

Exercise 14.1 : Solutions of Questions on Page Number : 220

Q1 :

Find the common factors of the terms

(i) $12x, 36$

(ii) $2y, 22xy$

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

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

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

(vi) $16x^3, -4x^2, 32x$

(vii) $10pq, 20qr, 30rp$

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

Answer :

(i) $12x = 2 \times 2 \times 3 \times x$

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

The common factors are 2, 2, 3.

And, $2 \times 2 \times 3 = 12$

(ii) $2y = 2 \times y$

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

The common factors are 2, y .

And, $2 \times y = 2y$

(iii) $14pq = 2 \times 7 \times p \times q$

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

The common factors are 2, 7, p , q .

$$\text{And, } 2 \times 7 \times p \times q = 14pq$$

$$\text{(iv) } 2x = 2 \times x$$

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

$$4 = 2 \times 2$$

The common factor is 1.

$$\text{(v) } 6abc = 2 \times 3 \times a \times b \times c$$

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

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

The common factors are 2, 3, a , b .

$$\text{And, } 2 \times 3 \times a \times b = 6ab$$

$$\text{(vi) } 16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$$

$$-4x^2 = -1 \times 2 \times 2 \times x \times x$$

$$32x = 2 \times 2 \times 2 \times 2 \times 2 \times x$$

The common factors are 2, 2, x .

$$\text{And, } 2 \times 2 \times x = 4x$$

$$\text{(vii) } 10pq = 2 \times 5 \times p \times q$$

$$20qr = 2 \times 2 \times 5 \times q \times r$$

$$30rp = 2 \times 3 \times 5 \times r \times p$$

The common factors are 2, 5.

And, $2 \times 5 = 10$

$$\text{(viii)} \quad 3x^2y^3 = 3 \times x \times x \times x \times y \times y \times y$$

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

The common factors are x, x, y, y .

$$\text{And, } x \times x \times x \times y \times y = x^2y^2$$

Q2 :

Factorise the following expressions

$$\text{(i)} \quad 7x - 42$$

$$\text{(ii)} \quad 6p - 12q$$

$$\text{(iii)} \quad 7a^2 + 14a$$

$$\text{(iv)} \quad -16z + 20z^3$$

$$\text{(v)} \quad 20l^2m + 30alm$$

$$\text{(vi)} \quad 5x^2y - 15xy^2$$

$$\text{(vii)} \quad 10a^2 - 15b^2 + 20c^2$$

$$\text{(viii)} \quad -4a^2 + 4ab - 4ca$$

$$\text{(ix)} \quad x^2yz + xy^2z + xyz^2$$

$$\text{(x)} \quad ax^2y + bxy^2 + cxyz$$

Answer :

$$\text{(i)} \quad 7x = 7 \times x$$

$$42 = 2 \times 3 \times 7$$

The common factor is 7.

$$\therefore 7x - 42 = (7 \times x) - (2 \times 3 \times 7) = 7(x - 6) \quad \text{(ii) } 6p = 2 \times 3 \times p$$

$$12q = 2 \times 2 \times 3 \times q$$

The common factors are 2 and 3.

$$\therefore 6p - 12q = (2 \times 3 \times p) - (2 \times 2 \times 3 \times q)$$

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

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

$$\text{(iii) } 7a^2 = 7 \times a \times a$$

$$14a = 2 \times 7 \times a$$

The common factors are 7 and a .

$$\therefore 7a^2 + 14a = (7 \times a \times a) + (2 \times 7 \times a)$$

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

$$\text{(iv) } 16z = 2 \times 2 \times 2 \times 2 \times z$$

$$20z^3 = 2 \times 2 \times 5 \times z \times z \times z$$

The common factors are 2, 2, and z .

$$\therefore -16z + 20z^3 = - (2 \times 2 \times 2 \times 2 \times z) + (2 \times 2 \times 5 \times z \times z \times z)$$

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

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

$$\text{(v) } 20l^2m = 2 \times 2 \times 5 \times l \times l \times m$$

$$30alm = 2 \times 3 \times 5 \times a \times l \times m$$

The common factors are 2, 5, l , and m .

$$\therefore 20l^2m + 30alm = (2 \times 2 \times 5 \times l \times l \times m) + (2 \times 3 \times 5 \times a \times l \times m)$$

$$= (2 \times 5 \times l \times m) [(2 \times l) + (3 \times a)]$$

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

$$(vi) \quad 5x^2y = 5 \times x \times x \times y$$

$$15xy^2 = 3 \times 5 \times x \times y \times y$$

The common factors are 5, x , and y .

