CBSE NCERT Solutions for Class 8 Mathematics Chapter 14

Back of Chapter Questions

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

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

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

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

Solution:

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

2	12
2	6
3	3
	1

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

$36 \Rightarrow$

2	36
2	18
3	9
3	3
	1

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

Thus,

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

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

So, the common factors are 2, 2 and 3

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

(ii) $2y, 22xy$

$2y = 2 \times y$

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

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

So, the common factors are 2 and y

And$2 \times y = 2y$

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

$14pq = 14 \times p \times q$

2	14
7	7
	1

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

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

2	28
2	14
7	7
	1

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

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

So,$14pq = 2 \times 7 \times p \times q$

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

$\therefore$ the common factor are 2, 7, p and q

And $2 \times 7 \times p \times q = 14 \times pq$

$= 14pq$

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

$2x = 2 \times x$

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

$= 3 \times x \times x$

$4 = 2 \times 2$

There is no common factor visible.

$\therefore$ 1 is the only common factor of the given terms.

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

$6abc = 6 \times abc$

$= 2 \times 3 \times abc$

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

$24ab^2 = 24 \times ab^2$

2	24
2	12
2	6
3	3
	1

$= 2 \times 2 \times 2 \times 3 \times ab^2$

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

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

2	12
2	6
3	3
	1

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

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

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

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

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

$\therefore$ the common factor are 2, 3, a and b

And $2 \times 3 \times a \times b = 6 \times ab$

$= 6\ ab$

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

$16x^3 = 16 \times x^3$

2	16
2	8
2	4
2	2
	1

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

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

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

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

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

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

$32x = 32 \times x$

2	32
2	16
2	8
2	4
2	2
	1

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

So, $16x^3 = 2 \times 2 \times 2 \times 2 \times x \times x \times x$

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

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

$\therefore$ the common factors are 2, 2 and x

And $2 \times 2 \times x = 4 \times x$

$= 4x$

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

$10pq = 10 \times pq$

$= 2 \times 5 \times pq$

$= 2 \times 5 \times p \times q$

$20qr = 20 \times qr$

2	20
2	10
5	5
	1

$= 2 \times 2 \times 5 \times qr$

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

$30rp = 30 \times rp$

2	30
3	15
5	5
	1

$= 2 \times 3 \times 5 \times rp$

$= 2 \times 2 \times 5 \times r \times p$

So,$10pq = 2 \times 5 \times p \times q$

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

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

$\therefore$ the common factors are 2 and 5

And$2 \times 5 = 10$

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

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

$= 3 \times x \times x \times y \times y \times y$

$10x^3y^2 = 10 \times x^3 \times y^2$

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

$= 2 \times 5 \times x \times x \times x \times y \times y$

$6x^2y^2z = 6 \times x^2 \times y^2 \times z$

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

$= 2 \times 3 \times x \times x \times y \times y \times z$

So,$3x^2y^3 = 2 \times x \times x \times y \times y \times y$

$10x^3y^2 = 2 \times 5 \times x \times x \times x \times y \times y$

$6x^2y^2z = 2 \times 3 \times x \times x \times y \times y \times z$

$\therefore$ the common factors are x, x, y and y

And$x \times x \times y \times y = (x \times x) \times (y \times y)$

$= x^2 \times y^2$

$= x^2y^2$

2. Factorise the following expressions.

(i) $7x - 42$

(ii) $6p - 12q$

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

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

(v) $20l^2m + 30\ a/m$

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

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

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

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

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

Solution:

(i) $7x - 42$

Method 1:

$7x = 7 \times x$

$42 = 2 \times 3 \times 7$

2	42
3	21
7	7
	1

7 is the only common factor.

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

$= 7\left(x - (2 \times 3)\right)$

$= 7(x - 6)$

Method 2:

$7x - 42$

$7x - 42$

$= (7 \times x) - (7 \times 6)$

$= 7(x - 6)$ (taking 7 as common)

(ii) $6p - 12q$

Method 1:

$6p = 6 \times p$

$= 2 \times 3 \times p$

$12q = 12 \times q$

2	12
2	6
3	3
	1

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

So, the common factors are 2 and 3.

