

# Chapter - 12 Factorisation

## Exercise - 12.1

1. Find the common factors of the given terms.

(i)  $12x, 36$

2	12	2	36
2	6	2	18
3	3	3	9
1	1	3	3

$12x = 2 \times 2 \times 3 \times x$   
 $36 = 2 \times 2 \times 3 \times 3$

$\therefore 2 \times 2 \times 3 = 12 //$

(ii)  $2y, 22xy$

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

$\therefore 2xy = 2y //$

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

$14pq = 2 \times 7 \times p \times q$   
 $28p^2q^2 = 2 \times 2 \times 7 \times p \times p \times q \times q$

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

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

$2x = 2 \times x$

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

$4 = 2 \times 2$

Nothing is common other than 1,  $SO = 1 //$

(v)  $6abc, 24a^2b^2, 12a^2b$

$6abc = 2 \times 3 \times a \times b \times c$

$24a^2b^2 = 2 \times 2 \times 2 \times 3 \times a \times a \times b \times b$

$12a^2b = 2 \times 2 \times 3 \times a \times a \times b$

$\therefore 2 \times 3 \times a \times b = 6ab //$

(vi)  $10pq, 20q^2r, 30r^2p$

$16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$   
 $-4x^2 = (-1) \times 2 \times 2 \times x \times x$   
 $32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$

$\therefore 2 \times 2 \times 2 \times 2 = 16 //$

$10pq = 2 \times 5 \times p \times q$   
 $20q^2r = 2 \times 2 \times 5 \times q \times q \times r$   
 $30r^2p = 2 \times 3 \times 5 \times r \times r \times p$

$\therefore 2 \times 5 = 10 //$

(viii)  $3a^2y^3, 10a^3y^2, 6a^2y^2z$

$3a^2y^3 = 3 \times a \times a \times y \times y \times y$   
 $10a^3y^2 = 2 \times 5 \times a \times a \times a \times y \times y$   
 $6a^2y^2z = 2 \times 3 \times a \times a \times y \times y \times z$

$\therefore a \times a \times y \times y = a^2y^2 //$

2. Factorise the following expressions.

(i)  $7x - 42$  [7x6=42]

$= 7(x - 6) //$

(ii)  $6p - 12q$

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

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

$= 7a(a + 2) //$

(iv)  $-16z^2 + 20z^3$

$= 4z(-4z + 5z^2) //$

(v)  $20l^2m + 30aldm$

$= 10lm(2l + 3a) //$

(vi)  $5x^2y - 15xy^2$

$= 5xy(x - 3y) //$

(vii)  $10a^2 - 15b^2 + 20c^2$

$= 5(2a^2 - 3b^2 + 4c^2) //$

(viii)  $-4a^2 + 4ab - 4ca$

$= 4a(-a + b - c) //$

(ix)  $x^2yz + xy^2z + xyz^2$

$= xyz(x + y + z) //$

(x)  $ax^2y + bxy^2 + cxyz$

$= xy(ax + by + cz) //$

### 3. Factorise

(i)  $x^2 + xy + 8x + 8y$   
Regrouping method

$$\underline{x^2 + xy} + \underline{8x + 8y}$$

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

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

Take common & write remaining

(ii)  $15xy - 6x + 5y - 2$

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

(iii)  $ax + bx - ay - by$

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

(iv)  $15pq + 15 + 9q + 25p$

$$\begin{aligned} 15pq + 15 &= 15(pq + 1) \\ 9q + 25 &= ? \\ \text{So shuffle the terms,} \\ 15pq + 9q + 15 + 25p & \end{aligned}$$

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

(v)  $z - 7 + 7xy - xyz$

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

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

## Exercise - 12.2

1. Factorise the following expressions.

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

use of identities

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

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

So,  $a^2 = a^2$  |  $b^2 = 16$

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

$a = a$  |  $b = 4$

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

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

$2ab = 2 \times a \times 4$

$= 8a$

$\therefore a^2 + 8a + 16 = (a+4)^2 //$

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

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

$a^2 = p^2$  |  $b^2 = 25$  |  $2ab = 2 \times p \times 5$

$a = p$  |  $b = 5$  |  $= 10p$

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

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

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

$a^2 = 25m^2$  |  $b^2 = 9$  |  $2ab = 2 \times 5m \times 3$

$a = 5m$  |  $b = 3$  |  $= 30m$

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



$$(8v) 4ay^2 + 84yz + 36z^2$$

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

$$a^2 = 4ay^2 \quad | \quad b^2 = 36z^2 \quad | \quad 2ab$$

$$a = 7y \quad | \quad b = 6z \quad | \quad 2 \times 7y \times 6z$$

$$= 84yz$$

$$\therefore 4ay^2 + 84yz + 36z^2 = (7y + 6z)^2 //$$

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

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

$$a^2 = 4x^2 \quad | \quad b^2 = 4 \quad | \quad 2ab$$

$$a = 2x \quad | \quad b = 2 \quad | \quad 2 \times 2x \times 2$$

$$= 8x$$

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

$$\text{or } 4(x-1)^2 //$$

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

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

$$a^2 = 121b^2 \quad | \quad b^2 = 16c^2 \quad | \quad 2ab = 2 \times 11b \times 4c$$

