (1+2x)\ (5-3x) \end{aligned}$$

**Question 19.**

Factorise : $4+y-14y^2$

**Solution:**

$$\begin{aligned} 4+y-14y^2 &= 4+8y-7y-14y^2 \\ &= 4(1+2y)-7y(1+2y) \\ &= (1+2y)\ (4-7y) \end{aligned}$$

**Question 20.**

Factorise : $5+3a-14a^2$

**Solution:**

$$\begin{aligned} 5+3a-14a^2 &= 5+10a-7a-14a^2 \\ &= 5(1+2a)\ -7a(1+2a) \\ &= (1+2a)\ (5-7a) \end{aligned}$$

**Question 21.**

Factorise : $(2a+b)^2+5(2a+b)+6$

**Solution:**

Let $(2a+b) = x$

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

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

(Substituting the value of $x$)

**Question 22.**

Factorise : $1-(2x+3y)-6(2x+3y)^2$

**Solution:**

Let $(2x+3y) = a$

$\therefore \quad (2x+3y)^2 = a^2$

$\therefore \quad 1-(2x+3y)-6(2x+3y)^2$

$= 1-a-6a^2$

$= 1-3a+2a-6a^2$

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

$= (1-3a)\ (1+2a)$

$=[1-3(2x+3y)][1+2(2x+3y)]$

(Substituting the value of $a$)

$= (1-6x-9y)\ (1+4x+6y)$

**Question 23.**

Factorise : $(x-2y)^2-12(x-2y)+32$

**Solution:**

Let $(x-2y) = a$

$\therefore \quad (x-2y)^2 = a^2$

$\therefore \quad (x-2y)^2-12(x-2y)+32$

$= a^2-12a+32$

$= a^2-8a-4a+32$

$= a(a-8)-4(a-8)$

$= (a-8)(a-4)$

$= (x-2y-8)\ (x-2y-4)$

(Substituting the value of $a$)

**Question 24.**

Factorise : $8 + 6\,(a+b) - 5\,(a+b)^2$

**Solution:**

Let $a+b = x$

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

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

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

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

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

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

$= [4+5(a+b)]\ [2-(a+b)]$

(Substituting the value of $x$)

$=[4+5a+5b][2-a-b]$

**Question 25.**

Factorise : $2(x+2y)^2 - 5(x+2y) + 2$

**Solution:**

$2(x+2y)^2 - 5(x+2y) + 2$

Let $x+2y = a$, then

$2a^2 - 5a + 2$

$\Rightarrow 2a^2 - a - 4a + 2$

$= a(2a-1) - 2(2a-1)$

$= (2a-1)\ (a-2)$

$= \{2(x+2y-1)\}\ \{(x+2y)-2\}$

$= (2x+4y-2)\ (x+2y-2)$

$$\left\{\begin{array}{l} \because 2\times 2 = 4 \\ -5 = -1-4 \\ 4 = (-1)\times(-4) \end{array}\right\}$$

## EXERCISE 13(E)

**Question 1.**

In each case find whether the trinomial is a perfect square or not:

(*i*) $x^2+14x+49$ (*ii*) $a^2-10a+25$

(*iii*) $4x^2+4x+1$ (*iv*) $9b^2+12b+16$

(*v*) $16x^2-16xy+y^2$ (*vi*) $x^2-4x+16$

**Solution:**

(*i*) $x^2+14x+49$

$= (x)^2+2\times x\times 7+(7)^2$

$= (x+7)^2$

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

$\therefore$ The given trinomial $x^2+14x+49$ is a perfect square.

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

$= (a-5)^2$

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

$\therefore$ The given trinomial $a^2-10a+25$ is a perfect square.

(*iii*) $4x^2+4x+1 = (2x)^2+2\times 2x\times 1+(1)^2$

$= (2x+1)^2$

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

$\therefore$ The given trinomial $4x^2 + 4x = 1$ is a perfect square.

