Exercise 14.1

1. Find the common factors of the given terms.
(i) 12x, 36
(ii) 2y, 22xy
(iii) 14 pq, $28p^2q^2$
(iv) 2x, $3x^2$, 4
(v) 6 abc, $24ab^2$, $12a^2b$
(vi) 16 x^3, - $4x^2$, 32 x
(vii) 10 pq, 20qr, 30 rp
(viii) $3x^2y^3$, $10x^3y^2$, $6x^2y^2z$

Solution:

(i) Factors of 12x and 36
12x = 2×2×3×x
36 = 2×2×3×3
Common factors of 12x and 36 are 2, 2, 3
and , 2×2×3 = 12

(ii) Factors of 2y and 22xy
2y = 2×y
22xy = 2×11×x×y
Common factors of 2y and 22xy are 2, y
and ,2×y = 2y

(iii) Factors of 14pq and $28p^2q$
14pq = 2x7xpxq
$28p^2q$ = 2x2x7xpxpxq

Common factors of 14 pq and 28 p^2q are 2, 7 , p , q
and, 2x7xpxq = 14pq

(iv) Factors of 2x, $3x^2$and 4
2x = 2×x
$3x^2$= 3×x×x
4 = 2x2
Common factors of 2x, $3x^2$ and 4 is 1.

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

6abc = 2×3×a×b×c
$24ab^2$ = 2×2×2×3×a×b×b
12 a^2 b = 2×2×3×a×a×b

Common factors of 6 abc, $24ab^2$ and $12a^2b$ are 2, 3, a, b
and, 2×3×a×b = 6ab

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

$16x^3 = 2×2×2×2×x×x×x$
$-4x^2 = -1×2×2×x×x$
$32x = 2×2×2×2×2×x$
Common factors of $16x^3$, $-4x^2$ and 32x are 2,2, x
and, 2×2×x = 4x

(vii) Factors of 10 pq, 20qr and 30rp

10 pq = 2×5×p×q
20qr = 2×2×5×q×r
30rp= 2×3×5×r×p

Common factors of 10 pq, 20qr and 30rp are 2, 5
and, 2×5 = 10

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

$3x^2y^3 = 3×x×x×y×y×y$
$10x^3y^2 = 2×5×x×x×x×y×y$
$6x^2y^2z = 3×2×x×x×y×y×z$

Common factors of $3x^2y^3$, $10x^3y^2$ and $6x^2y^2z$ are x^2, y^2
and, $x^2×y^2 = x^2y^2$

2.Factorise the following expressions

(i) 7x–42
(ii) 6p–12q
(iii) $7a^2+ 14a$
(iv) $-16z+20z^3$
(v) $20l^2m+30alm$
(vi) $5x^2y-15xy^2$
(vii) $10a^2-15b^2+20c^2$
(viii) $-4a^2+4ab–4ca$
(ix) $x^2yz+xy^2z+xyz^2$
(x) ax^2y+bxy^2+cxyz

Solution:

$(i)\ 7x = 7 \times x$

$42 = 2 \times 3 \times 7$

The common factor is 7

$\therefore 7x - 42 = (7 \times x) - (2 \times 3 \times 7) = 7(x - 6)$

$(ii)\ 6p = 2 \times 3 \times p$

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

The common factors are 2 and 3

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

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

$= 6(p - 2q)$

$(iii)\ 7a^2 = 7 \times a \times a$

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

The common factors are 7 and a

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

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

$(iv)\ 16z = 2 \times 2 \times 2 \times 2 \times z$

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

The common factors are 2, 2, and z.

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

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

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

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

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

The common factors are 2, 5, l and m

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

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

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

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

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

The common factors are 5, x, and y

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

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

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

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

$10a^2 = 2\times5\times a\times a$

$-15b^2 = -1\times3\times5\times b\times b$

$20c^2 = 2\times2\times5\times c\times c$

Common factor of $10a^2$, $15b^2$ and $20c^2$ is 5

$10a^2-15b^2+20c^2 = 5(2a^2-3b^2+4c^2)$

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

$-4a^2 = -1\times2\times2\times a\times a$

$4ab = 2\times2\times a\times b$

$-4ca = -1\times2\times2\times c\times a$

Common factor of $-4a^2$, $4ab$, $-4ca$ are 2, 2, a i.e. 4a

So,

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

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

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

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

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

Common factor of x^2yz, xy^2z and xyz^2 are x, y, z i.e. xyz

Now, $x^2yz+xy^2z+xyz^2 = xyz(x+y+z)$

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

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

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

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

Common factors of a x^2y ,bxy^2 and cxyz are xy

Now, $ax^2y+bxy^2+cxyz = xy(ax+by+cz)$

3. Factorise.
(i) $x^2+xy+8x+8y$
(ii) 15xy–6x+5y–2
(iii) ax+bx–ay–by
(iv) 15pq+15+9q+25p
(v) z–7+7xy–xyz

Solution:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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1. 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) $a^4+2a^2b^2+b^4$