$$a = 11b \quad | \quad b = 4c \quad | \quad 88bc$$

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

$$(vii) (1+m)^2 - 4lm$$

$$(a+b)^2 \text{ (expand)}$$

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

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

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

$$= (l-m)^2 \quad | \quad (a^2 - 2ab + b^2)$$

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

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

$$a^2 = a^4 \quad | \quad b^2 = b^4 \quad | \quad 2ab = 2 \times a^2 \times b^2$$

$$a = a^2 \quad | \quad b = b^2 \quad | \quad 2a^2b^2$$

$$\therefore a^4 + 2a^2b^2 + b^4 = (a^2 + b^2)^2 //$$

2.

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

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

$$a^2 = 4p^2 \quad | \quad b^2 = 9q^2$$

$$a = 2p \quad | \quad b = 3q$$

$$4p^2 - 9q^2 = (2p+3q)(2p-3q) //$$

$$(ii) 36a^2 - 11ab^2$$

$$= \mp (9a^2 - 16b^2)$$

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

$$a^2 = 9a^2 \quad | \quad b^2 = 16b^2$$

$$a = 3a \quad | \quad b = 4b$$

$$= \mp (3a+4b)(3a-4b) //$$

$$(iii) 16x^2 - 36$$

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

$$a^2 = 16x^2 \quad | \quad b^2 = 36$$

$$a = 4x \quad | \quad b = 6$$

$$16x^2 - 36 = (4x+6)(4x-6) //$$

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

$$= 16x^3 (x^2 - 9)$$

$$= 16x^3 (a^2 - b^2)$$

$$[a = x \quad | \quad b = 3]$$

$$= 16x^3 (x+3)(x-3) //$$

$$(v) (1+m)^2 - (l-m)^2$$

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

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

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

$$= 2lm + 2lm$$

$$= 4lm //$$

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

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

$$a^2 = 9x^2y^2 \quad | \quad b^2 = 16$$

$$a = 3xy \quad | \quad b = 4$$

$$\therefore 9x^2y^2 - 16 = (3xy+4)(3xy-4) //$$

$$(vii) 9(x^2 - 2xy + y^2) - z^2$$

$$(a^2 - 2ab + b^2) - z^2$$

$$a^2 = x^2 \quad b^2 = y^2 \quad 2ab = 2xy$$

$$a = x \quad b = y \quad z = 2xy$$

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

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

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

$$a = x-y \quad b = z$$

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

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

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

3. Factorise the expressions.

$$(i) x^2 + 6x \quad (ii) x^2 + 2xy + y^2$$

$$= x(x+6) \quad = (x+y)^2$$

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

$$(v) (m+1)^2 + (m+1)$$

$$am^2 + bmn^2 = m^2(a+b)$$

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

$$bm^2 + an^2 = n^2(a+b)$$

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

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

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

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

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

$$5y^2 - 20y + 2y - 8z \quad (5y-8)(y+2)$$

$$5y^2 - 20y = 5y(y-4)$$

$$2y - 8z = 2z(y-4)$$

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

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

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

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

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

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

$$6xy - 4y = 2y(3x-2)$$

$$6 - 9x = 3(2-3x)$$

$$10ab + 5b = 5b(2a+1)$$

$$4a + 2 = 2(2a+1)$$

$$10ab + 5b + 4a + 2$$

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

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

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

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

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

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



#### 4. Factorise

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

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

$$\begin{array}{l|l} a^2 = a^4 & b^2 = b^4 \\ a = a^2 & b = b^2 \end{array}$$

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

(ii)  $p^4 - 81$

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

$$\begin{array}{l|l} a^2 = p^4 & b^2 = 81 \\ a = p^2 & b = 9 \end{array}$$

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

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

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

$$\begin{array}{l|l} a^2 = x^4 & b^2 = (y+z)^4 \\ a = x^2 & b = (y+z)^2 \end{array}$$

