Fundamental Operations

IMPORTANT POINTS

1. **Fundamental Operations :** In mathematics, the operations : addition (+), subtraction (-), multiplication (x) and division (÷) are called the four fundamental operations.
2. **Addition and Subtraction :**
   - **Addition of Like Terms :**
     - When all the terms are positive, add their coefficients.
     - When all the terms are negative, add their coefficients without considering their negative signs and then prefix the minus sign to the sum.
   - **Addition of Unlike Terms :** As discussed above, the sum of two or more like terms is a single like term ; but the two unlike terms cannot be added together to get a single term.
   - **Subtraction of Like Terms :** The same rules, as those for subtraction of integers, are applied for the subraction of like terms. The result of subtraction of two like terms is also a like term.

Add the positive terms together and negative terms separately together. Then, find the result of two terms obtained.

EXERCISE 19(A)

Question 1.
Fill in the blanks :
(i) 5 + 4 = ………… and 5x + 4x = ………….
(ii) 12 + 18 = ………… and $12x^2y + 18x^2y$ = ………….
(iii) 7 + 16 = ………….. and 7a + 16b = …………
(iv) 1 + 3 = ………… and $x^2y + 3xy^2$ = ………..
(v) 7 – 4 = …………… and 7ab – 4ab = …………..
(vi) 12 – 5 = ………… and 12x – 5y = ……………
(vii) 35 – 16 = ………….. and 35ab – 16ba = …………
(viii) 28 – 13 = …………. and $28ax^2 – 13a^2x$ = ………….
Solution:
(i) 5 + 4 = **9** and 5x + 4x = **9x**
(ii) 12 + 18 = **30** and $12x^2y + 18x^2y$ = **$30x^2y$**
(iii) 7 + 16 = **23** and 7a + 16 b = **7a + 16b**
(iv) 1 + 3 = **4** and $x^2y + 3xy^2$ = **$x^2y + 3xy^2$**
(v) 7 – 4 = **3** and 7ab – 4ab = **3ab**
(vi) 12 – 5 = **7** and 12x – 5y = **12x – 5y**
(vii) 35 – 16 = **19** and 35ab – 16ba = **19ab**
(viii) 28 – 13 = **15** and $28ax^2 – 13a^2x$ = **$28ax^2 – 13a^2x$**

Question 2.
Fill in the blanks :

(i) The sum of – 2 and – 5 = …………. and the sum of – 2x and – 5x = ……………
(ii) The sum of 8 and – 3 = ………….. and the sum of 8ab and – 3ab = ………….
(iii) The sum of – 15 and – 4 = …………….. and the sum of – 15x and -4y =
………………
(iv) 15 + 8 + 3 = ……….. and 15x + 8y + 3x = ……………
(v) 12 – 9 + 15 = …………… and 12ab – 9ab + 15ba = ……………..
(vi) 25 – 7 – 9 = and 25xy – 7xy – 9yx = ……………
(vii) – 4 – 6 – 5 = …………. and – 4ax – 6ax – 5ay = ……………
Solution:
(i) The sum of – 2 and – 5 = **– 7** and the sum of – 2x and – 5x = **-7x**
(ii) The sum of 8 and -3 = **5** and the sum of 8ab and – 3ab = **5ab**
(iii) The sum of – 15 and – 4 = **– 19** and the sum of – 15x and – 4y = **– 15x – 4y**
(iv) 15 + 8 + 3 = **26** and 15x + 8y + 3x = **18x + 8y**
(v) 12 – 9 + 15 = **18** and 12ab – 9ab + 15ba = **18ab**
(vi) 25 – 7 – 9 = **9** and 25xy – 7xy – 9yx = **9xy**
(vii) – 4 – 6 – 5 = **– 15** and – 4ax – 6ax – 5ay = **– 10ax – 5ay**

Question 3.
Add:
(i) 8xy and 3xy
(ii) 2xyz, xyz and 6xyz
(iii) 2a, 3a and 4b
(iv) 3x and 2y
(v) 5m, 3n and 4p
(vi) 6a, 3a and 9ab
(vii) 3p, 4q and 9q
(viii) 5ab, 4ba and 6b
(ix) 50pq, 30pq and 10pr
(x) – 2y, – y and – 3y
(xi) – 3b and – b
(xii) 5b, – 4b and – 10b
(xiii) – 2c, – c and – 5c
Solution:
(i) 8xy + 3xy = 11xy
(ii) 2xyz + xyz + 6xyz = (2 + 1 + 6) xyz = 9xyz