(*iv*) $9b^2+12b+16 = (3b)^2+3b\times 4+(4)^2$

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

[Taking $3b=x$, and $4=y$]

$\therefore$ The given trinomial cannot be expressed as $x^2+2xy+y^2$. Hence, it is not a perfect square.

(*v*) $16x^2-16xy+y^2 = (4x)^2-4\times 4x\times y+(y)^2$

$= a^2-4ab+b^2$

[Taking $4x=a$, and $y=b$]

$\therefore$ The given trinomial cannot be expressed as $a^2-2ab+b^2$.

$\therefore$ It is not a perfect square.

(*vi*) $x^2-4x+16 = (x)^2-x\times 4+(4)^2$

$= a-ab+b^2$

[Taking $x=a$, and $4=b$]

$\therefore$ The given trinomial cannot be expressed as $a^2-2ab+b^2$.

Hence, it is not a perfect square.

**Question 2.**
Factorise completely $2 - 8x^2$.
**Solution:**

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

**Note :** $a^2-b^2 = (a+b)(a-b)$

**Question 3.**
Factorise completely : $8x^2y - 18y^3$
**Solution:**

$$\begin{aligned} 8x^2y-18y^3 &= 2y(4x^2-9y^2) \\ &= 2y[(2x)^2-(3y)^2] \\ &= 2y(2x+3y)(2x-3y) \end{aligned}$$

**Question 4.**
Factorise completely : $ax^2 - ay^2$
**Solution:**

$$\begin{aligned} ax^2-ay^2 &= a(x^2-y^2) \\ &= a(x+y)(x-y) \end{aligned}$$

**Question 5.**
Factorise completely : $25x^3 - x$
**Solution:**

$$\begin{aligned} 25x^3-x &= x(25x^2-1) \\ &= x[(5x)^2-(1)^2] \\ &= x(5x+1)(5x-1) \end{aligned}$$

**Question 6.**
Factorise completely : $a^4 - b^4$
**Solution:**

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

**Question 7.**
Factorise completely : $16x^4 - 81y^4$

**Solution:**

$$\begin{aligned} 16x^4-81y^4 &= (4x^2)^2-(9y^2)^2 \\ &= (4x^2+9y^2)\,(4x^2-9y^2) \\ &= (4x^2+9y^2)\,[(2x)^2-(3y)^2] \\ &= (4x^2+9y^2)(2x+3y)(2x-3y) \end{aligned}$$

**Question 8.**

Factorise completely : $625 - x^4$

**Solution:**

$$\begin{aligned} 625-x^4 &= (25)^2-(x^2)^2 \\ &= (25+x^2)\,(25-x^2) \\ &= (25+x^2)\,[(5)^2-(x)^2] \\ &= (25+x^2)(5+x)(5-x) \end{aligned}$$

**Question 9.**

Factorise completely : $x^2 - y^2 - 3x - 3y$

**Solution:**

$$\begin{aligned} x^2-y^2-3x-3y &= (x^2-y^2) - 3(x+y) \\ &= (x+y)\,(x-y) - 3(x+y) \\ &= (x+y)\,(x-y-3) \end{aligned}$$

**Question 10.**

Factorise completely : $x^2 - y^2 - 2x + 2y$

**Solution:**

$$\begin{aligned} x^2-y^2-2x+2y &= (x^2-y^2) - 2(x-y) \\ &= (x+y)\,(x-y) - 2(x-y) \\ &= (x-y)\,(x+y-2) \end{aligned}$$

**Question 11.**

Factorise completely : $3x^2 + 15x - 72$

**Solution:**

$$\begin{aligned} 3x^2+15x-72 &= 3(x^2+5x-24) \\ &= 3[x^2+8x-3x-24] \\ &= 3[x(x+8)-3(x+8)] \\ &= 3[(x+8)(x-3)] \\ &= 3(x+8)(x-3) \end{aligned}$$