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

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

$= 6(p - 2q)$

Method 2:

$6p - 12q$

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

$= 6(p - 2q)$(taking 6 as common)

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

Method 1:

$7a^2 = 7 \times a^2 = 7 \times a \times a$

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

So, the common factors are 7 and a

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

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

$= 7a(a + 2)$

Method 2:

$7a^2 + 14a$

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

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

$= 7a(a + 2)$(taking $7a$ common)

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

Method 1:

$-16z = -16 \times z$

$= -1 \times 2 \times 2 \times 2 \times 2 \times z$

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

2	20
2	10
5	5
	1

$= 2 \times 2 \times 5 \times z \times z \times z$

So, the common factors are 2, 2 and z

$-16z + 20z^3$

$= (-1 \times 2 \times 2 \times 2 \times 2 \times z) + (2 \times 2 \times 5 \times z \times z \times z)$

Taking $2 \times 2 \times z$ common,

$= 2 \times 2 \times z\big((-1 \times 2 \times 2) + (5 \times z \times z)\big)$

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

Method 2:

$-16z + 20z^3$

$= (4 \times -4)z + (4 \times 5)z^3$

$= 4z(-4 + 5z^2)$(taking 4z as common)

(v) $20l^2m + 30\ a/m$

Method 1:

$20\ l^2\ m = 20 \times l^2 \times m$

2	20
2	10
5	5
	1

$= 2 \times 2 \times 5 \times \mathrm{l} \times \mathrm{l} \times m$

$30 \text{ alm} = 30 \times a \times \mathrm{l} \times m$

2	30
3	15
5	5
	1

$= 2 \times 3 \times 5 \times a \times \mathrm{l} \times m$

So, $20l^2\mathrm{m} = 2 \times 2 \times 5 \times \mathrm{l} \times \mathrm{l} \times \mathrm{m}$

$30 \text{ alm} = 2 \times 3 \times 5 \times \mathrm{a} \times \mathrm{l} \times \mathrm{m}$

So, $2, 5, \mathrm{l}$ and m are the common factors.

Now,

$20l^2\mathrm{m} + 30 \text{ alm} = (2 \times 2 \times 5 \times \mathrm{l} \times \mathrm{l} \times \mathrm{m}) + (2 \times 3 \times 5 \times \mathrm{a} \times \mathrm{l} \times \mathrm{m})$

Taking $2 \times 5 \times \mathrm{l} \times \mathrm{m}$ common

$= 2 \times 5 \times \mathrm{l} \times \mathrm{m}\, [(2 \times 1) + (3 \times a)]$

$= 10\mathrm{lm}(2\mathrm{l} + 3\mathrm{a})$

Method 2:

$20\, l^2\, m + 30 \text{ alm}$

$= (10 \times 2)l \times l \times m + (10 \times 3)\, \mathrm{a} \times \mathrm{l} \times \mathrm{m}$

Taking $10 \times \mathrm{l} \times \mathrm{m}$ as common,

$= 10 \times \mathrm{l} \times \mathrm{m}(2\mathrm{l} + 3a)$

$= 10\mathrm{lm}(2\mathrm{l} + 3a)$

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

Method 1:

$5x^2y = 5 \times x \times x \times y$

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

$= 3 \times 5 \times x \times y \times y$

So, 5, x and y are the common factors.

Now,

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

Taking $5 \times x \times y$ common

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

$= 5xy(x - 3y)$

Method 2:

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

Taking 5 as common

$= 5(x^2y - 3xy^2)$

$= 5\big((xy \times x) - (xy \times 3y)\big)$

Taking xy as common

$= 5xy(x - 3y)$

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

Method 1:

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

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

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

So, 5 is the common factor.

$10a^2 - 15b^2 + 20c^2$

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

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

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

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

Method 2:

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

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

Taking 5 common,

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

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

Method 1:

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

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

$= -1 \times 2 \times 2 \times a \times a$

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

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

So, $2, 2$ and a are the common factors.

$-4a^2 + 4ab - 4ca$

$= (-1 \times 2 \times 2 \times a \times a) + (2 \times 2 \times a \times b) - (2 \times 2 \times c \times a)$

$= 2 \times 2 \times a \times \left((-1 \times a) + b - c\right)$

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

Method 2:

$-4a^2 + 4ab - 4\ ca$

Taking 4 common,

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

$= 4\left((-a \times a) + (a \times b) - (c \times a)\right)$

Taking a common,

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

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

Method 1:

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

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

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

So, x, y and z are the common factors.