(iii) $2a + 3a + 4b$
$$= (2 + 3)\, a + 4b$$
$$= 5a + 4b$$

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

(v) $5m + 3n + 4p = 5m + 3n + 4p$

(vi) $6a + 3a + 9ab$
$$= (6 + 3)\, a + 9ab$$
$$= 9a + 9ab$$

(vii) $3p + 4q + 9q$
$$= 3p + (4 + 9)q$$
$$= 3p + 13q$$

(viii) $5ab + 4ba + 6b$
$$= (5 + 4)\, ab + 6b$$
$$= 9ab + 6b$$

(ix) $50pq + 30pq + 10pr$
$$= (50 + 30).pq + 10\, pr$$
$$= 80pq + 10pr$$

(x) $(- 2y) + (- y) + (- 3y)$
$$= -(2 + 1 + 3)y$$
$$= - 6y$$

(xi) $(- 3b) + (- b)$
$$= -(3 + 1)b$$
$$= - 4b$$

(xii) $5b + (- 4b) + (- 10b)$
$$= 5b - (4 + 10)b$$
$$= 5b - 14b = - 9b$$

(xiii) $(- 2c) + (- c) + (- 5c)$
$$= -(2 + 1 + 5)c = - 8c$$

Question 4.
Evaluate :

(i) $6a - a - 5a - 2a$

(ii) $2b - 3b - b + 4b$

(iii) $3x - 2x - 4x + 7x$

(iv) $5ab + 2ab - 6ab + ab$

(v) $8x - 5y - 3x + 10y$

Solution:

(i) 6a – a – 5a – 2a = 6a – (1 + 5 + 2).a
$$= 6a - 8a = -2a$$

(ii) 2b – 3b – b + 4b
$$= 2b + 4b - (3 + 1).b$$
$$= 6b - 4b = 2b$$

(iii) 3x – 2x – 4x + 7x
$$= 3x + 7x - 2x - 4x$$
$$= (3 + 7).x - (2 + 4).x$$
$$= 10x - 6x = 4x$$

(iv) 5ab + 2ab – 6ab + ab
$$= 5ab + 2ab + ab - 6ab$$
$$= 8ab - 6ab = 2ab$$

(v) 8x – 5y – 3x + 10y
$$= 8x - 3x + 10y - 5y$$
$$= 5x + 5y$$

Question 5.
Evaluate :

(i) – 7x + 9x + 2x – 2x

(ii) 5ab – 2ab – 8ab + 6ab

(iii) –8a – 3a + 12a + 13a – 6a

(iv) 19abc – 11abc -- 12abc + 14abc

Solution:

(i) – 7x + 9x + 2x – 2x
$$= 9x + 2x - 7x - 2x$$
$$= 11x - 9x = 2x$$

(ii) 5ab – 2ab – 8ab + 6ab
$$= 5ab + 6ab - 2ab - 8ab$$
$$= 11ab - 10ab = ab$$

(iii) –8a – 3a + 12a + 13a – 6a
$$= 12a + 13a - (8a + 3a + 6a)$$
$$= 25a - 17a = 8a$$

(iv) 19abc – 11abc – 12abc + 14abc
$$= abc (19 - 11 - 12 + 14)$$
$$= abc (33 - 23) = 10abc$$

Question 6.
Subtract the first term from the second :

(i) $4ab, 6ba$

(ii) $4\cdot8b, 6\cdot8b$

(iii) $3\cdot5abc, 10\cdot5abc$

(iv) $3\frac{1}{2}mn, 8\frac{1}{2}nm$

Solution:

(i) $6ba - 4ab = \mathbf{2ab}$

(ii) $6\cdot8b - 4\cdot8b = \mathbf{2b}$

(iii) $10\cdot5abc - 3\cdot5abc = \mathbf{7abc}$

(iv) $8\frac{1}{2}nm - 3\frac{1}{2}nm$

$$= \frac{17}{2}nm - \frac{7}{2}mn$$

$$= \frac{17mn - 7mn}{2} = \frac{10mn}{2} = \mathbf{5mn}$$

Question 7.
Simplify :

(i) $2a^2b^2 + 5ab^2 + 8a^2b^2 - 3ab^2$

(ii) $4a + 3b - 2a - b$

(iii) $2xy + 4yz + 5xy + 3yz - 6xy$

(iv) $ab + 15ab - 11ab - 2ab$

(v) $6a^2 - 3b^2 + 2a^2 + 5b^2 - 4a^2$

(vi) $8abc + 2ab - 4abc + ab$

(vii) $9xyz + 15yxz - 10zyx - 2zxy$

(viii) $13pqr + 2p + 4q - 6pqr + 5pqr$

(ix) $4ab + 0 - 2ba$

(x) $6x^2y - 2xy^2 + 5x^2y - xy^2$

(xi) $6·4a + 5·3b - 2·4a - 2·2b$

(xii) $2·5a + 4·6b + 1·2a - 3·6b$

(xiii) $22m - 12\frac{1}{2}n - 15p + 16n$

(xiv) $6p + \frac{2}{3}q - 1\frac{1}{2}p + \frac{1}{3}q + 2q$

(xv) $2\frac{2}{3}xy - 3\frac{1}{2}xy + 3\frac{1}{3}xy - 2\frac{1}{2}xy$

Solution:

(i) $2a^2b^2 + 5ab^2 + 8a^2b^2 - 3ab^2$
$= 2a^2b^2 + 8a^2b^2 + 5ab^2 - 3ab^2$
$= \mathbf{10a^2b^2 + 2\,ab^2}$

(ii) $4a + 3b - 2a - b$
$= 4a - 2a + 3b - b$
$= \mathbf{2a + 2b}$

(iii) $2xy + 4yz + 5xy + 3yz - 6xy$
$= 2xy + 5xy - 6xy + 4yz + 3yz$
$= 7xy - 6xy + 7yz$
$= \mathbf{x + 7yz}$

(iv) $ab + 15ab - 11ab - 2ab$
$= 16ab - 13ab = \mathbf{3ab}$

(v) $6a^2 - 3b^2 + 2a^2 + 5b^2 - 4a^2$
$= 6a^2 + 2a^2 - 4a^2 + 5b^2 - 3b^2$
$= \mathbf{4a^2 + 2b^2}$

(vi) $8abc + 2ab - 4abc + ab$
$= 8abc - 4abc + 2ab + ab$
$= \mathbf{4abc + 3ab}$

(vii) $9xyz + 15yxz - 10zyx - 2zxy$
$= 9xyz + 15xyz - 10xyz - 2xyz$
$= 24xyz - 12xyz = \mathbf{12xyz}$

(viii) $13pqr + 2p + 4q - 6pqr + 5pqr$

$$= 13pqr + 5pqr - 6pqr + 2p + 4q$$
$$= \mathbf{12pqr + 2p + 4q}$$

(ix) $4ab + 0 - 2ba$
$$= 4ab - 2ab + 0 = \mathbf{2ab}$$

(xii) $6x^2y - 2xy^2 + 5x^2y - xy^2$
$$= 6x^2y + 5x^2y - 2xy^2 - xy^2$$
$$= \mathbf{11x^2y - 3xy^2}$$

(xi) $6 \cdot 4a + 5 \cdot 3b - 2 \cdot 4a - 2 \cdot 2b$
$$= 6 \cdot 4a - 2 \cdot 4a + 5 \cdot 3b - 2 \cdot 2b$$
$$= \mathbf{4a + 3 \cdot 1b}$$

(xii) $2 \cdot 5a + 4 \cdot 6b + 1 \cdot 2a - 3 \cdot 6b$
$$= 2 \cdot 5a + 1 \cdot 2a + 4 \cdot 6b - 3 \cdot 6b$$
$$= \mathbf{3 \cdot 7a + b}$$

(xiii) $22m - 12\dfrac{1}{2}n - 15p + 16n$

$$= 22m - \frac{25}{2}n - 15p + 16n$$

$$= 22m + 16n - \frac{25}{2}n - 15p$$

$$= 22m \div \frac{32n - 25n}{2} - 15p$$

$$= 22m + \frac{7n}{2} - 15p$$

$$= \mathbf{22m + 3\dfrac{1}{2}n - 15p}$$

(xiv) $6p + \dfrac{2}{3}q - 1\dfrac{1}{2}p + \dfrac{1}{3}q + 2q$

$$= 6p - \frac{3}{2}p + \frac{2}{3}q + \frac{1}{3}q + 2q$$

$$= \left(\frac{12p - 3p}{2} \right) + \left(\frac{2q + q + 6q}{3} \right)$$

$$= \frac{9}{2}p + 3q = \mathbf{4\dfrac{1}{2}p + 3q}$$

(xv) $2\dfrac{2}{3}xy - 3\dfrac{1}{2}xy + 3\dfrac{1}{3}xy - 2\dfrac{1}{2}xy$

$$= xy\left(2\frac{2}{3} - 3\frac{1}{2} + 3\frac{1}{3} - 2\frac{1}{2}\right)$$

$$= xy\left(\frac{8}{3} - \frac{7}{2} + \frac{10}{3} - \frac{5}{2}\right)$$

$$= xy\left(\frac{16 - 21 + 20 - 15}{6}\right)$$

$$= xy\left(\frac{36 - 36}{6}\right) = 0 \times xy = 0$$

EXERCISE 19(B)

Question 1.
Find the sum of :

(i) $3a + 4b + 7c, -5a + 3b - 6c$
and $4a - 2b - 4c$.

(ii) $2x^2 + xy - y^2, -x^2 + 2xy + 3y^2$
and $3x^2 - 10xy + 4y^2$.

(iii) $x^2 - x + 1, -5x^2 + 2x - 2$
and $3x^2 - 3x + 1$

(iv) $a^2 - ab + bc, \ 2ab + bc - 2a^2$
and $-3bc + 3a^2 + ab$.