**Question 12.**
Factorise completely : $2a^2 - 8a - 64$
**Solution:**

$$\begin{aligned} 2a^2-8a-64 &= 2[a^2-4a-32] \\ &= 2[a^2-8a+4a-32] \\ &= 2[a(a-8)+4(a-8)] \\ &= 2[(a-8)\,(a+4)] \\ &= 2(a-8)\,(a+4) \end{aligned}$$

**Question 13.**
Factorise completely : $5b^2 + 45b + 90$
**Solution:**

$$\begin{aligned} 5b^2+45b+90 &= 5[b^2+9b+18] \\ &= 5[b^2+6b+3b+18] \\ &= 5[b(b+6)+3(b+6)] \\ &= 5[(b+6)(b+3)] \\ &= 5(b+6)(b+3) \end{aligned}$$

**Question 14.**
Factorise completely : $3x^2y + 11xy + 6y$
**Solution:**

$$\begin{aligned} 3x^2y+11xy+6y &= y(3x^2+11x+6) \\ &= y[(3x^2+9x+2x+6)] \\ &= y[3x(x+3)+2(x+3)] \\ &= y[(x+3)\,(3x+2)] \\ &= y\,(x+3)\,(3x+2) \end{aligned}$$

**Question 15.**
Factorise completely : $5ap^2 + 11ap + 2a$
**Solution:**

$$\begin{aligned} 5ap^2+11ap+2a &= a[5p^2+11p+2] \\ &= a[5p^2+10p+p+2] \\ &= a[5p(p+2)+1(p+2)] \\ &= a[(p+2)(5p+1)] \\ &= a(p+2)\,(5p+1) \end{aligned}$$

**Question 16.**
Factorise completely : $a^2 + 2ab + b^2 - c^2$
**Solution:**

$$a^2+2ab+b^2-c^2 = (a^2+2ab+b^2)-c^2$$
$$= (a+b)^2-(c)^2$$
$$= (a+b+c)\,(a+b-c)$$

**Question 17.**
Factorise completely : $x^2 + 6xy + 9y^2 + x + 3y$
**Solution:**

$$x^2+6xy+9y^2+x+3y$$
$$= [(x)^2+2\times x\times 3y+(3y)^2]+(x+3y)$$
$$= [x+3y]^2+(x+3y)$$
$$= (x+3y)\,(x+3y) + (x+3y)$$
$$= (x+3y)\,(x+3y+1)$$

**Question 18.**
Factorise completely : $4a^2 - 12ab + 9b^2 + 4a - 6b$
**Solution:**

$$[4a^2-12ab+9b^2]+(4a-6b)$$
$$= [(2a)^2-2\times 2a\times 3b+(3b)^2]+2(2a-3b)$$
$$= (2a-3b)^2+2(2a-3b)$$
$$= (2a-3b)\,(2a-3b+2)$$

**Question 19.**
Factorise completely : $2a^2b^2 - 98b^4$
**Solution:**

$$2a^2b^2-98b^4 = 2b^2(a^2-49b^2)$$
$$= 2b^2[(a)^2-(7b)^2]$$
$$= 2b^2(a+7b)(a-7b)$$

**Question 20.**
Factorise completely : $a^2 - 16b^2 - 2a - 8b$
**Solution:**

$$(a^2-16b)^2-2a-8b = [(a)^4-(4b)^2]-2(a+4b)$$
$$= (a+4b)(a-4b)-2(a+4b)$$
$$= (a+4b)(a-4b-2)$$

## EXERCISE 13(F)

**Question 1.**

Factorise :

