

## Factorisation: Exercise 14.3

**Q.1** Carry out the following divisions.

(i)  $28x^4 \div 56x$

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

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

(iv)  $34x^3y^3z^3 \div 51xy^2z^3$

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

**Sol. Division:**

(i) **Given:**  $28x^4 \div 56x$

$$\begin{aligned} 28x^4 \div 56x &= \frac{28x^4}{56x} \\ &= \frac{1}{2} \times x^3 \end{aligned}$$

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

$$-36y^3 \div 9y^2 = \frac{-36y^3}{9y^2} = -4y$$

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

$$\begin{aligned} 66pq^2r^3 \div 11qr^2 &= \frac{66pq^2r^3}{11qr^2} \\ &= \frac{66 \times pq^2r^3}{11 \times qr^2} \\ &= 6pqr \end{aligned}$$

(iv) **Given:**  $34x^3y^3z^3 \div 51xy^2z^3$

$$\begin{aligned} 34x^3y^3z^3 \div 51xy^2z^3 &= \frac{34x^3y^3z^3}{51xy^2z^3} \\ &= \frac{34 \times x^3y^3z^3}{51 \times xy^2z^3} \\ &= \frac{2}{3} x^2y \end{aligned}$$

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

$$\begin{aligned} 12a^8b^8 \div (-6a^6b^4) &= \frac{12a^8b^8}{-6a^6b^4} \\ &= \frac{12 \times a^8b^8}{-6 \times a^6b^4} \\ &= -2a^2b^4 \end{aligned}$$

**Q.2 Divide the given polynomial by the given monomial.**

**(i)**  $(5x^2 - 6x) \div 3x$

**(ii)**  $(3y^8 - 4y^6 + 5y^4) \div y^4$

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

**(iv)**  $(x^3 + 2x^2 + 3x) \div 2x$

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

**Sol.** Division of the given polynomial by the given monomial:

**(i) Given:**  $(5x^2 - 6x) \div 3x$

$$\begin{aligned}(5x^2 - 6x) \div 3x &= \frac{5x^2 - 6x}{3x} \\&= \frac{5x^2}{3x} - \frac{6x}{3x} \\&= \frac{5x}{3} - 2 \\&= \frac{1}{3}[5x - 6]\end{aligned}$$

**(ii) Given:**  $(3y^8 - 4y^6 + 5y^4) \div y^4$

$$\begin{aligned}(3y^8 - 4y^6 + 5y^4) \div y^4 &= \frac{(3y^8 - 4y^6 + 5y^4)}{y^4} \\&= \frac{3y^8}{y^4} - \frac{4y^6}{y^4} + \frac{5y^4}{y^4} \\&= 3y^4 - 4y^2 + 5\end{aligned}$$

**(iii) Given:**  $8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2$

$$\begin{aligned}8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) \div 4x^2y^2z^2 &= \frac{8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3)}{4x^2y^2z^2} \\&= \frac{8x^3y^2z^2}{4x^2y^2z^2} + \frac{8x^2y^3z^2}{4x^2y^2z^2} + \frac{8x^2y^2z^3}{4x^2y^2z^2} \\&= 2x + 2y + 2z \\&= 2(x + y + z)\end{aligned}$$

**(iv) Given:**  $(x^3 + 2x^2 + 3x) \div 2x$

$$\begin{aligned}(x^3 + 2x^2 + 3x) \div 2x &= \frac{x^3 + 2x^2 + 3x}{2x} \\&= \frac{x^3}{2x} + \frac{2x^2}{2x} + \frac{3x}{2x} \\&= \frac{1}{2}(x^2 + 2x + 3)\end{aligned}$$

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

$$\begin{aligned}(p^3q^6 - p^6q^3) \div p^3q^3 &= \frac{(p^3q^6 - p^6q^3)}{p^3q^3} \\&= \frac{p^3q^6}{p^3q^3} - \frac{p^6q^3}{p^3q^3} \\&= q^3 - p^3\end{aligned}$$

**Q.3 Work out the following divisions.**

**(i)  $(10x - 25) \div 5$**

**(ii)  $(10x - 25) \div (2x - 5)$**

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

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

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

**Sol. Divisions:**

**(i) Given:**  $(10x - 25) \div 5$

$$\begin{aligned}(10x - 25) \div 5 &= \frac{(10x - 25)}{5} \\&= \frac{10x}{5} - \frac{25}{5} \\&= 2x - 5\end{aligned}$$

**(ii) Given:**  $(10x - 25) \div (2x - 5)$

$$(10x - 25) \div (2x - 5) = \frac{(10x - 25)}{(2x - 5)}$$

By taking common,

$$\begin{aligned}&= \frac{5(2x - 5)}{(2x - 5)} \\&= 5\end{aligned}$$

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

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

By taking common,

$$\begin{aligned}&= \frac{10y \times 3(2y + 7)}{5(2y + 7)} \\&= 6y\end{aligned}$$

