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NCERT Solution For Class 8 Maths Chapter 14 Factorisation

Exercise 14.1 Page No: 208

1. Find the common factors of the given terms.

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

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 x y
22xy = 2 × 11 × x × y
Common factors of 2y and 22xy are 2, y
and , 2 x y = 2y

(iii) Factors of 14 pq and 28 p^2 q

14 pq = 2 x 7 x p x q
28 p^2 q = 2 x 2 x 7 x p x p x q

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

(iv) Factors of 2x, 3x^2 and 4

2x = 2 × x
3x^2 = 3 × x × x
4 = 2 x 2
Common factors of 2x, 3x^2 and 4 is 1.

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

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$6\,abc = 2 \times 3 \times a \times b \times c$
$24ab^2 = 2 \times 2 \times 2 \times 3 \times a \times b \times b$
$12\,a^2 b = 2 \times 2 \times 3 \times a \times a \times b$

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

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

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

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

$10\,pq = 2 \times 5 \times p \times q$
$20qr = 2 \times 2 \times 5 \times q \times r$
$30\,rp = 2 \times 3 \times 5 \times r \times p$

Common factors of 10 pq, 20qr and 30 rp are 2, 5 and,
$2 \times 5 = 10$

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

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

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

2. Factorise the following expressions

(i) $7x - 42$
(ii) $6p - 12q$
(iii) $7a^2 + 14a$
(iv) $-16\,z + 20\,z^3$

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(v) $20 l^2 m + 30 a l m$
(vi) $5 x^2 y - 15 xy^2$
(vii) $10 a^2 - 15 b^2 + 20 c^2$
(viii) $-4 a^2 + 4 ab - 4 ca$
(ix) $x^2 y z + x y^2 z + x y z^2$
(x) $a x^2 y + b x y^2 + c x y z$

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.

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

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

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

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

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

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) $10\,a^2 - 15\,b^2 + 20\,c^2$

$10\,a^2 = 2 \times 5 \times a \times a$

$-15\,b^2 = -1 \times 3 \times 5 \times b \times b$

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

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

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

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

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

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

$-4\,ca = -1 \times 2 \times 2 \times c \times a$

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

So,

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

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

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

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

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

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Common factor of $x^2 y z$, $x y^2 z$ and $x y z^2$ are x, y, z i.e. xyz Now, $x^2 y z + x y^2 z + x y z^2 = xyz (x + y + z)$

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

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

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

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

Common factors of $a x^2 y$, $b x y^2$ and $c x y z$ are xy

Now, $a x^2 y + b x y^2 + c x y z = xy (ax + by + cz)$

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

Solution:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Exercise 14.2 Page No: 223

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) $a^2 + 8a + 16$

$= a^2 + 2 \times 4 \times a + 4^2$

$= (a + 4)^2$

$Using\ identity: (x + y)^2 = x^2 + 2xy + y^2$

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

$= p^2 - 2 \times 5 \times p + 5^2$

$= (p - 5)^2$

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

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

$= (5m)^2 - 2 \times 5m \times 3 + 3^2$

$= (5m + 3)^2$

$Using\ identity: (x + y)^2 = x^2 + 2xy + y^2$

(iv) $49y^2 + 84yz + 36z^2$

$= (7y)^2 + 2 \times 7y \times 6z + (6z)^2$

$= (7y + 6z)^2$

$Using\ identity: (x + y)^2 = x^2 + 2xy + y^2$

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

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

$= (2x - 2)^2$

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

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

$= (11b)^2 - 2 \times 11b \times 4c + (4c)^2$

$= (11b - 4c)^2$

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

(vii) $(l + m)^2 - 4lm$ (Hint: first)

Expand $(l + m)^2$

Expand $(l + m)$ $using\ identity: (x + y)^2 = x^2 + 2xy + y^2$

$(l + m)^2 - 4lm = l^2 + m^2 + 2ml - 4lml$

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

$= (l - m)^2$

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

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(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) $9x^2 y^2 – 16$
(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) $63a^2 – 112b^2$

$= 7(9\ a^2 – 16b^2\ )$
$= 7\ (\ (3a)^2 – (4b)^2\ )$
$= 7\ (3a + 4b)(\ 3a - 4b)$

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

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(iii) $49x^2 - 36$

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

$= (7a + 6)(7a - 6)$

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

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

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

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

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

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

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

$= (3xy - 4) (3xy + 4)$

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

$= \{(x - y) - z\}\{(x - y) + z\}$

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= (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)

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(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) $x^4-(x-z)^4=(x^2)^2-\{(x-2)^2\}^2$

$=\{x^2-(x-z)^2\}\{x^2+(x-z)^2\}$

$=\{x-(x-z)\}\{x+(x-z)\}\{x^2+(x-z)^2\}$

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

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

(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, $8 = 4 \times 2$ 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, $21 = -7 \times -3$ and $-7 + (-3) = -10$

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

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= 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, $16 = -2 \times 8$ and $8 + (-2) = 6$

$p^2 + 6p – 16 = p^2 – 2p + 8p – 16$

= p (p – 2) + 8(p – 2)

= (p + 8) (p – 2)

So, $p^2 + 6p – 16 = (p + 8) (p – 2)$

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Exercise 14.3 Page No: 227

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)

$28x^4 = 2 \times 2 \times 7 \times x \times x \times x \times x$

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

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

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

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

(iv) $34x^3y^3z^3 \div 51xy^2z^3 = \frac{2 \times 17 \times x \times x \times x \times y \times y \times y \times z \times z \times z}{3 \times 17 \times x \times y \times y \times z \times z \times z} = 2/3\ x^2\ y$