$$\therefore 5x^2y - 15xy^2 = (5 \times x \times x \times y) - (3 \times 5 \times x \times y \times y)$$

$$= 5 \times x \times y [x - (3 \times y)]$$

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

$$(vii) \quad 10a^2 = 2 \times 5 \times a \times a$$

$$15b^2 = 3 \times 5 \times b \times b$$

$$20c^2 = 2 \times 2 \times 5 \times c \times c$$

The common factor is 5.

$$10a^2 - 15b^2 + 20c^2 = (2 \times 5 \times a \times a) - (3 \times 5 \times b \times b) + (2 \times 2 \times 5 \times c \times c)$$

$$= 5 [(2 \times a \times a) - (3 \times b \times b) + (2 \times 2 \times c \times c)]$$

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

$$(viii) \quad 4a^2 = 2 \times 2 \times a \times a$$

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

$$4ca = 2 \times 2 \times c \times a$$

The common factors are 2, 2, and a .

$$\therefore -4a^2 + 4ab - 4ca = - (2 \times 2 \times a \times a) + (2 \times 2 \times a \times b) - (2 \times 2 \times c \times a)$$

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

$$= 4a (-a + b - c) \quad (\text{ix})$$

$$x^2yz = x \times x \times y \times z$$

$$xy^2z = x \times y \times y \times z$$

$$xyz^2 = x \times y \times z \times z$$

The common factors

are x, y, and z.

$$\therefore x^2yz + xy^2z + xyz^2 = (x \times x \times y \times z) + (x \times y \times y \times z) + (x \times y \times z \times z)$$

$$= x \times y \times z [x + y + z]$$

$$= xyz (x + y + z) \quad (\text{x})$$

$$ax^2y = a \times x \times x \times y$$

$$bxy^2 = b \times x \times y \times y$$

$$cxyz = c \times x \times y \times z$$

The common factors are x and y.

a

Q3 :

Factorise

$$(i) \quad x^2 + xy + 8x + 8y$$

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

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

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

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

Answer :

$$(i) x^2 + xy + 8x + 8y = x \times x + x \times y + 8 \times x + 8 \times y$$

$$= x(x + y) + 8(x + y)$$

$$= (x + y)(x + 8)$$

$$(ii) 15xy - 6x + 5y - 2 = 3 \times 5 \times x \times y - 3 \times 2 \times x + 5 \times y - 2$$

$$= 3x(5y - 2) + 1(5y - 2)$$

$$= (5y - 2)(3x + 1)$$

$$(iii) ax + bx - ay - by = a \times x + b \times x - a \times y - b \times y$$

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

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

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

$$= 3 \times 5 \times p \times q + 3 \times 3 \times q + 5 \times 5 \times p + 3 \times 5$$

$$= 3q(5p + 3) + 5(5p + 3)$$

$$= (5p + 3)(3q + 5)$$

$$(v) z - 7 + 7xy - xyz = z - x \times y \times z - 7 + 7 \times x \times y$$

$$= z(1 - xy) - 7(1 - xy)$$

$$= (1 - xy)(z - 7)$$

Exercise 14.2 : Solutions of Questions on Page Number : 223

Q1 :

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

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

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

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

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

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

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

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

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

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

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

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

Q2 :

Factorise

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

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

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

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

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

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

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

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

Answer :

$$(i) \quad 4p^2 - 9q^2 = (2p)^2 - (3q)^2$$

$$= (2p + 3q) (2p - 3q) [a^2 - b^2 = (a - b) (a + b)]$$

$$(ii) \quad 63a^2 - 112b^2 = 7(9a^2 - 16b^2)$$

$$= 7[(3a)^2 - (4b)^2]$$

$$= 7(3a + 4b) (3a - 4b) [a^2 - b^2 = (a - b) (a + b)]$$

$$(iii) \quad 49x^2 - 36 = (7x)^2 - (6)^2$$

$$= (7x - 6) (7x + 6) [a^2 - b^2 = (a - b) (a + b)]$$

$$(iv) \quad 16x^5 - 144x^3 = 16x^3(x^2 - 9)$$

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

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

$$(v) \quad (l + m)^2 - (l - m)^2 = [(l + m) - (l - m)] [(l + m) + (l - m)]$$

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

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

$$= 2m \times 2l$$

$$= 4ml$$

$$= 4lm$$

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

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

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

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

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

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

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

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

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

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

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

Q3 :

Factorise the expressions

$$(i) \quad ax^2 + bx$$

$$(ii) \quad 7p^2 + 21q^2$$

$$(iii) \quad 2x^3 + 2xy^2 + 2xz^2$$

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

$$(v) \quad (lm + l) + m + 1$$

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

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

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

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

Answer :

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 $(-7) + (-3) = -10$ ∴

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

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

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

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

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

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

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

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

Exercise 14.3 : Solutions of Questions on Page Number : 227

Q1 :

Carry out the following divisions.