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

Taking $x \times y \times z$ common,

$= x \times y \times z(x + y + z)$

$= xyz(x + y + z)$

Method 2:

$x^2yz + xy^2z + xyz^2$

$= (x \times xyz) + (y \times xyz) + (z \times xyz)$

Taking xyz common,

$= xyz(x + y + z)$

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

Method 1:

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

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

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

So, x and y are the common factors.

$ax^2y + bxy^2 + cxyz$

$= (a \times x \times x \times y) + (b \times x \times y \times y) + (c \times x \times y \times z)$

$= x \times y(a \times x) + (b \times y) + (c \times z)$

$= xy(ax + by + cz)$

Method 2:

$ax^2y + bxy^2 + cxyz$

$= (x \times axy) + (x \times by^2) + (x \times cyz)$

Taking x common,

$= x(axy + by^2 + cyz)$

$= x\big((ax \times y) + (by \times y) + (cz \times y)\big)$

Taking y common,

$= x \times y(ax + by + cz)$

$= xy(ax + by + cz)$

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) $x^2 + xy + 8x + 8y$

$= \underbrace{(x^2 + xy)}_{\text{Both have x as common factor}} + \underbrace{(8x + 8y)}_{\text{Both have 8 as common factor}}$

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

Taking $(x + y)$ common

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

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

$15xy - 6x + 5y - 2$

$= \underbrace{(15xy - 6x)}_{\text{Both have 3 and } x \text{ as common factor}} + \underbrace{(5y - 2)}_{\text{Since nothing is common, we take 1 common}}$

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

Taking $(5y - 2)$ common

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

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

$ax + bx - ay - by$

$\underbrace{(ax + bx)}_{\text{Both have x as common factor}} - \underbrace{(ay - by)}_{\text{Both have y as common factor}}$

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

Taking $(a + b)$ common

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

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

$15pq + 15 + 9q + 25p$

$= \underbrace{(15pq + 25p)}_{\text{Both have 5 and p as common factor}} + \underbrace{(15 + 9q)}_{\text{Both have 3 as common factor}}$

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

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

Taking $(3q + 5)$ Common,

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

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

$z - 7 + 7xy - xyz$

$(z - 7) + \underbrace{(7xy - xyz)}_{\substack{\text{Both have } x \\ \text{and } y \text{ as} \\ \text{common factor}}}$