(v)

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

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) $8(x_3\,y_2\,z_2 + x_2\,y_3\,z_2 + x_2\,y_2\,z_3) \div 4x_2\,y_2\,z_2$

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

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

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

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(ii) (10x – 25) ÷ (2x – 5)

(iii) 10y(6y + 21) ÷ 5(2y + 7)

(iv) $9x^2y^2(3z – 24) ÷ 27xy(z – 8)$

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

Solution:

(i) $(10x – 25) ÷ 5 = \frac{5(2x-5)}{5} = 2x - 5$

(ii) $(10x – 25) ÷ (2x – 5) = \frac{5(2x-5)}{2x-5} = 5$

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

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

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

4. Divide as directed.

(i) 5(2x + 1) (3x + 5) ÷ (2x + 1)

(ii) 26xy(x + 5)(y – 4) ÷ 13x(y – 4)

(iii) 52pqr (p + q) (q + r) (r + p) ÷ 104pq(q + r) (r + p)

(iv) 20(y + 4) (y2 + 5y + 3) ÷ 5(y + 4)

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(v) x(x + 1) (x + 2) (x + 3) ÷ x(x + 1)

Solution:

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

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

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

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

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

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

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

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

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

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

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

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

5. Factorise the expressions and divide them as directed.

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

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(ii) $(m^2 – 14m – 32) ÷ (m + 2)$

(iii) $(5p^2 – 25p + 20) ÷ (p – 1)$

(iv) $4yz(z^2 + 6z – 16) ÷ 2y(z + 8)$

(v) $5pq(p^2 – q^2) ÷ 2p(p + q)$

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

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

Solution:

(i) $(y^2 + 7y + 10) ÷ (y + 5)$

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, $(y^2 + 7y + 10) ÷ (y + 5) = (y + 2)(y + 5) / (y + 5) = y + 2$

(ii) $(m^2 – 14m – 32) ÷ (m + 2)$

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

(iii) $(5p^2 – 25p + 20) ÷ (p – 1)$

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 $p^2 – 5p + 4$

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$p^2 – 5p + 4 = p^2 – p - 4p + 4 = (p – 1) (p – 4)$

Step 3: Solve original equation

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

(iv) $4yz(z^2 + 6z – 16) ÷ 2y(z + 8)$

Factorize $z^2 + 6z – 16$,

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

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

(v) $5pq(p^2 – q^2) ÷ 2p(p + q)$

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

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

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

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

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

First solve for $50y^2 – 98$, we have

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

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Now, $39y^3(50y^2 - 98) \div 26y^2(5y + 7) = \frac{3 \times 13 \times y^3 \times 2(5y - 7)(5y + 7)}{2 \times 13 \times y^2(5y+7)} = 3y(5y - 7)$

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

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3. 2x + 3y = 5xy

Solution:

LHS = 2x + 3y ≠ R. H. S

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

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

Solution:

LHS = x + 2x + 3x = 6x ≠ RHS

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

5. 5y + 2y + y – 7y = 0

Solution:

LHS = 5y + 2y + y – 7y = y ≠ RHS

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

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

Solution:
LHS = 3x + 2x = 5x ≠ RHS

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

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

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

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

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

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

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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 $(a – b)^2 = a^2 + b^2 - 2ab$.

$(y – 3)^2 = y^2 + (3)^2 – 2y \times 3 = y^2 + 9 – 6y \neq y^2 – 9$ = 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 $(a + b)^2 = a^2 + b^2 + 2ab$.

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

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

13. $(2a + 3b) (a – b) = 2a^2 – 3b^2$

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Solution:

LHS = (2a + 3b) (a – b) = 2a (a – b) + 3b (a – b)
= $2a^2 – 2ab + 3ab – 3b^2$
= $2a^2 + ab – 3b^2$
≠ $2a^2 – 3b^2$ = 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)
= $a^2 + 2a + 4a + 8$
= $a^2 + 6a + 8$
≠ 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)
= $a^2 – 2a – 4a + 8$
= $a^2 – 6a + 8$
≠ a^2 - 8 = RHS

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

16. $\frac{3x^2}{3x^2}$ **= 0**

Solution:

LHS = $\frac{3x^2}{3x^2} = 1 \neq$ 0 = RHS

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

17. $\frac{3x^2+1}{3x^2}$ **= 1 + 1 = 2**

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Solution:

LHS = $\frac{3x^2+1}{3x^2} = \frac{3x^2}{3x^2} + \frac{1}{3x^2}$ = 1 + $\frac{1}{3x^2}$ ≠ 2 = RHS

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

18. $\frac{3x}{3x+2} = \frac{1}{2}$

Solution:

LHS = $\frac{3x}{3x+2}$ ≠ 1/2 = RHS

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

19. $\frac{3}{4x+3} = \frac{1}{4x}$

Solution:

LHS = $\frac{3}{4x+3}$ ≠ $\frac{1}{4x}$

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

20. $\frac{4x+5}{4x}$ **= 5**

Solution:

LHS = $\frac{4x+5}{4x}$ = 4x/4x + 5/4x = 1 + $\frac{5}{4x}$ ≠5 = RHS

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

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

Solution:

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LHS = $\frac{7x+5}{5}$ = 7x/5 + 5/5 = $\frac{7x}{5} + 1 \neq 7x$ = RHS

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