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

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

$$a^2 - b^2$$

$$\begin{array}{l|l} a^2 = x^4 & b^2 = (x-z)^4 \\ a = x^2 & b = (x-z)^2 \end{array}$$

$$\begin{aligned} x^4 - (x-z)^4 &= (x^2 + (x-z)^2)(x^2 - (x-z)^2) \rightarrow (a^2 - b^2) \\ &= (x^2 + x^2 - 2xz + z^2)(x + (x-z))(x - (x-z)) \\ &= (2x^2 - 2xz + z^2)(x + x - z)(x - x + z) \\ &= (2x^2 - 2xz + z^2)(2x - z)(z) \\ &= 2(2x - z)(2x^2 - 2xz + z^2) // \end{aligned}$$

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

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

$a^2 = a^4$	$b^2 = b^4$	$2ab = 2 \times a^2 \times b^2$
$a \pm a^2$	$b = b^2$	$= 2a^2b^2$

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

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

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

5. Factorise the following expressions.

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

$$\begin{array}{c} \wedge \\ +2+4 \checkmark \\ 1 \quad 8 \quad \times \end{array}$$

$$p^2 + 6p + 8$$

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

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

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

~~first~~ First write factors of 8

\* Match the possible signs to the central expression

\* Regroup them & take common expression & remaining expression.

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

$$\begin{array}{c} \wedge \\ -3 \quad -7 \quad \checkmark \\ 1 \quad 21 \quad \times \end{array}$$

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

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

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

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

$$\begin{array}{c} \wedge \\ -2+8 \checkmark \\ 1 \quad 16 \quad \times \end{array}$$

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

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

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

## Exercise - 12.3

1. Carry out the following divisions:

(i)  $8x^4 \div 56x$

$$\begin{array}{r} 8x^4 \div 56x = \frac{1}{7}x^3 \\ \underline{56x} \phantom{00} \\ 2x^4 - 1 \end{array}$$

(ii)  $-36y^3 \div 9y^2$

$$\begin{array}{r} -36y^3 \div 9y^2 = -4y \\ \underline{36y^3} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 2x^3 \div 2 = x^3 \\ \underline{2x^3} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 2 - 4y \div 2 = -4y \\ \underline{2} \phantom{00} \\ 0 \end{array}$$

(iii)  $66pq^2r^3 \div 11qr^2$

$$\begin{array}{r} 66pq^2r^3 \div 11qr^2 = 6pq^2r^3 \\ \underline{11qr^2} \phantom{00} \\ 26pq^2r^3 \phantom{00} \\ \underline{22pq^2r^2} \phantom{00} \\ 4pq^2r^3 \phantom{00} \\ \underline{4pq^2r^2} \phantom{00} \\ 0 \end{array}$$

(iv)  $24x^3y^3z^3 \div 51xy^3z^3$

$$\begin{array}{r} 24x^3y^3z^3 \div 51xy^3z^3 = \frac{24}{51}x^2z^0 \\ \underline{51xy^3z^3} \phantom{00} \\ 24x^3y^3z^3 \phantom{00} \\ \underline{51xy^3z^3} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 2 - 4y \div 3 = \frac{2}{3} - \frac{4}{3}y \\ \underline{2} \phantom{00} \\ 0 \end{array}$$

(v)  $12a^8b^8 \div (-6a^6b^4)$

$$\begin{array}{r} 12a^8b^8 \div (-6a^6b^4) = -2a^2b^4 \\ \underline{-6a^6b^4} \phantom{00} \\ 6a^2b^4 \phantom{00} \\ \underline{-6a^2b^4} \phantom{00} \\ 0 \end{array}$$

2. Divide the given polynomial by the given monomial.

(i)  $(8x^2 - 6x) \div 3x$  (ii)  $(3y^8 - 4y^6 + 5y^4) \div y^4$

$$\begin{array}{r} 8x^2 - 6x \div 3x = \frac{8}{3}x - 2 \\ \underline{8x^2 - 6x} \phantom{00} \\ 0 \end{array}$$

(iii)  $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2$  (iv)  $(9x^3 + 2x^2 + 3x) \div 2x$

$$\begin{array}{r} 8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2 = 2x + 2y + 2z \\ \underline{8x^3y^2z^2} \phantom{00} \\ 8x^2y^3z^2 \phantom{00} \\ \underline{8x^2y^2z^2} \phantom{00} \\ 0 \end{array}$$

(v)  $(p^3q^6 - p^6q^3) \div p^3q^3$

$$\begin{array}{r} p^3q^6 - p^6q^3 \div p^3q^3 = q^3 - p^3 \\ \underline{p^3q^6} \phantom{00} \\ -p^6q^3 \phantom{00} \\ \underline{-p^6q^3} \phantom{00} \\ 0 \end{array}$$