(i) $6x^3 - 8x^2$ (ii) $35a^3b^2c + 42ab^2c^2$

(iii) $36x^2y^2 - 30x^3y^3 + 48x^3y^2$

(iv) $8(2a + 3b)^3 - 12(2a + 3b)^2$

(v) $9a\,(x - 2y)^4 - 12a\,(x - 2y)^3$

**Solution:**

(i) $6x^3 - 8x^2 = 2x^2\,(3x - 4)$

(ii) $35a^3b^2c + 42ab^2c^2 = 7ab^2\,c\,(5a^2 + 6c)$

(iii) $36x^2\,y^2 - 30x^3y^3 + 48x^3y^3 = 6x^2y^2\,(6 - 5xy + 8xy)$

(iv) $8(2a + 3b)^3 - 12(2a + 3b)^2$

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

$= 4(2a + 3b)^2\,[4a + 6b - 3]$

(v) $9a\,(x - 2y)^4 - 12a\,(x - 2y)^3$

$= 3a\,(x - 2y)^3\,(3(x - 2y) - 4$

$= 3a\,(x - 2y)^3\,(3x - 6y - 4)$

**Question 2.**

Factorise :

(i) $a^2 - ab - 3a + 3b$ (ii) $x^2\,y - xy^2 + 5x - 5y$

(iii) $a^2 - ab\,(1 - b) - b^3$

(iv) $xy^2 + (x - 1)y - 1$

(v) $(ax + by)^2 + (bx - ay)^2$

(vi) $ab\,(x^2 + y^2) - xy\,(a^2 + b^2)$

(vii) $m - 1 - (m - 1)^2 + am - a$

**Solution:**

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

$= (a - b)(a - 3)$

(ii) $x^2 y - xy^2 + 5x - 5y = xy(x - y) + 5(x - y)$

$= (x - y)(xy + 5)$

(iii) $a^2 - ab(1 - b) - b^3 = a^2 - ab + ab^2 - b^3$

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

(iv) $xy^2 + (x - 1)y - 1 = xy^2 + xy - y - 1$

$= xy(y + 1) - 1(y + 1) = (xy - 1)(y + 1)$

(v) $(ax + by)^2 + (bx - ay)^2$

$= a^2 x^2 + b^2 y^2 + 2abxy + b^2 x^2 + a^2 y^2 - 2abxy$

$= a^2 x^2 + b^2 y^2 + b^2 x^2 + a^2 y^2 = a^2 x^2 + a^2 y^2 + b^2 x^2 + b^2 y^2$

$= a^2(x^2 + y^2) + b^2(x^2 + y^2) = (x^2 + y^2)(a^2 + b^2)$

(vi) $ab(x^2 + y^2) - xy(a^2 + b^2)$

$= abx^2 + aby^2 - a^2xy - b^2xy = abx^2 - a^2xy + aby^2 - b^2xy$

$= abx^2 - a^2xy - b^2xy + aby^2$

$= ax(bx - ay) - by(bx - ay)$

$= (bx - ay)(ax - by)$

(vii) $m - 1 - (m - 1)^2 + am - a$

$= (m - 1) - (m - 1)^2 + a(m - 1)$

$= (m - 1)(1 - (m - 1) + a)$

$= (m - 1)(1 - m + 1 + a)$

$= (m - 1)(2 - m + a)$

**Question 3.**

Factorise :

(i) $a^2 - (b - c)^2$ (ii) $25(2x - y)^2 - 16(x - 2y)^2$

(iii) $16(5x + 4)^2 - 9(3x - 2)^2$ (iv) $9x^2 - \frac{1}{16}$

(v) $25(x - 2y)^2 - 4$

**Solution:**

(i) $a^2 - (b - c)^2$

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

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

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

(ii) $25\ (2x - y)^2 - 16\ (x - 2y)^2$

$= (5\ (2x - y))^2 - (4\ (x - 2y))^2$

$= [5(2x - y) - 4\ (x - 2y)]\ [5\ (2x - y) + 4\ (x - 2y)$

$= [10x - 5y - 4x + 8y]\ [10x - 5y + 4x - 8y]$

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

$= (6x + 3y)\ (14x - 13y) = 3\ (2x + y)\ (14x - 13y)$

(iii) $16\ (5x + 4)^2 - 9\ (3x - 2)^2$

$= (4\ (5x + y))^2 - (3\ (3x - 2))^2$

$= [4\ (5x + 4) - 3\ (3x - 2)]\ [4\ (5x + 4) + 3\ (3x - 2)]$

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

$= (20x + 16 - 9x + 6]\ [20x + 16 + 9x - 6]$

$= [11x + 22]\ (29x + 10)\ = 11\ (x + 2)\ (29x + 10)$

(iv) $9x^2 - \frac{1}{16} = (3x)^2 - \left(\frac{1}{4}\right)^2$

$= \left(3x - \frac{1}{4}\right)\left(3x + \frac{1}{4}\right)$ $[(a^2 - b^2) = (a - b)\ (a + b)]$