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

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

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

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

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

Answer :

$$(i) 28x^4 = 2 \times 2 \times 7 \times x \times x \times x \times x$$

$$56x = 2 \times 2 \times 2 \times 7 \times x$$

$$28x^4 \div 56x = \frac{2 \times 2 \times 7 \times x \times x \times x \times x}{2 \times 2 \times 2 \times 7 \times x} = \frac{x^3}{2} = \frac{1}{2}x^3$$

$$(ii) 36y^3 = 2 \times 2 \times 3 \times 3 \times y \times y \times y$$

$$9y^2 = 3 \times 3 \times y \times y$$

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

$$(iii) 66pq^2r^3 = 2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r$$

$$11qr^2 = 11 \times q \times r \times r$$

$$66pq^2r^3 \div 11qr^2 = \frac{2 \times 3 \times 11 \times p \times q \times q \times r \times r \times r}{11 \times q \times r \times r} = 6pqr$$

$$(iv) 34x^3y^3z^3 = 2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z$$

$$51xy^2z^3 = 3 \times 17 \times x \times y \times y \times z \times z \times z$$

$$\begin{aligned} 34x^3y^3z^3 \div 51xy^2z^3 &= \frac{2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z}{3 \times 17 \times x \times y \times y \times z \times z \times z} \\ &= \frac{2}{3}x^2y \end{aligned}$$

$$(v) 12a^8b^8 = 2 \times 2 \times 3 \times a^8 \times b^8$$

$$6a^6b^4 = 2 \times 3 \times a^6 \times b^4$$

$$12a^8b^8 \div (-6a^6b^4) = \frac{2 \times 2 \times 3 \times a^8 \times b^8}{-2 \times 3 \times a^6 \times b^4} = -2a^2b^4$$

Q2 :

Divide the given polynomial by the given monomial.

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

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

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

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

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

Answer :

$$(i) 5x^2 - 6x = x(5x - 6)$$

$$(5x^2 - 6x) \div 3x = \frac{x(5x - 6)}{3x} = \frac{1}{3}(5x - 6)$$

$$(ii) 3y^8 - 4y^6 + 5y^4 = y^4(3y^4 - 4y^2 + 5)$$

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

$$(iii) 8(x^3y^2z^2 + x^2y^3z^2 + x^2y^2z^3) = 8x^2y^2z^2(x + y + z)$$

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

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

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

$$(v) p^3q^6 - p^6q^3 = p^3q^3(q^3 - p^3)$$

$$(p^3q^6 - p^6q^3) \div p^3q^3 = \frac{p^3q^3(q^3 - p^3)}{p^3q^3} = q^3 - p^3$$

Q3 :

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

Answer :

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

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

(iii)
$$10y(6y + 21) \div 5(2y + 7) = \frac{2 \times 5 \times y[2 \times 3 \times y + 3 \times 7]}{5(2y + 7)}$$

$$= \frac{2 \times 5 \times y \times 3(2y + 7)}{5(2y + 7)} = 6y$$

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

$$= \frac{xy \times 3(z - 8)}{3(z - 8)} = xy$$

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

$$\begin{aligned} &= \frac{96abc(3 \times a - 3 \times 4)(5 \times b - 2 \times 3 \times 5)}{144(a - 4)(b - 6)} \\ &= \frac{2abc \times 3(a - 4) \times 5(b - 6)}{3(a - 4)(b - 6)} = 10abc \end{aligned}$$

Q4 :

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

Answer :

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

(ii)
$$26xy(x + 5)(y - 4) \div 13x(y - 4) = \frac{2 \times 13 \times xy(x + 5)(y - 4)}{13x(y - 4)} = 2y(x + 5)$$

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

$$\begin{aligned} &= \frac{2 \times 2 \times 13 \times p \times q \times r \times (p + q) \times (q + r) \times (r + p)}{2 \times 2 \times 2 \times 13 \times p \times q \times (q + r) \times (r + p)} \\ &= \frac{1}{2}r(p + q) \end{aligned}$$

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

$$\begin{aligned} 20(y + 4)(y^2 + 5y + 3) \div 5(y + 4) &= \frac{2 \times 2 \times 5 \times (y + 4) \times (y^2 + 5y + 3)}{5 \times (y + 4)} \\ &= 4(y^2 + 5y + 3) \end{aligned}$$

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

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

Q5 :

Factorise the expressions and divide them as directed.