8. (i)  $(10x - 25) \div 5$  (ii)  $(10x - 25) \div (2x - 5)$

$$\begin{array}{r} 10x - 25 \div 5 = 2x - 5 \\ \underline{10x - 25} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 10x - 25 \div (2x - 5) = 5 \\ \underline{10x - 25} \phantom{00} \\ 0 \end{array}$$



$$(iii) 10y(6y+21) \div 5(2y+7)$$

$$(iv) 9x^2y^2(3z-24) \div 27xy(2-8)$$

$$\frac{10y(6y+21)}{5(2y+7)}$$

$$= \frac{9x^2y^2(3z-24)}{27xy(2-8)}$$

$$= \frac{2y(6y+21)}{(2y+7)}$$

$$= \frac{9x^2y^2 \times 3(2-8)}{27xy(2-8)}$$

$$= 2y \times 3(2y+7)$$

$$= 6y$$

$$= 6y //$$

$$(v) 96abc(3a-12)(5b-30) \div 144(a-4)(b-6)$$

$$= \frac{96abc \times 3(a-4) \times 5(b-6)}{144(a-4)(b-6)}$$

$$= 10abc //$$

4. Divide as directed.

$$(i) 5(2x+1)(3x+5) \div (2x+1) \quad (ii) 86xy(x+5)(y-4) \div 13x(y-4)$$

$$= \frac{5(2x+1)(3x+5)}{(2x+1)}$$

$$= \frac{86xy(x+5)(y-4)}{13x(y-4)}$$

$$= 5(3x+5) //$$

$$= 2y(x+5) //$$

$$(iii) 5apqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$$

$$= \frac{5apqr(p+q)(q+r)(r+p)}{104pq(q+r)(r+p)}$$

$$= \frac{5a(p+q)}{104}$$

$$= \frac{5a(p+q)}{104} //$$

$$(iv) 20(y+4)(y^2+5y+3) \div 5(y+4)$$

$$= \frac{20(y+4)(y^2+5y+3)}{5(y+4)}$$

$$= 4(y^2+5y+3)$$

$$= 4(y^2+5y+3) //$$

$$(v) x(x+1)(x+2)(x+3) \div x(x+1)$$

$$= \frac{x(x+1)(x+2)(x+3)}{x(x+1)}$$

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

5. Factorise the expressions & divide them as directed.

$$(i) (y^2+7y+10) \div (y+5)$$

$$= \frac{(y^2+7y+10)}{(y+5)}$$

$$= \frac{(y+2)(y+5)}{(y+5)}$$

$$= (y+2) //$$

$$y^2+7y+10$$

$$= (y+2)(y+5)$$

$$(y+2)(y+5)$$

$$(i) (m^2 - 14m - 32) \div (m+2)$$

$$\frac{m^2 - 14m - 32}{m+2}$$

$$m^2 - 14m - 32$$

$$(m+2)$$

$$= (m+2)(m-16)$$

$$(m+2)$$

$$= (m-16) //$$

$$(ii) (5p^2 - 25p + 20) \div (p-1)$$

$$\frac{5p^2 - 25p + 20}{p-1}$$

$$5p^2 - 25p + 20$$

$$(p-1)$$

$$= 5(p-1)(p-1)$$

$$(p-1)$$

$$= 5(p-1) //$$

$$= 5(p-1)(p-1)$$

$$(iv) 4yz(2^2 + 6z - 16) \div 2y(2+8)$$

$$\frac{4yz(2^2 + 6z - 16)}{2y(2+8)}$$

$$2^2 + 6z - 16$$

$$2y(2+8)$$

$$= 4yz(2-2)(2+8)$$

$$2y(2+8)$$

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

$$(v) 5pq(p^2 - q^2) \div 2p(p+q)$$

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

$$\frac{5pq(p+q)(p-q)}{2p(p+q)}$$

$$= \frac{5q(p-q)}{2} //$$

$$(vi) 12xy(9x^2 - 16y^2) \div 4xy(3x+4y)$$

$$\frac{12xy(9x^2 - 16y^2)}{4xy(3x+4y)}$$

$$= \frac{12xy(3x+4y)(3x-4y)}{4xy(3x+4y)}$$

$$= 3(3x-4y) //$$

$$(vii) 3ay^3(5ay^2 - 98) \div 2ay^2(5y+7)$$

$$\frac{3ay^3(5ay^2 - 98)}{2ay^2(5y+7)}$$

$$= \frac{3ay^3 \times 2 \times (5y+7)(5y-7)}{2ay^2(5y+7)}$$

$$= 3ay(5y-7) //$$

$$= 3ay(5y-7) //$$