(v) $4x^2 + 7 - 3x, \ 4x - x^2 + 8$
and $-10 + 5x - 2x^2$.

(vi) $3x + 4xy - y^2, xy - 4x + 2y^2$
and $3y^2 - xy + 6x$.

Solution:

(i) $(3a + 4b + 7c) + (-5a + 3b - 6c)$
$$+ (4a - 2b - 4c)$$
$$= 3a + 4b + 7c - 5a + 3b - 6c$$
$$+ 4a - 2b - 4c$$
$$= 3a + 4a - 5a + 4b + 3b - 2b$$
$$+ 7c - 6c - 4c$$
$$= 7a - 5a + 7b - 2b + 7c - 10c$$
$$= 2a + 5b - 3c$$

(ii) $(2x^2 + xy - y^2) + (-x^2 + 2xy + 3y^2)$
$$+ (3x^2 - 10xy + 4y^2)$$
$$= 2x^2 + xy - y^2 - x^2 + 2xy + 3y^2$$
$$+ 3x^2 - 10xy + 4y^2$$
$$= 2x^2 + 3x^2 - x^2 + xy + 2xy - 10xy$$
$$+ 3y^2 + 4y^2 - y^2$$
$$= 5x^2 - x^2 + 3xy - 10xy + 7y^2 - y^2$$
$$= 4x^2 - 7xy + 6y^2$$

(iii) $(x^2 - x + 1) + (-5x^2 + 2x - 2)$
$$+ (3x^2 - 3x + 1)$$
$$= x^2 - x + 1 - 5x^2 + 2x - 2 + 3x^2$$
$$- 3x + 1$$
$$= x^2 + 3x^2 - 5x^2 + 2x - x - 3x + 1 + 1 - 2$$
$$= 4x^2 - 5x^2 + 2x - 4x + 2 - 2 = -x^2 - 2x$$

(iv) $(a^2 - ab + bc) + (2ab + bc - 2a^2)$
$$+ (-3bc + 3a^2 + ab)$$
$$= a^2 - ab + bc + 2ab + bc - 2a^2 - 3bc$$
$$+ 3a^2 + ab$$
$$= a^2 + 3a^2 - 2a^2 + 2ab + ab - ab + bc$$
$$+ bc - 3bc$$
$$= 4a^2 - 2a^2 + 3ab - ab + 2bc - 3bc$$
$$= 2a^2 + 2ab - bc$$

(v) $(4x^2 + 7 - 3x) + (4x - x^2 + 8)$
$$+ (-10 + 5x - 2x^2)$$
$$= 4x^2 + 7 - 3x + 4x - x^2 + 8$$
$$- 10 + 5x - 2x^2$$
$$= 4x^2 - x^2 - 2x^2 + 7 + 8 - 10$$
$$+ 4x + 5x - 3x$$
$$= 4x^2 - 3x^2 + 15 - 10 + 9x - 3x$$
$$= x^2 + 5 + 6x$$

(vi) $(3x + 4xy - y^2) + (xy - 4x + 2y^2)$
$$+ (3y^2 - xy + 6x)$$
$$= 3x + 4xy - y^2 + xy - 4x + 2y^2$$
$$+ 3y^2 - xy + 6x$$
$$= 3x + 6x - 4x + 4xy + xy - xy$$
$$+ 2y^2 + 3y^2 - y^2$$
$$= 9x - 4x + 5xy - xy + 5y^2 - y^2$$
$$= 5x + 4xy + 4y^2$$

Question 2.
Add the following expressions :

(i) $-17x^2 - 2xy + 23y^2,\ -9y^2 + 15x^2 + 7xy$
and $13x^2 + 3y^2 - 4xy$

(ii) $-x^2 - 3xy + 3y^2 + 8,\ 3x^2 - 5y^2 - 3 + 4xy$
and $-6xy + 2x^2 - 2 + y^2$

(iii) $a^3 - 2b^3 + a,\ b^3 - 2a^3 + b$
and $-2b + 2b^3 - 5a + 4a^3$

Solution:

(i) $(-17x^2 - 2xy + 23y^2) + (-9y^2 + 15x^2 + 7xy)$

$\qquad\qquad\qquad + (13x^2 + 3y^2 - 4xy)$

$= -17x^2 - 2xy + 23y^2 - 9y^2 + 15x^2$

$\qquad\qquad + 7xy + 13x^2 + 3y^2 - 4xy$

$= -17x^2 + 15x^2 + 13x^2 - 2xy - 4xy$

$\qquad\qquad + 7xy + 23y^2 + 3y^2 - 9y^2$

$= \mathbf{11x^2 + xy + 17y^2}$

(ii) $(-x^2 - 3xy + 3y^2 + 8) + (3x^2 - 5y^2 - 3$

$\qquad\qquad + 4xy) + (-6xy + 2x^2 - 2 + y^2)$

$= -x^2 - 3xy + 3y^2 + 8 + 3x^2 - 5y^2 - 3$

$\qquad\qquad + 4xy - 6xy + 2x^2 - 2 + y^2$

$= -x^2 + 3x^2 + 2x^2 - 3xy - 6xy + 4xy$

$\qquad\qquad + 3y^2 + y^2 - 5y^2 + 8 - 3 - 2$

$= \mathbf{4x^2 - 5xy - y^2 + 3}$

(iii) $(a^3 - 2b^3 + a) + (b^3 - 2a^3 + b)$

$\qquad\qquad + (-2b + 2b^3 - 5a + 4a^3)$

$= a^3 - 2b^3 + a + b^3 - 2a^3 + b - 2b$

$\qquad\qquad + 2b^3 - 5a + 4a^3$

$= a^3 + 4a^3 - 2a^3 - 2b^3 + b^3 + 2b^3$

$\qquad\qquad + a - 5a + b - 2b$

$= \mathbf{3a^3 + b^3 - 4a - b}$

Question 3.
Evaluate :

  (i) $3a - (a + 2b)$

 (ii) $(5x - 3y) - (x + y)$

(iii) $(8a + 15b) - (3b - 7a)$

(iv) $(8x + 7y) - (4y - 3x)$

  (v) $7 - (4a - 5)$

(vi) $(6y - 13) - (4 - 7y)$

Solution:

  (i) $3a - (a + 2b)$

$= 3a - a - 2b = 2a - 2b$

$= 2(a - b)$

(ii) $(5x - 3y) - (x + y)$

$= 5x - 3y - x - y$

$$= 5x - x - 3y - y$$
$$= 4x - 4y = 4 (x - y)$$

(iii) $(8a + 15b) - (3b - 7a)$
$$= 8a + 15b - 3b + 7a$$
$$= 8a + 7a + 15b - 3b$$
$$= 15a + 12b$$

(iv) $(8x + 7y) - (4y - 3x)$
$$= 8x + 7y - 4y + 3x$$
$$= 8x + 3x + 7y - 4y$$
$$= 11x + 3y$$

(v) $7 - (4a - 5)$
$$= 7 - 4a + 5 = 7 + 5 - 4a$$
$$= 12 - 4a$$

(vi) $(6y - 13) - (4 - 7y)$
$$= 6y - 13 - 4 + 7y$$
$$= 6y + 7y - 13 - 4$$
$$= 13y - 17$$

Question 4.

Subtract :

(i) $5a - 3b + 2c$ from $a - 4b - 2c$.

(ii) $4x - 6y + 3z$ from $12x + 7y - 21z$.

(iii) $5 - a - 4b + 4c$ from $5a - 7b + 2c$.

(iv) $- 8x - 12y + 17z$ from $x - y - z$.

(v) $2ab + cd - ac - 2bd$ from $ab - 2cd + 2ac + bd$.

Solution:

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

$= a - 4b - 2c - 5a + 3b - 2c$

$= a - 5a - 4b + 3b - 2c - 2c$

$= - 4a - b - 4c.$

(ii) $(12x + 7y - 21z) - (4x - 6y + 3z)$

$= 12x + 7y - 21z - 4x + 6y - 3z$

$= 12x - 4x + 7y + 6y - 21z - 3z$

$= 8x + 13y - 24z.$

(iii) $(5a - 7b + 2c) - (5 - a - 4b + 4c)$

$= 5a - 7b + 2c - 5 + a + 4b - 4c$

$= 5a + a - 7b + 4b + 2c - 4c - 5$

$= 6a - 3b - 2c - 5.$

(iv) $(x - y - z) - (- 8x - 12y + 17z)$

$= x - y - z + 8x + 12y - 17z$

$= x + 8x + 12y - y - z - 17z$

$= 9x + 11y - 18z.$

(v) $(ab - 2cd + 2ac + bd)$

$\qquad - (2ab + cd - ac - 2bd)$

$= ab - 2cd + 2ac + bd - 2ab - cd$

$\qquad\qquad + ac + 2bd$

$= ab - 2ab - 2cd - cd + 2ac$

$\qquad\qquad + ac + bd + 2bd$

$= - ab - 3cd + 3ac + 3bd$

Question 5.

(i) Take $- ab + bc - ca$ from $bc - ca + ab$.

(ii) Take $5x + 6y - 3z$ from $3x + 5y - 4z$.

(iii) Take $\dfrac{-3}{2}p + q - r$ from $\dfrac{1}{2}p - \dfrac{1}{3}q - \dfrac{3}{2}r$.

(iv) Take $1 - a + a^2$ from $a^2 + a + 1$.