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

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

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

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

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

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

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

Answer :

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

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

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

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

$$(ii) \quad m^2 - 14m - 32 = m^2 + 2m - 16m - 32$$

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

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

$$(m^2 - 14m - 32) \div (m + 2) = \frac{(m+2)(m-16)}{(m+2)} = m - 16$$

$$(iii) \ 5p^2 - 25p + 20 = 5(p^2 - 5p + 4)$$

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

$$= 5[p(p - 1) - 4(p - 1)]$$

$$= 5(p - 1)(p - 4)$$

$$(5p^2 - 25p + 20) \div (p - 1) = \frac{5(p-1)(p-4)}{(p-1)} = 5(p - 4)$$

$$(iv) \ 4yz(z^2 + 6z - 16) = 4yz [z^2 - 2z + 8z - 16]$$

$$= 4yz [z(z - 2) + 8(z - 2)]$$

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

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

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

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

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

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

$$(vii) \ 39y^3(50y^2 - 98) = 3 \times 13 \times y \times y \times y \times 2[(25y^2 - 49)]$$

$$= 3 \times 13 \times 2 \times y \times y \times y \times [(5y)^2 - (7)^2]$$

$$= 3 \times 13 \times 2 \times y \times y \times y (5y - 7)(5y + 7)$$

$$26y^2(5y + 7) = 2 \times 13 \times y \times y \times (5y + 7)$$

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

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

$$= \frac{3y(5y + 7)(5y - 7)}{(5y + 7)}$$

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

Exercise 14.4 : Solutions of Questions on Page Number : 228

Q1 :

Find and correct the errors in the statement: $4(x - 5) = 4x - 5$

Answer :

$$\text{L.H.S.} = 4(x - 5) = 4 \times x - 4 \times 5 = 4x - 20 \neq \text{R.H.S.}$$

The correct statement is $4(x - 5) = 4x - 20$

Q2 :

Find and correct the errors in the statement: $x(3x + 2) = 3x^2 + 2$

Answer :

$$\text{L.H.S.} = x(3x + 2) = x \times 3x + x \times 2 = 3x^2 + 2x \neq \text{R.H.S.}$$

The correct statement is $x(3x + 2) = 3x^2 + 2x$

Q3 :

Find and correct the errors in the statement: $2x + 3y = 5xy$

Answer :

$$\text{L.H.S} = 2x + 3y \neq \text{R.H.S.}$$

The correct statement is $2x + 3y = 2x + 3y$

Q4 :

Find and correct the errors in the statement: $x + 2x + 3x = 5x$ Answer :

$$\text{L.H.S} = x + 2x + 3x = 1x + 2x + 3x = x(1 + 2 + 3) = 6x \neq \text{R.H.S.}$$

The correct statement is $x + 2x + 3x = 6x$

Q5 :

Find and correct the errors in the statement: $5y + 2y + y - 7y = 0$

Answer :

$$\text{L.H.S.} = 5y + 2y + y - 7y = 8y - 7y = y \neq \text{R.H.S}$$

The correct statement is $5y + 2y + y - 7y = y$

Q6 :

Find and correct the errors in the statement: $3x + 2x = 5x^2$

Answer :

$$\text{L.H.S.} = 3x + 2x = 5x \neq \text{R.H.S}$$

The correct statement is $3x + 2x = 5x$

Q7 :

Find and correct the errors in the statement: $(2x)^2 + 4(2x) + 7 = 2x^2 + 8x + 7$

Answer :

$$\text{L.H.S} = (2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7 \neq \text{R.H.S}$$

The correct statement is $(2x)^2 + 4(2x) + 7 = 4x^2 + 8x + 7$

Q8 :

Find and correct the errors in the statement: $(2x)^2 + 5x = 4x + 5x = 9x$

Answer :

$$\text{L.H.S} = (2x)^2 + 5x = 4x^2 + 5x \neq \text{R.H.S.}$$

The correct statement is $(2x)^2 + 5x = 4x^2 + 5x$

Q9 :

Find and correct the errors in the statement: $(3x + 2)^2 = 3x^2 + 6x + 4$

Answer :

$$\text{L.H.S.} = (3x + 2)^2 = (3x)^2 + 2(3x)(2) + (2)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= 9x^2 + 12x + 4 \neq \text{R.H.S}$$

The correct statement is $(3x + 2)^2 = 9x^2 + 12x + 4$

Q10 :