(v) $25(x - 2y)^2 - 4 = (5\ (x - 2y))^2 - 2^2$

$= [5\ (x - 2y) - 2]\ [5\ (x - 2y) + 2]$

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

$= (5x - 10y - 2)\ (5x - 10y + 2)$

## Question 4.

Factorise :

(i) $a^2 - 23a + 42$ (ii) $a^2 - 23a - 108$

(iii) $1 - 18x - 63x^2$ (iv) $5x^2 - 4xy - 12y^2$

(v) $x\ (3x + 14) + 8$ (vi) $5 - 4x\ (1 + 3x)$

(vii) $x^2\ y^2 - 3xy - 40$

(viii) $(3x - 2y)^2 - 5\ (3x - 2y) - 24$

(ix) $12\ (a + b)^2 - (a + b) - 35$

**Solution:**

(i) $a^2 - 23a + 42$

$[42 = 21 \times 2$ and $21 + 2 = 23]$

$= a^2 - 21a - 2a + 42 = a(a - 21) - 2(a - 21)$

$= (a - 21)(a - 2)$

(ii) $a^2 - 23a - 108$

$= a^2 - 27a + 4a - 108$

$[27 \times 4 = 108$ and $27 - 4 = 23]$

$= a(a - 27) + 4(a - 27)$

$= (a - 27)(a + 4)$

(iii) $1 - 18x - 63x^2 = 1 - 21x + 3x - 63x^2$

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

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

(iv) $5x^2 - 4xy - 12y^2 = 5x^2 - 10xy + 6xy - 12y^2$

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

(v) $x(3x + 14) + 8 = 3x^2 + 14x + 8$

$= 3x^2 + 12x + 2x + 8 = 3x(x + 4) + 2(x + 4)$

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

(vi) $5 - 4x(1 + 3x) = 5 - 4x - 12x^2$

$= 5 - 10x + 6x - 12x^2 = 5(1 - 2x) + 6x(1 - 2x)$

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

(vii) $x^2y^2 - 3xy - 40 = x^2y^2 - 8xy + 5xy - 40$

$= xy(xy - 8) + 5(xy - 8) = (xy - 8)(xy + 5)$

(viii) $(3x - 2y)^2 - 5(3x - 2y) - 24$

$= (3x - 2y)^2 - 8(3x - 2y) + 3(3x - 2y) - 24$

$= (3x - 2y)(3x - 2y - 8) + 3(3x - 2y - 8)$

$= (3x - 2y - 8)(3x - 2y + 3)$

(ix) $12(a + b)^2 - (a + b) - 35$

$= 12(a + b)^2 - 21(a + b) + 20(a + b) - 35$

$= 3(a + b)[4(a + b) - 7] + 5[4(a + b) - 7]$

$= (4a + 4b - 7)(3a + 3b + 5)$

**Question 5.**

Factorise :