Solution:

(i) $(bc - ca + ab) - (- ab + bc - ca)$

$= bc - ca + ab + ab - bc + ca$

$= bc - bc - ca + ca + ab + ab$

$= \mathbf{2ab}$

(ii) $(3x + 5y - 4z) - (5x + 6y - 3z)$

$= 3x + 5y - 4z - 5x - 6y + 3z$

$= 3x - 5x + 5y - 6y - 4z + 3z$

$= \mathbf{-2x - y - z}$

(iii) $\left(\dfrac{1}{2}p - \dfrac{1}{3}q - \dfrac{3}{2}r\right) - \left(-\dfrac{3}{2}p + q - r\right)$

$= \dfrac{1}{2}p - \dfrac{1}{3}q - \dfrac{3}{2}r + \dfrac{3}{2}p - q + r$

$= \dfrac{1}{2}p + \dfrac{3}{2}p - \dfrac{1}{3}q - q - \dfrac{3}{2}r + r$

$= \dfrac{3p + 9p - 2q - 6q - 9r + 6r}{6}$

[Since L.C.M. = 6]

$= \dfrac{12p}{6} - \dfrac{8q}{6} - \dfrac{3r}{6}$

$= \mathbf{2p - \dfrac{4}{3}q - \dfrac{1}{2}r}$

(iv) $(a^2 + a + 1) - (1 - a + a^2)$

$= a^2 + a + 1 - 1 + a - a^2$

$= a^2 - a^2 + a + a + 1 - 1 = \mathbf{2a}$

Question 6.

From the sum of x + y – 2z and 2x – y + z subtract x + y + z.

Solution:

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

$= x + y - 2z + 2x - y + z - x - y - z$

$= x + 2x - x + y - y - y - 2z - z + z$

$= \mathbf{2x - y - 2z}$

Question 7.

From the sum of 3a – 2b + 4c and 3b – 2c subtract a – b – c.

Solution:

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

Question 8.
Subtract x – 2y – z from the sum of 3x – y + z and x + y – 3z.
Solution:
(3x – y + z) + (x + y – 3 z) – (x – 2y – z)
= 3x – y + z + x + y – 3z – x + 2y + z
= 3x + x – x – y + y + 2y + z + z – 3z
= 3x + 2y – z

Question 9.
Subtract the sum of x + y and x – z from the sum of x – 2z and x + y + z
Solution:

$(x - 2z) + (x + y + z) - \{(x + y) + (x - z)\}$
$= x - 2z + x + y + z - \{x + y + x - z\}$
$= x - 2z + x + y + z - x - y - x + z$
$= x + x - x - x + y - y + z + z - 2z$
$= 0$

Question 10.
By how much should x + 2y – 3z be increased to get 3x ?
Solution:
3x – (x + 2y – 3z)
= 3x – x – 2y + 3z
= 2x – 2y + 3z

Question 11.
The sum of two expressions is 5x² – 3y². If one of them is 3x² + 4xy – y², find the other.
Solution:

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

Question 12.

The sum of two expressions is $3a^2 + 2ab - b^2$. If one of them is $2a^2 3b^2$, find the other.

Solution:

$(3a^2 + 2ab - b^2) - (2a^2 + 3b^2)$

$= 3a^2 + 2ab - b^2 - 2a^2 - 3b^2$

$= 3a^2 - 2a^2 + 2ab - b^2 - 3b^2$

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

EXERCISE 19(C)

Question 1.

Fill in the blanks :

(i) $6 \times 3 =$ .... and $6x \times 3x =$ ....

(ii) $6 \times 3 =$ .... and $6x^2 \times 3x^3 =$ ....

(iii) $5 \times 4 =$ .... and $5x \times 4y =$ ....

(iv) $4 \times 7 =$ .... and $4ax \times 7x =$ ....

(v) $6 \times 2 =$ .... and $6xy \times 2xy =$ ....

(vi) 12×4 .... and $12ax^2 \times 4ax =$ ....

(vii) $1 \times 8 =$ ...... and $a^2xy^2 \times 8a^3x^2y =$ ....

(viii) $15 \times 3 =$ .... and $15x \times 3x^5y^2 =$ ....

Solution:

(i) 6 x 3 = 18 and 6x x 3x = 6 x 3x x x x = 18x²

(ii) $6 \times 3 = 18$ and $6x^2 \times 3x^3$

$= 6 \times 3 \times x^2 \times x^3 = 18x^5$

(ii.) $5 \times 4 = 20$ and $5x \times 4y$

$= 5 \times 4 \times x \times y = 20xy$

(iv) $4 \times 7 = 28$ and $4ax \times 7x$

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

(v) $6 \times 2 = 12$ and $6xy \times 2xy$

$= 6 \times 2 \times x \times x \times y \times y = 12x^2y^2$

(vi) $12 \times 4 = 48$ and $12ax^2 \times 4ax$

$= 12 \times 4 \times a \times a \times x^2 \times x$

$= 48a^2x^3$

(vii) $1 \times 8 = 8$ and $a^2xy^2 \times 8a^3x^2y$

$= 1 \times 8 \times a^2 \times a^3 \times x \times x^2 \times y^2 \times y$

$= 8a^5x^3y^3$

(viii) $15 \times 3 = 45$ and $15x \times 3x^5y^2$

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

$= 45x^6y^2$

Question 2.