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

$= (z - 7) + xy \times -(z - 7)$ $\big($As $(7 - z) = -(z - 7)\big)$

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

Taking $(z - 7)$ common

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

Exercise 14.2

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) $a^2 + 8a + 16$

$= a^2 + 8a + 4^2$

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

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

Using $(x + y)^2 = x^2 + y^2 + 2xy$

Here, $x = a$ and $y = 4$

$= (a + 4)^2$

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

$p^2 - 10p + 25$

$= p^2 - 10p + 5^2$

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

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

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

Here, $a = p$ and $b = 5$

$= (p - 5)^2$

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

$25m^2 + 30m + 9$

$= (5m)^2 + 30m + 3^2$

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

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

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

Here, $a = 5m$ and $b = 3$

$= (5m + 3)^2$

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

$49y^2 + 84yz + 36z^2$

$= (7y)^2 + 84yz + (6z)^2$

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

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

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

Here, $a = 7y$ and $b = 6z$

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

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

$4x^2 - 8x + 4$

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

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

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

Here, $a = 2x$ and $b = 2$

$= (2x - 2)^2$

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

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

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

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

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

Here, $x = 11b$ and $y = 4c$

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

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

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

Here, $a = l$ and $b = m$

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

$= l^2 + m^2 + 2lm(1 - 2)$

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

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

Here, $a = l$ and $b = m$

$= (l - m)^2$

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

$a^4 + 2a^2b^2 + b^4$

Using $(a^m)^n = a^{m \times n}$

$\therefore (a^2)^2 = a^{2 \times 2} = a^4$

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

$= (a^2)^2 + 2(a^2 \times b^2) + (b^2)^2$

$= (a^2)^2 + (b^2)^2 + 2(a^2 \times b^2)$

Using $(x + y)^2 = x^2 + y^2 + 2xy$

Here, $x = a^2$ and $y = b^2$

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

2. Factorise

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

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

(iii) $49x^2 - 36$

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

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

$= (2p)^2 - (3q)^2$

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

Here $a = 2p$ and $b = 3q$

$= (2p + 3q)(2p - 3q)$

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

$63a^2 - 112b^2$

$= (7 \times 9)a^2 - (7 \times 16)b^2$

Taking 7 common,

$= 7(9a^2 - 16b^2)$

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

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

Here $x = 3a$ and $y = 4b$

$= 7(3a + 4b)(3a - 4b)$

(iii) $49x^2 - 36$

$49x^2 - 36$

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

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

Here $a = 7x$ and $b = 6$

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

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

$16x^5 - 144x^3$

$= 16x^2x^3 - 144x^3$

Taking x^3 common,

$= x^3(16x^2 - 144)$

$= x^3((4x)^2 - (12)^2)$

Using $a^2 - b^2 = (a + b)(a - b)$ Here $a = 4x$ and $b = 12$

$= x^3(4x + 12)(4x - 12)$

$= x^3 \underbrace{(4x + 12) \quad (4x - 12)}_{\text{Both have 4 as common factor}}$

$= x^3 \times 4(x + 3) \times 4(x - 3)$

$= x^3 \times 4 \times 4 \times (x + 3)(x - 3)$

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

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

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

Using $a^2 - b^2 = (a + b)(a - b)$ Here $a = (l + m)$ and $b = (l - m)$

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

$= [l + m + l - m][l + m - l + m]$

$= (2l)(2m)$

$= 2 \times 2 \times l \times m$

$= 4lm$

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

$9x^2y^2 - 16$

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

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

Here $a = 3xy$ and $b = 4$

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

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

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

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

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

Here $a = x$ and $b = y$

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

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

Here $a = x - y$ and $b = z$

$= (x - y + z)(x - y - z)$

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

$25a^2 - \underbrace{4b^2 + 28bc - 49c^2}_{\text{Taking–common}}$

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

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

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

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

Here $x = 2b$ and $y = 7c$

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

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

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

Here $x = 5a$ and $y = 2b - 7c$

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

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

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) $ax^2 + bx$

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

$bx = b \times x$

So, x is a common factor.

Taking x common,

$= x\big((a \times x) + b\big)$

$= x(ax + b)$

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

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

$21q^2 = 21 \times q^2 = 3 \times 7 \times q \times q$

So, 7 is the only common factor.

Taking 7 common,

$= 7 \times \big((p \times p) + (3 \times q \times q)\big)$

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

$= 7(p^2 + 3q^2)$

Method 1:

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

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

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

$2xz^2 = 2 \times x \times z^2 = 2 \times x \times z \times z$

So, 2 and x are the common factors.

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

Taking $2 \times x$ common,

$= 2 \times x\big((x \times x) + (y \times y) + (z \times z)\big)$

$= 2x\ (x^2 + y^2 + z^2)$

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

$\underbrace{(am^2 + bm^2)}_{\substack{Both\ have\ m^2\ as \\ common\ factor}} + \underbrace{(bn^2 + an^2)}_{\substack{Both\ have\ n^2\ as \\ common\ factor}}$

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

Taking $(a + b)$ common,

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

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

$(lm + l) + m + 1$

Taking l common,

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

Taking $(m + 1)$ common,

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

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

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

Taking $(y + z)$ common,

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

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

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

$= \underbrace{(5y^2 - 20y)}_{\substack{\text{Both have 5 only } y \\ \text{as common factors}}} + \underbrace{(-8z + 2yz)}_{\substack{\text{Both have 2 only } z \\ \text{as common factors}}}$

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

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

Taking $(y - 4)$ as common,

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

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

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

$\underbrace{(10ab + 4a)}_{\substack{\text{Both have 2 and} \\ \text{as common factors}}} + \underbrace{(5b + 2)}_{\substack{\text{Since nothing is} \\ \text{common,we} \\ \text{take 1 common}}}$