(i) $15\ (5x - 4)^3 - 10\ (5x - 4)$

(ii) $3a^2\ x - bx + 3a^2 - b$

(iii) $b\ (c - d)^2 + a\ (d - c) + 3\ (c - d)$

(iv) $ax^2 + b^2y - ab^2 - x^2y$

(v) $1 - 3x - 3y - 4\ (x + y)^2$

**Solution:**

(i) $15\ (5x - 4)^3 - 10\ (5x - 4) = 5\ (5x - 4)\ [3\ (5x - 4)^2 - 2]$

$= 5\ (5x - 4)\ [3\ (25x^2 - 40x + 16) - 2]$

$= 5(5x - 4)\ (75x^2 - 120x + 46)$

(ii) $3a^2\ x - bx + 3a^2 - b$

$= x\ (3a^2 - b) + 1\ (3a^2 - b) = (x + 1)\ (3a^2 - b)$

(iii) $b\ (c - d)^2 + a\ (d - c) + 3\ (c - d)$

$= b\ (c - d)^2 - a\ (c - d) + 3\ (c - d)$

$= (c - d)\ [b\ (c - d) - a + 3]$

$= (c - d)\ (bc - bd - a + 3)$

(iv) $ax^2 + b^2y - ab^2 - x^2y$

$= ax^2 - ab^2 + b^2y - x^2\ y = a\ (x^2 - b^2) + y\ (b^2 - x^2)$

$= a\ (x^2 - b^2) - y\ (x^2 - b^2) = (x^2 - b^2)\ (a - y)$

$= (x - b)\ (x + b)\ (a - y)$

(v) $1 - 3x - 3y - 4\ (x + y)^2$

$= 1 - 3\ (x + y) - 4\ (x + y)^2$

$= 1 - 4\ (x + y) + (x + y) - 4\ (x + y)^2$

$= 1[1 - 4\ (x + y)] + (x + y)\ [1 - 4\ (x + y)]$

$= [1 - 4x - 4y]\ (1 + x + y)$

**Question 6.**

Factorise :

(i) $2a^3 - 50a$

(ii) $54a^2\ b^2 - 6$

(iii) $64a^2\ b - 144b^3$

(iv) $(2x - y)^3 - (2x - y)$

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

(vi) $x^2 - y^2 - 2yz - z^2$

(vii) $7a^5 - 567a$ (viii) $5x^2 - \frac{20x^4}{9}$

**Solution:**

(i) $2a^3 - 50a = 2a\,(a^2 - 25) = 2a\,(a^2 - 5^2)$

$= 2a\,(a - 5)\,(a + 5)$

(ii) $54a^2b^2 - 6 = 6\,(9a^2b^2 - 1) = 6\,[(3ab)^2 - (1)^2]$

$= 6\,(3ab - 1)\,(3ab + 1)$

(iii) $64a^2b - 144b^3$

$= 16b\,(4a^2 - 9b^2) = 16b\,[(2a)^2 - (3b)^2]$

$= 16b\,(2a + 3b)\,(2a - 3b)$

(iv) $(2x - y)^3 - (2x - y) = (2x - y)\,[(2x - y)^2 - 1]$

$= (2x - y)\,(2x - y - 1)\,(2x - y + 1)$

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

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

$= (x - y - z)\,(x - y + z)$

(vi) $x^2 - y^2 - 2yz - z^2 = x^2 - (y^2 + 2yz + z^2)$

$= x^2 - (y + z)^2 = (x - y - z)\,(x + y + z)$

(vii) $7a^5 - 567a = 7a\,(a^4 - 81)$

$= 7a\,(a^2)^2 - (9)^2$

$= 7a\,(a^2 + 9)\,(a^2 - 9)$

$= 7a\,(a^2 + 9)\,((a)^2 - (3)^2)$

$= 7a\,(a^2 + 9)\,(a + 3)\,(a - 3)$

(viii) $5x^2 - \frac{20x^4}{9} = 5x^2\left[1 - \frac{4x^2}{9}\right]$

$= 5x^2\left[1 - \frac{2x}{3}\right]\left[1 + \frac{2x}{3}\right]$

**Question 7.**

Factorise $xy^2 - xz^2$, Hence, find the value of:

(i) $9 \times 8^2 - 9 \times 2^2$ (ii) $40 \times 5.5^2 - 40 \times 4.5^2$

**Solution:**

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

(i) $9 \times 8^2 - 9 \times 2^2 = 9(8^2 - 2^2)$

$= 9(8 - 2)(8 + 2) = 9(6)(10) = 540$

(ii) $40 \times 5.5^2 - 40 \times 4.5^2 = 40(5.5)^2 - (4.5^2)$

$= 40(5.5 - 4.5)(5.5 + 4.5)$

$= 40(1)(10) = 400$

**Question 8.**

Factorise :

(*i*) $(a - 3b)^2 - 36\,b^2$

(*ii*) $25(a - 5b)^2 - 4(a - 3b)^2$

(*iii*) $a^2 - 0.36\,b^2$

(*iv*) $a^4 - 625$

(*v*) $x^4 - 5x^2 - 36$

(*vi*) $15(2x - y)^2 - 16(2x - y) - 15$

**Solution:**

(*i*) $(a - 3b)^2 - 36\,b^2$

$= (a - 3b)^2 - (6b)^2$

$= (a - 3b + 6b)(a - 3b - 6b)$

$= (a + 3b)(a - 9b)$ $\quad \left\{\begin{matrix} a^2 - b^2 \\ = (a+b)(a-b) \end{matrix}\right\}$

(*ii*) $25(a - 5b)^2 - 4(a - 3b)^2$

$= [5(a - 5b)]^2 - [2(a - 3b)]^2$

$= (5a - 25b)^2 - (2a - 6b)^2$

$= (5a - 25b + 2a - 6b)(5a - 25b - 2a + 6b)$

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

$= (7a = 31b)(3a - 19b)$

(iii) $a^2 - 0.36\,b^2$

$= (a)^2 - (0.6b)^2$

$= (a + 0.6b)\,(a - 0.6b)$

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

(iv) $a^4 - 625 = (a^2)^2 - (25)^2$

$= (a^2 + 25)\,(a^2 - 25)$

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

$= (a^2 + 25)\,\{(a)^2 - (5)^2\}$

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

(v) $x^4 - 5x^2 - 36$

$= (x^2)^2 - 5x^2 - 36$

$= (x^2)^2 - 9x^2 + 4x^2 - 36 \quad \left\{\begin{array}{l}\because -36 = -9 \times 4 \\ -5 = -9 + 4\end{array}\right\}$

$= x^2\,(x^2 - 9) + 4\,(x^2 - 9)$

$= (x^2 - 9)\,(x^2 + 4)$

$= \{x^2 - (3)^2\}\,\{x^2 + 4\}$

$= (x + 3)\,(x - 3)\,(x^2 + 4)$

$= (x^2 + 4)\,(x + 3)\,(x - 3)$

(vi) $15\,(2x - y)^2 - 16\,(2x - y) - 15$

Let $2x - y = a$, then

$15a^2 - 16a - 15$

$= 15a^2 - 25a + 9a - 15$

$\left\{\begin{array}{l}\because 15 \times (-15) = -225 \\ \therefore -225 = -25 \times 9 \\ -16 = -25 + 9\end{array}\right\}$

$= 5a\,(3a - 5) + 3\,(3a - 5)$

$= (3a - 5)\,(5a + 3)$

$= [3\,(2x - y) - 5]\,[5\,(2x - y) + 3]$

$= (6x - 3y - 5)\,(10x - 5y + 3)$

**Question 9.**

Factorise $a^2b - b^3$ Using this result, find the value of $101^2 \times 100 - 100^3$.

**Solution:**

$a^2b - b^3$

$b\,(a^2 - b^2)$

$b\,(a + b)\,(a - b)$

Now,

$101^2 \times 100 - 100^3$

$= 100\,(101^2 - 100^2)$

$= 100\,(101 + 100)\,(101 - 100)$

$= 100(201)\,(1)$

$= 20100$

**Question 10.**

Evaluate (using factors): $301^2 \times 300 - 300^3$.

**Solution:**

$301^2 \times 300 - 300^3$

$= 300(301^2 - 300^2)$

$= 300(301 + 300)\,(301 - 300)$

$= 300\,(601)\,(1)$

$= 180300$