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

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

By taking common,

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

$$= xy$$

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

$$96abc(3a-12)(5b-30) \div 144(a-4)(b-6) = \frac{96abc(3a-12)(5b-30)}{144(a-4)(b-6)}$$

By taking common,

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

$$= 10abc$$

#### Q.4 Divide as directed.

**(i)**  $5(2x+1)(3x+5) \div (2x+1)$

**(ii)**  $26xy(x+5)(y-4) \div 13x(y-4)$

**(iii)**  $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$

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

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

**Sol. Division:**

**(i) Given:**  $5(2x+1)(3x+5) \div (2x+1)$

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

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

**(ii) Given:**  $26xy(x+5)(y-4) \div 13x(y-4)$

$$26xy(x+5)(y-4) \div 13x(y-4) = \frac{26xy(x+5)(y-4)}{13x(y-4)}$$

$$= \frac{26xy(x+5)}{13x}$$

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

**(iii) Given:**  $52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p)$

$$52pqr(p+q)(q+r)(r+p) \div 104pq(q+r)(r+p) = \frac{52pqr(p+q)(q+r)(r+p)}{104pq(q+r)(r+p)}$$

$$= \frac{1}{2}r(p+q)$$

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

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

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

**(v) Given:**  $x(x+1)(x+2)(x+3) \div x(x+1)$

$$\begin{aligned} x(x+1)(x+2)(x+3) \div x(x+1) &= \frac{x(x+1)(x+2)(x+3)}{x(x+1)} \\ &= (x+2)(x+3) \end{aligned}$$

**Q.5 Factorise the expressions and divide them as directed.**

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

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

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

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

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

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

**(vii)**  $39y^3(50y^2 - 98) \div 26y^2(5y + 7)$

*Sol.* Factorisation of expressions and their division:

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

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

Factorise by splitting the middle term,

$$\begin{aligned} &= \frac{(y^2 + 5y + 2y + 10)}{(y + 5)} \\ &= \frac{(y(y+5) + 2(y+5))}{(y + 5)} \\ &= \frac{(y+2)(y+5)}{(y+5)} \\ &= (y+2) \end{aligned}$$

**(ii) Given:**  $(m^2 - 14m - 32) \div (m + 2)$

$$(m^2 - 14m - 32) \div (m + 2) = \frac{(m^2 - 14m - 32)}{(m + 2)}$$

Factorise by splitting the middle term,

$$= \frac{(m^2 - 16m + 2m - 32)}{(m + 2)}$$

By taking the common,

$$\begin{aligned} &= \frac{m(m-16) + 2(m-16)}{(m + 2)} \\ &= \frac{(m+2)(m-16)}{(m + 2)} \\ &= (m-16) \end{aligned}$$

**(iii) Given:**  $(5p^2 - 25p + 20) \div (p - 1)$

$$(5p^2 - 25p + 20) \div (p - 1) = \frac{(5p^2 - 25p + 20)}{(p - 1)}$$

Factorise by splitting the middle term,

$$= \frac{5p^2 - 20p - 5p + 20}{(p - 1)}$$

By taking the common,

$$= \frac{5p(p - 4) - 5(p - 4)}{(p - 1)}$$

$$= \frac{(5p - 5)(p - 4)}{(p - 1)}$$

$$= \frac{5(p - 1)(p - 4)}{(p - 1)}$$

$$= 5(p - 4)$$

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

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

Factorise by splitting the middle term,

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

By taking the common,

$$= \frac{4yz[z(z + 8) - 2(z + 8)]}{2y(z + 8)}$$

$$= \frac{4yz[(z - 2)(z + 8)]}{2y(z + 8)}$$

$$= 2z(z - 2)$$

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

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

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

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

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

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

$$\begin{aligned} 12xy (9x^2 - 16y^2) \div 4xy (3x + 4y) &= \frac{12xy(9x^2 - 16y^2)}{4xy(3x + 4y)} \\ &= \frac{12xy((3x)^2 - (4y)^2)}{4xy(3x + 4y)} \end{aligned}$$

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

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

**(vii) Given:**  $39y^3 (50y^2 - 98) \div 26y^2 (5y + 7)$

$$39y^3 (50y^2 - 98) \div 26y^2 (5y + 7) = \frac{39y^3(50y^2 - 98)}{26y^2(5y + 7)}$$

By taking common,

$$\begin{aligned} &= \frac{39y^3 \times 2 \times (25y^2 - 49)}{26y^2(5y + 7)} \\ &= \frac{39y^3 \times 2 \times ((5y)^2 - (7)^2)}{26y^2(5y + 7)} \end{aligned}$$

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

$$\begin{aligned} &= \frac{39y^3 \times 2 \times (5y - 7) \times (5y + 7)}{26y^2(5y + 7)} \\ &= 3y(5y - 7) \end{aligned}$$