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

Taking $(5b + 2)$ as common,

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

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

$\underbrace{(6xy - 4y)}_{\substack{\text{Both have 2 and } y \\ \text{as common factors}}} + \underbrace{(6 - 9x)}_{\substack{\text{Both have 3} \\ \text{as common factors}}}$

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

$= 2y(3x - 2) + 3 \times -1(3x - 2)\big(As\ (2 - 3x) = -1 \times (3x - 2)\big)$

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

Taking $(3x - 2)$ as common,

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

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) $a^4 - b^4$

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

Using $x^2 - y^2 = (x + y)(x - y)$ Here $x = a^2$ and $y = b^2$

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

Using $x^2 - y^2 = (x + y)(x - y)$ Here $x = a$ and $y = b$

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

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

(ii) $p^4 - 81$

$= (p^2)^2 - (9)^2$

Using $a^2 - b^2 = (a + b)(a - b)$
Here $a = p^2$ and $b = 9$

$= (p^2 + 9)(p^2 - 9)$

$= (p^2 + 9)(p^2 - 3^2)$

Again Using $a^2 - b^2 = (a + b)(a - b)$
Here $a = p$ and $b = 3$

$= (p^2 + 9)(p + 3)(p - 3)$

$= (p - 3)(p + 3)(p^2 + 9)$

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

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

Using $a^2 - b^2 = (a + b)(a - b)$
Here $a = x^2$ and $b = (y + z)^2$

$= [x^2 + (y + z)^2]\,[x^2 - (y + z)^2]$

Again Using $a^2 - b^2 =$ $(a + b)(a - b)$
Here $a = x$ and $b = (y + z)$

$= [x^2 + (y + z)^2]\big(x - (y + z)\big)\big(x + (y + z)\big)$

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

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

$= (x^2)^2 - [(x - z)^2]^2$

Using $a^2 - b^2 = (a + b)(a - b)$
Here $a = x^2$ and $b = (x - z)^2$

$= [x^2 + (x - z)^2]\,[x^2 - (x - z)^2]$

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

Here $a = x$ and $b = (x - z)$

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

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

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

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

Here $a = x$ and $b = z$

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

$= [x^2 + x^2 + z^2 - 2xz][2x - z][z]$

$= [2x^2 + z^2 - 2xz][2x - z][z]$

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

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

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

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

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

Here $x = a^2$ and $y = b^2$

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

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

Here $x = a$ and $y = b$

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

$= (a + b)^2(a - b)^2$($Since$ $(ab)^m = a^m \times b^m$)

5. Factorise the following expressions:

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

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

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

Solution:

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

$= p^2 + 2p + 4p + 8$(here 6p can be written as 2p + 4p)

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

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

Taking $(p+2)$ common,

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

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

$= q^2 - 3q - 7q + 21$ (here -10q can be written as- 3q – 7q)

$= (q^2 - 3q) - (7q - 21)$

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

Taking $(q-3)$ common,

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

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

$= p^2 - 2p + 8p - 16$(here, 6p can be written as -2p + 8p)

$= (p^2 - 2p) + (8p - 16)$

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

Taking $(p-2)$ common

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

Exercise: 14.3

1. Carryout 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) $28x^4 \div 56x$

$= \dfrac{28\,x^4}{56\,x}$

$= \dfrac{28}{56} \times \dfrac{x^4}{x}$

$= \dfrac{1}{2} \times x^{4-1} \left(\dfrac{a^m}{a^n} = a^{m-n}\right)$

$= \dfrac{1}{2} \times x^3$

$=\frac{1}{2}x^3$

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

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

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

$=-4\times y^{3-2}\left(\frac{a^m}{a^n}=a^{m-n}\right)$

$=-4y$

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

$=\frac{66pq^2r^3}{11qr^2}$

$=\frac{66}{11}\times p\times\frac{q^2}{q}\times\frac{r^3}{r^2}$

$=6\times p\times q^{2-1}\times r^{3-2}\left(\frac{a^m}{a^n}=a^{m-n}\right)$

$=6\times p\times q\times r$

$=6pqr$

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

$=\frac{34x^3y^3z^3}{51xy^2z^3}$

$=\frac{34}{51}\times\frac{x^3}{x}\times\frac{y^3}{y^2}\times\frac{z^3}{z^3}$

$=\frac{2}{3}\times x^{3-1}\times y^{3-2}\times z^{3-3}\left(\frac{a^m}{a^n}=a^{m-n}\right)$