Solution:

(i) $a^2+8a+16$
$= a^2+2\times4\times a+4^2$
$= (a+4)^2$
Using identity: $(x+y)^2 = x^2+2xy+y^2$

(ii) $p^2-10p+25$
$= p^2-2\times5\times p+5^2$
$= (p-5)^2$
Using identity: $(x-y)^2 = x^2-2xy+y^2$

(iii) $25m^2+30m+9$
$= (5m)^2-2\times5m\times3+3^2$
$= (5m+3)^2$
Using identity: $(x+y)^2 = x^2+2xy+y^2$

(iv) $49y^2+84yz+36z^2$
$=(7y)^2+2\times7y\times6z+(6z)^2$
$= (7y+6z)^2$
Using identity: $(x+y)^2 = x^2+2xy+y^2$

(v) $4x^2-8x+4$
$= (2x)^2-2\times4x+2^2$
$= (2x-2)^2$
Using identity: $(x-y)^2 = x^2-2xy+y^2$

(vi) $121b^2-88bc+16c^2$
$= (11b)^2-2\times11b\times4c+(4c)^2$
$= (11b-4c)^2$
Using identity: $(x-y)^2 = x^2-2xy+y^2$

(vii) $(l+m)^2$-4lm (Hint: Expand $(l+m)^2$ first)
Expand $(l+m)^2$ using identity: $(x+y)^2 = x^2+2xy+y^2$
$(l+m)^2-4lm = l^2+m^2+2lm-4lm$
$= l^2+m^2-2lm$
$= (l-m)^2$
Using identity: $(x-y)^2 = x^2-2xy+y^2$

(viii) $a^4+2a^2b^2+b^4$
$= (a^2)^2+2\times a^{2\times}b^2+(b^2)^2$
$= (a^2+b^2)^2$
Using identity: $(x+y)^2 = x^2+2xy+y^2$

2. Factorise.
(i) $4p^2–9q^2$
(ii) $63a^2–112b^2$
(iii) $49x^2–36$
(iv) $16x^5–144x^3$ differ
(v) $(l+m)^2-(l-m)^2$
(vi) $9x^2y^2–16$
(vii) $(x^2–2xy+y^2)–z^2$
(viii) $25a^2–4b^2+28bc–49c^2$

Solution:
(i) $4p^2–9q^2$
$= (2p)^2-(3q)^2$
$= (2p-3q)(2p+3q)$
Using identity: $x^2-y^2 = (x+y)(x-y)$

(ii) $63a^2–112b^2$

$= 7(9a^2 –16b^2)$
$= 7((3a)^2–(4b)^2)$
$= 7(3a+4b)(3a-4b)$
Using identity: $x^2-y^2 = (x+y)(x-y)$

(iii) $49x^2–36$

$= (7a)^2 -6^2$

$= (7a+6)(7a–6)$
Using identity: $x^2-y^2 = (x+y)(x-y)$

(iv) $16x^5 – 144x^3$

$= 16x^3(x^2–9)$

$= 16x^3(x^2–9)$

$= 16x^3(x–3)(x+3)$
Using identity: $x^2-y^2 = (x+y)(x-y)$

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

$= \{(l+m)-(l–m)\}\{(l +m)+(l–m)\}$
Using Identity: $x^2-y^2 = (x+y)(x-y)$

$= (l+m–l+m)(l+m+l–m)$

$= (2m)(2l)$

$= 4\ ml$

(vi) $9x^2y^2–16$

$= (3xy)^2-4^2$

$= (3xy–4)(3xy+4)$
Using Identity: $x^2-y^2 = (x+y)(x-y)$

(vii) $(x^2–2xy+y^2)–z^2$

$= (x–y)^2–z^2$

Using Identity: $(x-y)^2 = x^2-2xy+y^2$

$= \{(x–y)–z\}\{(x–y)+z\}$

$= (x–y–z)(x–y+z)$
Using Identity: $x^2-y^2 = (x+y)(x-y)$

(viii) $25a^2–4b^2+28bc–49c^2$

$= 25a^2–(4b^2-28bc+49c^2)$
$= (5a)^2-\{(2b)^2-2(2b)(7c)+(7c)^2\}$
$= (5a)^2-(2b-7c)^2$