(i) $4x \times 6x \times 2 = $ ....

(ii) $3ab \times 6ax = $ ....

(iiii) $x \times 2x^2 \times 3x^3 = $ ....

(iv) $5 \times 5a^3 = $ ....

(v) $6 \times 6x^2 \times 6x^2y^2 = $ ....

(vi) $-8x \times -3x = - $ ....

(vii) $-5 \times -3x \times 5x^2 = $ ....

(viii) $8 \times -4xy^2 \times 3x^3y^2 = $ ....

(ix) $-4x \times 5xy \times 3z = $ ....

(x) $5x \times 2x^2y \times (-7y^3) \times 2x^3y^2 = $ ....

(i) $4x \times 6x \times 2 = 4 \times 6 \times 2 \times x \times x$
$$= 48x^2$$

(ii) $3ab \times 6ax = 3 \times 6 \times a \times a \times b \times x$
$$= 18a^2bx$$

(iii) $x \times 2x^2 \times 3x = 1 \times 2 \times 3 \times x^{1+2+3}$
$$= 6x^6$$

(iv) $5 \times 5a^3 = 25a^3$

(v) $6 \times 6x^2 \times 6x^2y^2 = 6 \times 6 \times 6 \times x^{2+2} \, y^2$
$$= 216x^4y^2$$

(vi) $-8x \times -3x = -8 \times -3 \times x^{1+1}$
$$= 24x^2$$

(vii) $-5 \times -3x \times 5x^2 = -5 \times -3 \times 5 \times x^{1+2}$
$$= 75x^3$$

(viii) $8 \times -4xy^2 \times 3x^3y^2$
$$= 8 \times -4 \times 3 \times x^{1+3}y^{2+2}$$
$$= -96x^4y^4$$

(ix) $-4x \times 5xy \times 3z$
$$= -4 \times 5 \times 3 \times x^{1+1} \times y \times z$$
$$= -60x^2yz$$

(x) $5x \times 2x^2y \times -7y^3 \times 2x^3y^2$
$$= 5 \times 2 \times -7 \times 2 \times x^{1+2+3} \times y^{1+3+2}$$
$$= -140x^6y^6$$

Question 3.

   (i) $3x^3 \times 5x^4$

  (ii) $5a^2 \times 7a^7$

 (iii) $3abc \times 6ac^3$

 (iv) $a^2b^2 \times 5a^3b^4$

  (v) $2x^2y^3 \times 5x^3y^4$

 (vi) $abc \times bcd$

Solution:

    (i) $3x^3 \times 5x^4 = 3 \times 5x^{3+4} = \mathbf{15x^7}$

   (ii) $5a^2 \times 7a^7 = 5 \times 7 \times a^{2+7} = \mathbf{35a^9}$

  (iii) $3abc \times 6ac^3 = 3 \times 6 \times a^{1+1} \times b \times c^{1+3}$

$$= \mathbf{18a^2bc^4}$$

  (iv) $a^2b^2 \times 5a^3b^4 = 1 \times 5 \times a^{2+3}\, b^{2+4}$

$$= \mathbf{5a^5b^6}$$

   (v) $2x^2y^3 \times 5x^3y^4 = 2 \times 5 \times x^{2+3} \times y^{3+4}$

$$= \mathbf{10x^5y^7}$$

  (vi) $abc \times bcd = a \times b^{1+1} \times c^{1+1} \times d$

$$= \mathbf{ab^2c^2d}$$

Question 4.
Multiply :

   (i) $a + b$ by ab

  (ii) $3ab - 4b$ by $3ab$

 (iii) $2xy - 5by$ by $4bx$

 (iv) $4x + 2y$ by $3xy$

  (v) $x^2 - x$ by $2x$

 (vi) $1 + 4x$ by x

 (vii) $9xy^2 + 3x^2y$ by $5xy$

(viii) $6x - 5y$ by $3axy$

Solution:

(i) $(a + b) \times ab = a \cdot ab + b \cdot ab$
$$= a^2b + ab^2$$

(ii) $(3ab - 4b) \times 3ab = 3ab \times 3ab - 4b \times 3ab$
$$= 3 \times 3a^{1+1}b^{1+1} - 4 \times 3 \times a \times b^{1+1}$$
$$= 9a^2b^2 - 12ab^2$$