$=\frac{2}{3}\times x^2\times y\times z^0$

$=\frac{2}{3}\times x^2\times y\times 1$

$=\frac{2}{3}x^2y$

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

$$= \frac{12a^8b^8}{-6a^6b^4}$$

$$= \frac{12}{-6} \times \frac{a^8}{a^6} \times \frac{b^8}{b^4}$$

$$= -2 \times a^{8-6} \times b^{8-4} \left(\frac{a^m}{a^n} = a^{m-n}\right)$$

$$= -2 \times a^2 \times b^4$$

$$= -2a^2b^4$$

2. (**Method 1:**) Separating each term

Divide the given polynomial by the given monomial.

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

Solution:

$5x^2 - 6x$

Taking x common,

$= x(5x - 6)$

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

$$= \frac{x}{x} \times \frac{5x - 6}{3}$$

$$= \frac{5x - 6}{3}$$

(**Method 2:**) Cancelling the terms

Divide the given polynomial by the given monomial.

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

Solution:

$$\frac{5x^2 - 6x}{3x}$$

$$= \frac{5x^2}{3x} - \frac{6x}{3x}$$

$$= \left(\frac{5}{3} \times \frac{x^2}{x}\right) - \left(\frac{6}{3} \times \frac{x}{x}\right)$$

$$= \left(\frac{5}{3} \times x\right) - 2$$

$= \frac{5}{3}x - 2$

$= \frac{5x - (2 \times 3)}{3} = \frac{5x - 6}{3}$

(ii) (**Method 1:**)

Divide the given polynomial by the given monomial.

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

Solution:

$3y^8 - 4y^6 + 5y^4$

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

Taking y^4 common

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

$\Rightarrow \frac{3y^8 - 4y^6 + 5y^4}{y^4}$

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

$= 3y^4 - 4y^2 + 5$

(**Method 2:**)

Divide the given polynomial by the given monomial.

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

Solution:

$\frac{3y^8 - 4y^6 + 5y^4}{y^4}$

$= \frac{3y^8}{y^4} - \frac{4y^6}{y^4} + \frac{5y^4}{y^4}$

$= 3 \times y^{8-4} - 4 \times y^{6-4} + 5 \times y^{4-4} \left(\frac{a^m}{a^n} = a^{m-n}\right)$

$= 3 \times y^4 - 4 \times y^2 + 5y^0$

$= 3y^4 - 4y^2 + 5(a^0 = 1)$

(iii) (**Method 1:**)

Divide the given polynomial by the given monomial.

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

Solution:

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

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

Taking $x^2y^2z^2$ common

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

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

$= \dfrac{8x^2y^2z^2(x + y + z)}{4x^2y^2z^2}$

$= \dfrac{8}{4} \times \dfrac{x^2y^2z^2}{x^2y^2z^2} \times (x + y + z)$

$= 2 \times (x + y + z)$

$= 2(x + y + z)$

(**Method 2:**)

Divide the given polynomial by the given monomial.

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

Solution:

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

$= \dfrac{8x^3y^2z^2}{4x^2y^2z^2} + \dfrac{8x^2y^3z^2}{4x^2y^2z^2} + \dfrac{8x^2y^2z^3}{4x^2y^2z^2}$

$= 2x + 2y + 2z$

Taking 2 common

$= 2(x + y + z)$

(iv) (**Method 1:**)

Divide the given polynomial by the given monomial.

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

Solution:

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

Taking x common,

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

$\Rightarrow \dfrac{x^3 + 2x^2 + 3x}{2x}$

$= \dfrac{x(x^2 + 2x + 3)}{2x}$

$= \dfrac{x}{x} \times \dfrac{x^2 + 2x + 3}{2}$

$= \dfrac{x^2 + 2x + 3}{2}$

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

(**Method 2:**)

Divide the given polynomial by the given monomial.