Using Identity: $x^2-y^2 = (x+y)(x-y)$, we have
$= (5a+2b-7c)(5a-2b-7c)$

3. Factorise the expressions.
(i) ax^2+bx
(ii) $7p^2+21q^2$
(iii) $2x^3+2xy^2+2xz^2$
(iv) $am^2+bm^2+bn^2+an^2$
(v) $(lm+l)+m+1$
(vi) $y(y+z)+9(y+z)$
(vii) $5y^2–20y–8z+2yz$
(viii) $10ab+4a+5b+2$
(ix)$6xy–4y+6–9x$

Solution:

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

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

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

(vii) $5y^2–20y–8z+2yz = 5y(y–4)+2z(y–4) = (y–4)(5y+2z)$

(viii) $10ab+4a+5b+2 = 5b(2a+1)+2(2a+1) = (2a+1)(5b+2)$

(ix) $6xy–4y+6–9x = 6xy–9x–4y+6 = 3x(2y–3)–2(2y–3) = (2y–3)(3x–2)$

4.Factorise.
(i) $a^4–b^4$
(ii) $p^4–81$
(iii) $x^4–(y+z)^4$
(iv) $x^4–(x–z)^4$
(v) $a^4–2a^2b^2+b^4$

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

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

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

5. Factorise the following expressions.

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

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

(iii) $p^2+6p–16$

Solution:

(i) p^2+6p+8

We observed that, 8 = 4×2 and 4+2 = 6

p^2+6p+8 can be written as $p^2+2p+4p+8$
Taking Common terms, we get

$p^2+6p+8 = p^2+2p+4p+8 = p(p+2)+4(p+2)$

Again p+2 is common in both the terms.

= (p+2)(p+4)

This implies: $p^2+6p+8 = (p+2)(p+4)$

(ii) $q^2–10q+21$
Observed that, 21 = -7×-3 and -7+(-3) = -10

$q^2–10q+21 = q^2–3q-7q+21$

= q(q–3)–7(q–3)

= (q–7)(q–3)

This implies $q^2–10q+21 = (q–7)(q–3)$

(iii) $p^2+6p–16$

We observed that, -16 = -2×8 and 8+(-2) = 6

$p^2+6p–16 = p^2–2p+8p–16$

= p(p–2)+8(p–2)

= (p+8)(p–2)

So, $p^2+6p–16 = (p+8)(p–2)$

Exercise 14.3

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

Solution:

(i) $28x^4 = 2\times2\times7\times x\times x\times x\times x$
$56x = 2\times2\times2\times7\times x$

$$28x^4 \div 56x = \frac{2\times2\times7\times x\times x\times x\times x}{2\times2\times2\times7\times x} = \frac{x^3}{2} = \frac{1}{2}x^3$$

$$\text{(ii) } -36y^3 \div 9y^2 = \frac{-2\times2\times3\times3\times y\times y\times y}{3\times3\times y\times y} = -4y$$

$$\text{(iii) } 66pq^2r^3 \div 11qr^2 = \frac{2\times3\times11\times p\times q\times q\times r\times r\times r}{11\times q\times r\times r} = 6pqr$$

$$\text{(iv) } 34x^3y^3z^3 \div 51xy^2z^3 = \frac{2\times17\times x\times x\times x\times y\times y\times y\times z\times z\times z}{3\times17\times x\times y\times y\times z\times z\times z} = \frac{2}{3}x^2y$$

$$\text{(v) } 12a^8b^8 \div (-6a^6b^4) = \frac{2\times2\times3\times a^8\times b^8}{-2\times3\times a^6\times b^4} = -2a^2b^4$$

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

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

(v) $(p^3q^6–p^6q^3) \div p^3q^3$

Solution:

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

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

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

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

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

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

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

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

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

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

3. Work out the following divisions.

(i) (10x–25) ÷ 5

(ii) (10x–25) ÷ (2x–5)

(iii) 10y(6y+21) ÷ 5(2y+7)

(iv) $9x^2y^2(3z–24) \div 27xy(z–8)$

(v) 96abc(3a–12)(5b–30) ÷ 144(a–4)(b–6)

Solution:

(i) $(10x–25) \div 5 = 5(2x-5)/5 = 2x-5$
(ii) $(10x–25) \div (2x–5) = 5(2x-5)/(2x-5) = 5$

(iii) $10y(6y+21) \div 5(2y+7) = 10y\times3(2y+7)/5(2y+7) = 6y$
(iv) $9x^2y^2(3z–24) \div 27xy(z–8) = 9x^2y^2\times3(z-8)/27xy(z-8) = xy$

(v) $96abc(3a –12)(5b–30) \div 144(a–4)(b – 6) = \frac{96\ abc \times 3(a-4) \times 5(b-6)}{144(a-4)(b-6)} = 10abc$

4. Divide as directed.

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

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

Solution:

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

$= 5(3x+5)$

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

$= 2y(x+5)$

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

$= \dfrac{2 \times 2 \times 13 \times p \times q \times r \times (p+q) \times (q+r) \times (r+p)}{2 \times 2 \times 2 \times 13 \times p \times q \times (q+r) \times (r+p)}$

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

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

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

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

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

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

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

Solution:

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

First solve for equation, $(y^2+7y+10)$
$(y^2+7y+10) = y^2+2y+5y+10 = y(y+2)+5(y+2) = (y+2)(y+5)$

Now, $(y^2+7y+10)\div(y+5) = (y+2)(y+5)/(y+5) = y+2$

(ii) **$(m^2–14m–32)\div (m+2)$**

Solve for $m^2–14m–32$, we have

$m^2–14m–32 = m^2+2m-16m–32 = m(m+2)–16(m+2) = (m–16)(m+2)$

Now, $(m^2–14m–32)\div(m+2) = (m–16)(m+2)/(m+2) = m-16$

(iii) $(5p^2–25p+20)\div(p–1)$

Step 1: Take 5 common from the equation, $5p^2–25p+20$, we get

$5p^2–25p+20 = 5(p^2–5p+4)$

Step 2: Factorize $p^2–5p+4$

$p^2–5p+4 = p^2–p-4p+4 = (p–1)(p–4)$

Step 3: Solve original equation

$(5p^2–25p+20)\div(p–1) = 5(p–1)(p–4)/(p-1) = 5(p–4)$

(iv) $4yz(z^2 + 6z–16)\div 2y(z+8)$

Factorize $z^2+6z–16$,

$z^2+6z–16 = z^2-2z+8z–16 = (z–2)(z+8)$

Now, $4yz(z^2+6z–16) \div 2y(z+8) = 4yz(z–2)(z+8)/2y(z+8) = 2z(z-2)$

(v) $5pq(p^2–q^2) \div 2p(p+q)$

$p^2–q^2$ can be written as (p–q)(p+q) using identity.

$5pq(p^2–q^2) \div 2p(p+q) = 5pq(p–q)(p+q)/2p(p+q) = 5/2q(p–q)$

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

Factorize $9x^2–16y^2$, we have

$9x^2–16y^2 = (3x)^2–(4y)^2 = (3x+4y)(3x-4y)$ using identity: $p^2–q^2 = (p–q)(p+q)$

Now, $12xy(9x^2–16y^2) \div 4xy(3x+4y) = 12xy(3x+4y)(3x-4y) /4xy(3x+4y) = 3(3x-4y)$

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

First solve for $50y^2–98$, we have

$50y^2–98 = 2(25y^2–49) = 2((5y)^2–7^2) = 2(5y–7)(5y+7)$

Now, $39y^3(50y^2–98) \div 26y^2(5y+7) =$

$$\frac{3 \times 13 \times y^3 \times 2(5y-7)(5y+7)}{2 \times 13 \times y^2 (5y+7)} = 3y(5y – 7)$$

Exercise 14.4 Page No: 228

Find and correct the errors in the following mathematical statements.

1. **$4(x–5) = 4x–5$**

Solution:
$4(x- 5)= 4x – 20 \neq 4x – 5$ = RHS

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

2. **$x(3x+2) = 3x^2+2$**

Solution:

LHS = $x(3x+2) = 3x^2+2x \neq 3x^2+2$ = RHS

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

3. **$2x+3y = 5xy$**

Solution:

LHS= $2x+3y \neq$ R. H. S

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

4. **$x+2x+3x = 5x$**

Solution:

LHS = $x+2x+3x = 6x \neq$ RHS

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

5. **$5y+2y+y–7y = 0$**

Solution:

LHS = $5y+2y+y–7y = y \neq$ RHS

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

6. $3x+2x = 5x^2$

Solution:
LHS = $3x+2x = 5x \neq$ RHS

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

7. $(2x)^2+4(2x)+7 = 2x^2+8x+7$
Solution:
LHS = $(2x)^2+4(2x)+7 = 4x^2+8x+7 \neq$ RHS

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

8. $(2x)^2+5x = 4x+5x = 9x$
Solution:
LHS = $(2x)^2+5x = 4x^2+5x \neq 9x$ = RHS

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

9. $(3x + 2)^2 = 3x^2+6x+4$
Solution:
LHS = $(3x+2)^2 = (3x)^2+2^2+2x2x3x = 9x^2+4+12x \neq$ RHS

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

10. Substituting $x = -3$ in
(a) $x^2 + 5x + 4$ gives $(-3)^2+5(-3)+4 = 9+2+4 = 15$
(b) $x^2 - 5x + 4$ gives $(-3)^2-5(-3)+4 = 9-15+4 = -2$
(c) $x^2 + 5x$ gives $(-3)^2+5(-3) = -9-15 = -24$

Solution:
(a) Substituting $x = -3$ in x^2+5x+4, we have

$x^2+5x+4 = (-3)^2+5(-3)+4 = 9-15+4 = -2$. This is the correct answer.

(b) Substituting $x = -3$ in x^2-5x+4

$x^2-5x+4 = (-3)^2-5(-3)+4 = 9+15+4 = 28$. This is the correct answer

(c)Substituting $x = -3$ in x^2+5x

$x^2+5x = (-3)^2+5(-3) = 9-15 = -6$. This is the correct answer

11.$(y–3)^2 = y^2–9$

Solution:

LHS = $(y–3)^2$, which is similar to $(a–b)^2$ identity, where $(a–b)^2 = a^2+b^2-2ab$.

$(y – 3)^2 = y^2+(3)^2–2y×3 = y^2+9 –6y \neq y^2 – 9$ = RHS

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

12. $(z+5)^2 = z^2+25$

Solution:

LHS = $(z+5)^2$, which is similar to $(a +b)^2$ identity, where $(a+b)^2 = a^2+b^2+2ab$.

$(z+5)^2 = z^2+5^2+2×5×z = z^2+25+10z \neq z^2+25$ = RHS

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

13. $(2a+3b)(a–b) = 2a^2–3b^2$

Solution:
LHS = $(2a+3b)(a–b) = 2a(a–b)+3b(a–b)$
$= 2a^2–2ab+3ab–3b^2$
$= 2a^2+ab–3b^2$
$\neq 2a^2–3b^2$ = RHS

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

14. $(a+4)(a+2) = a^2+8$

Solution:

LHS = $(a+4)(a+2) = a(a+2)+4(a+2)$
$= a^2+2a+4a+8$
$= a^2+6a+8$
$\neq a^2+8$ = RHS

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

15. $(a–4)(a–2) = a^2–8$

Solution:

LHS = $(a–4)(a–2) = a(a–2)–4(a–2)$
$= a^2–2a–4a+8$
$= a^2–6a+8$
$\neq a^2-8$ = RHS

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

16. $3x^2/3x^2 = 0$

Solution:

LHS = $3x^2/3x^2 = 1 \neq 0$ = RHS

The correct statement is $3x^2/3x^2 = 1$

17. $(3x^2+1)/3x^2 = 1 + 1 = 2$

Solution:

LHS = $(3x^2+1)/3x^2 = (3x^2/3x^2)+(1/3x^2) = 1+(1/3x^2) \neq 2$ = RHS

The correct statement is $(3x^2+1)/3x^2 = 1+(1/3x^2)$

18. $3x/(3x+2) = ½$
Solution:
LHS = $3x/(3x+2) \neq 1/2$ = RHS

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

19. $3/(4x+3) = 1/4x$

Solution:

LHS = $3/(4x+3) \neq 1/4x$

The correct statement is $3/(4x+3) = 3/(4x+3)$

20. $(4x+5)/4x = 5$

Solution:

LHS = (4x+5)/4x = 4x/4x + 5/4x = 1 + 5/4x ≠ 5 = RHS

The correct statement is (4x+5)/4x = 1 + (5/4x)

21. $\frac{7x+5}{5} = 7x$

Solution:

LHS = (7x+5)/5 = (7x/5)+ 5/5 = (7x/5)+1 ≠ 7x = RHS

The correct statement is (7x+5)/5 = (7x/5) +1