Find and correct the errors in the statement: $(y - 3)^2 = y^2 - 9$

Answer :

$$\text{L.H.S} = (y - 3)^2 = (y)^2 - 2(y)(3) + (3)^2 [(a - b)^2 = a^2 - 2ab + b^2]$$

$$= y^2 - 6y + 9 \neq \text{R.H.S}$$

The correct statement is $(y - 3)^2 = y^2 - 6y + 9$

Q11 :

Find and correct the errors in the statement: $(z + 5)^2 = z^2 + 25$

Answer :

$$\text{L.H.S} = (z + 5)^2 = (z)^2 + 2(z)(5) + (5)^2 [(a + b)^2 = a^2 + 2ab + b^2]$$

$$= z^2 + 10z + 25 \neq \text{R.H.S}$$

The correct statement is $(z + 5)^2 = z^2 + 10z + 25$

Q12 :

Find and correct the errors in the statement: $(2a + 3b)(a - b) = 2a^2 - 3b^2$

Answer :

$$\begin{aligned}\text{L.H.S.} &= (2a + 3b)(a - b) = 2a \times a + 3b \times a - 2a \times b - 3b \times b \\ &= 2a^2 + 3ab - 2ab - 3b^2 = 2a^2 + ab - 3b^2 \neq \text{R.H.S.}\end{aligned}$$

The correct statement is $(2a + 3b)(a - b) = 2a^2 + ab - 3b^2$

Q13 :

Find and correct the errors in the statement: $(a + 4)(a + 2) = a^2 + 8$

Answer :

$$\begin{aligned}\text{L.H.S.} &= (a + 4)(a + 2) = (a)^2 + (4 + 2)(a) + 4 \times 2 \\ &= a^2 + 6a + 8 \neq \text{R.H.S.}\end{aligned}$$

The correct statement is $(a + 4)(a + 2) = a^2 + 6a + 8$

Q14 :

Find and correct the errors in the statement: $(a - 4)(a - 2) = a^2 - 8$

Answer :

$$\begin{aligned}\text{L.H.S.} &= (a - 4)(a - 2) = (a)^2 + [(-4) + (-2)](a) + (-4)(-2) \\ &= a^2 - 6a + 8 \neq \text{R.H.S.}\end{aligned}$$

The correct statement is $(a - 4)(a - 2) = a^2 - 6a + 8$

Q15 :

Find and correct the errors in the statement: $\frac{3x^2}{3x^2} = 0$

Answer :

$$\text{L.H.S} = \frac{3x^2}{3x^2} = \frac{3 \times x \times x}{3 \times x \times x} = 1 \neq \text{R.H.S.}$$

The correct statement is $\frac{3x^2}{3x^2} = 1$

Q16 :

Find and correct the errors in the statement: $\frac{3x^2 + 1}{3x^2} = 1 + 1 = 2$

Answer :

$$\frac{3x^2 + 1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2} = 1 + \frac{1}{3x^2} \neq \text{R.H.S.}$$

The correct statement is $\frac{3x^2 + 1}{3x^2} = 1 + \frac{1}{3x^2}$

Q17 :

Find and correct the errors in the statement: $\frac{3x}{3x + 2} = \frac{1}{2}$

Answer :

$$\text{L.H.S} = \frac{3x}{3x+2} \neq \text{R.H.S.}$$

The correct statement is $\frac{3x}{3x+2} = \frac{3x}{3x+2}$

Q18 :

Find and correct the errors in the statement: $\frac{3}{4x+3} = \frac{1}{4x}$

Answer :

$$\text{L.H.S.} = \frac{3}{4x+3} \neq \text{R.H.S.}$$

The correct statement is $\frac{3}{4x+3} = \frac{3}{4x+3}$

Q19 :

Find and correct the errors in the statement: $\frac{4x+5}{4x} = 5$

Answer :

$$\text{L.H.S.} = \frac{4x+5}{4x} = \frac{4x}{4x} + \frac{5}{4x} = 1 + \frac{5}{4x} \neq \text{R.H.S}$$

The correct statement is $\frac{4x+5}{4x} = 1 + \frac{5}{4x}$

Q20 :

Find and correct the errors in the statement: $\frac{7x+5}{5} = 7x$

Answer :

$$\text{L.H.S.} = \frac{7x+5}{5} = \frac{7x}{5} + \frac{5}{5} = \frac{7x}{5} + 1 \neq \text{R.H.S.}$$

The correct statement is $\frac{7x+5}{5} = \frac{7x}{5} + 1$