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

Solution:

$\dfrac{x^2 + 2x + 3}{2x}$

$= \dfrac{x^3}{2x} + \dfrac{2x^2}{2x} + \dfrac{3x}{2x}$

$= \left(\dfrac{1}{2} \times \dfrac{x^3}{x}\right) + \left(\dfrac{2}{2} \times \dfrac{x^2}{x}\right) + \left(\dfrac{3}{2} \times \dfrac{x}{x}\right)$

$= \left(\dfrac{1}{2} \times x^2\right) + (1 \times x) + \left(\dfrac{3}{2} \times 1\right)$

$= \dfrac{1}{2}x^2 + x + \dfrac{3}{2}$

$= \dfrac{x^2 + 2x + 3}{2}$

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

(v) (**Method 1:**)

Divide the given polynomial by the given monomial.

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

Solution:

$p^3q^6 - p^6q^3$

$= (p^3q^3 \times q^3) - (p^3q^3 \times p^3)$

Taking p^3q^3 common,

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

$\Rightarrow \dfrac{p^3q^6 - p^6q^3}{p^3q^3}$

$= \dfrac{p^3q^3(q^3 - p^3)}{p^3q^3}$

$= q^3 - p^3$

(**Method 2:**)

Divide the given polynomial by the given monomial.

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

Solution:

$\dfrac{p^3q^6 - p^6q^3}{p^3q^3}$

$= \dfrac{p^3q^6}{p^3q^3} - \dfrac{p^6q^3}{p^3q^3}$

$= \dfrac{q^6}{q^3} - \dfrac{p^6}{p^3}$

$= q^{6-3} - p^{6-3} \left(\dfrac{a^m}{a^n} = a^{m-n}\right)$

$= q^3 - p^3$

3. Work out the following divisions.

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

Solution:

$10x - 25$

$= (5 \times 2)x - (5 \times 5)$

Taking 5 common,

$= 5(2x - 5)$

Dividing, $\frac{10x-25}{5}$

$= \dfrac{5(2x-5)}{5}$

$= (2x-5)$

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

Solution:

$10x - 25$

$= (5 \times 2)x - (5 \times 5)$

Taking 5 common,

$= 5(2x-5)$

Dividing, $\frac{(10x-25)}{(2x-5)}$

$= \dfrac{5(2x-5)}{(2x-5)}$

$= 5$

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

Solution:

$10y(6y+21)$

$= 10y[(3 \times 2)y + (3 \times 7)]$

Taking 3 common,

$= 10y \times 3(2y+7)$

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

$= \dfrac{10y \times 3(2y+7)}{5 \times (2y+7)}$

$= 3 \times \dfrac{10}{5} \times y \times \dfrac{(2y+7)}{(2y+7)}$

$= 3 \times 2 \times y \times 1$

$= 6y$

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

Solution:

$9x^2y^2(3z-24)$

$= 9x^2y^2 \times [3z-(3\times 8)]$

Taking 3 common,

$= 9x^2y^2 \times 3(z-8)$

$= 27x^2y^2(z-8)$

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

$= \dfrac{27x^2y^2(z-8)}{27xy(z-8)}$

$= \dfrac{27}{27}\times\dfrac{x^2}{x}\times\dfrac{y^2}{y}\times\dfrac{(z-8)}{(z-8)}$

$= 1\times x\times y\times 1\left(\dfrac{a^m}{a^n}=a^{m-n}\right)$

$= xy$

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

Solution:

$96\,abc\,(3a-12)(5b-30)$

$= 96\,abc\,\big(3a-(3\times 4)\big)(5b-30)$

Taking 3 common,

$= 96\,abc\times 3(a-4)(5b-30)$

$= 288\,abc\,(a-4)(5b-30)$

$= 288\,abc\,(a-4)(5b-5\times 6)$

Taking 5 common,

$= 288\,abc(a-4)\times 5(b-6)$

$= 288\times 5\,abc(a-4)(b-6)$

$= 1440\,abc\,(a-4)(b-6)$

Dividing,

$\dfrac{96\,abc\,(3a-12)(5b-30)}{144(a-4)(b-6)}$

$= \dfrac{1440\,abc\,(a-4)(b-6)}{144\,(a-4)(b-6)}$

$$= \frac{1440}{144} \times abc \times \frac{(a-4)}{(a-4)} \times \frac{(b-6)}{(b-6)}$$

$$= 10 \times abc \times 1 \times 1$$

$$= 10\, abc$$

4. Divide as directed

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

Solution:

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

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

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

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

Solution:

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

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

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

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

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

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

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

Solution:

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

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

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

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

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

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

Solution:

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

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

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

$= 4 \times 1 \times (y^2+5y+3)$

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

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

Solution:

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

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

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

$= 1 \times 1 \times (x+2)(x+3)$

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

5. Factorise the expressions and divide them as directed.

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

Solution:

$y^2+7y+10$

$= y^2+2y+5y+10$(here, the middle term can be split as7y = 2y + 5y)

$= (y^2+2y)+(5y+10)$

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

Taking $(y+2)$ common,

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

Now, dividing

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

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

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

$= (y + 2) \times \dfrac{(y + 5)}{(y + 5)}$

$= (y + 2)$

Hint: To split the middle term

We need to find two numbers whose

Sum $= 7$

Product $= 10$

	Sum	Product
1 and 10	11	10
2 and 5	7	10

So, we write $7y = 2y + 5y$

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

Solution:

$m^2 - 14m - 32$

$= m^2 + 2m - 16m - 32$(here, the middle term can be split as $-14m = 2m - 16m$)

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

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

Taking $(m + 2)$ common,

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

Now, dividing

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

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

$= \dfrac{(m + 2)(m - 16)}{(m + 2)}$

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

$= (m-16)$

Hint: To split the middle term

We need to find two numbers whose

Sum $= -14$

Product $= -32$

	Sum	Product
1 and -32	-31	-32
2 and -16	-14	-32

So, we write $-14m = 2m - 16m$

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

Solution:

$5p^2 - 25p + 20$

Taking 5 common,

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

$= 5(p^2 - p - 4p + 4)$(here, the middle term can be split as- 5p = - p – 4p)

$= 5[(p^2 - p) - (4p - 4)]$

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

Taking $(p-1)$ common,

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

Now, dividing

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

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

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

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

$= 5(p-4)$

Hint: To split the middle term

We need to find two numbers whose

Sum $= -5$

Product $= 4$

	Sum	Product
-1 and -4	-5	4

So, we write $-5p = -p - 4p$

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

Solution:

$4yz(z^2 + 6z - 16)$

$= 4yz(z^2 - 2z + 8z - 16)$(here, the middle term can be split as6z = - 2z + 8z)

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

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

Taking $(z - 2)$ common,

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

Now, dividing

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

$= \dfrac{4yz(z - 2)(z + 8)}{2y(z + 8)}$

$= \dfrac{4}{2} \times \dfrac{y}{y} \times z \times (z - 2) \times \dfrac{(z + 8)}{(z + 8)}$

$= 2 \times z \times (z - 2)$

$= 2z(z - 2)$

Hint: To split the middle term

We need to find two numbers whose

Sum $= 6$

Product $= -16$

	Sum	Product
-1 and 16	15	-16
-2 and 8	-15	-16

-2 and 8	6	-16

So, we write $6z = -2z + 8z$

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

Solution:

$5pq(p^2 - q^2)$

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

Here $a = p$ and $b = q$

$= 5pq(p+q)(p-q)$

Now, dividing

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

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

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

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

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

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

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

Solution:

$12xy(9x^2 - 16y^2)$

$= 12xy[(3x)^2 - (4y)^2]$

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

Here $a = 3x$ and $b = 4y$

$= 12xy(3x+4y)(3x-4y)$

Now, dividing

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

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

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

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

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

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

Solution:

$39y^3(50y^2-98)$

$= 39y^3(2 \times 25y^2 - 2 \times 49)$

Taking 2 common,

$= 39y^3 \times 2(25y^2-49)$

$= 78y^3(25y^2-49)$

$= 78y^3[(5y)^2-(7)^2]$

Using $a^2-b^2=(a+b)(a-b)$
Here $a=5y$ and $b=7$

$= 78y^3(5y-7)(5y+7)$

Now, dividing

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

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

$$= \frac{78y^3(5y+7)(5y-7)}{26y^2(5y+7)}$$

$$= \frac{78}{26} \times \frac{y^3}{y^2} \times \frac{(5y+7)}{(5y+7)} \times (5y-7)$$

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

$= 3y(5y-7)$