(iii) $(2xy - 5by) \times 4bx = 2xy \cdot 4bx - 5by \cdot 4bx$
$$= 8bx^2y - 20b^2xy$$

(iv) $(4x + 2y) \times 3xy = 4x \cdot 3xy + 2y \cdot 3xy$
$$= 12x^2y + 6xy^2$$

(v) $(x^2 - x) \times 2x = x^2 \cdot 2x - x \cdot 2x$
$$= 2x^3 - 2x^2$$

(vi) $(1 + 4x) \times x = 1 \cdot x + 4x \cdot x$
$$= x + 4x^2$$

(vii) $(9xy^2 + 3x^2y) \times 5xy$
$$= 9xy^2 \cdot 5xy + 3x^2y \cdot 5xy$$
$$= 45x^2y^3 + 15x^3y^2$$

(viii) $(6x - 5y) \times 3axy$
$$= 6x \cdot 3axy - 5y \cdot 3axy$$
$$= 18ax^2y - 15axy^2$$

Question 5.
Multiply :

(i) $-x + y - z$ and $-2x$

(ii) $xy - yz$ and x^2yz^2

(iii) $2xyz + 3xy$ and $-2y^2z$

(iv) $-3xy^2 + 4x^2y$ and $-xy$

(v) $4xy$ and $-x^2y - 3x^2y^2$

Solution:

(i) $(-x + y - z) \times -2x$

        $= -x \cdot -2x + y \cdot -2x - z \cdot -2x$

        $= 2x^2 - 2xy + 2xz$

(ii) $xy - yz \times x^2yz^2$

    $= xy \cdot x^2yz^2 - yz \cdot x^2yz^2$

    $= x^{2+1} \times y^{1+1} \times z^2 - x^2 \times y^{1+1} \times z^{2+1}$

    $= x^3y^2z^2 - x^2y^2z^3$

(iii) $2xyz + 3xy \times -2y^2z$

     $= 2xyz \cdot -2y^2z + 3xy \cdot -2y^2z$

     $= -4x \times y^{2+1} \times z^{1+1} - 6 \times x \times y^{2+1} \times z$

     $= -4xy^3z^2 - 6xy^3z$

(iv) $-3xy^2 + 4x^2y \times -xy$

       $= -3xy^2 \cdot -xy + 4x^2y \cdot -xy$

       $= 3x^2y^3 - 4x^3y^2$

(v) $-x^2y - 3x^2y^2 \times 4xy$

       $= -x^2y \cdot 4xy - 3x^2y^2 \cdot 4xy$

       $= -4x^3y^2 - 12x^3y^3$

Question 6.
Multiply :

(i) $3a + 4b - 5c$ and $3a$

(ii) $-5xy$ and $-xy^2 - 6x^2y$

Solution:

     (i) $(3a + 4b - 5c) \times 3a$

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

$= 9a^2 + 12ab - 15ac$

(ii) $(-xy^2 - 6x^2y) \times -5xy$

     $= -xy^2 \times -5xy - 6x^2y \times -5xy$

     $= 5x^2y^3 + 30x^3y^2$

Question 7.
Multiply :
(i) x + 2 and x + 10
(ii) x + 5 and x – 3
(iii) x – 5 and x + 3
(iv) x – 5 and x – 3

(v) 2x+ y and x+ 3y
(vi) (3x – 5y) and (x + 6y)
(vii) (x + 9y) and (x – 5y)
(viii) (2x + 5y) and (2x + 5y)

Solution:

(i) $(x + 2) \cdot (x + 10)$
$$= x \cdot (x + 2) + 10 \cdot (x + 2)$$
$$= x^2 + 2x + 10x + 20$$
$$= x^2 + 12x + 20$$

(ii) $(x + 5) \cdot (x - 3)$
$$= x \cdot (x + 5) - 3 \cdot (x + 5)$$
$$= x^2 + 5x - 3x - 15$$
$$= x^2 + 2x - 15$$

(iii) $(x - 5) \cdot (x + 3) = x \cdot (x - 5) + 3 \cdot (x - 5)$
$$= x^2 - 5x + 3x - 15$$
$$= x^2 - 2x - 15$$

(iv) $(x - 5) \cdot (x - 3) = x \cdot (x - 5) - 3 \cdot (x - 5)$
$$= x^2 - 5x - 3x + 15$$
$$= x^2 - 8x + 15$$

(v) $(2x + y) \cdot (x + 3y)$
$$= x \cdot (2x + y) + 3y (2x + y)$$
$$= 2x^2 + xy + 6xy + 3y^2$$
$$= 2x^2 + 7xy + 3y^2$$

(vi) $(3x - 5y) \cdot (x + 6y)$
$$= x \cdot (3x - 5y) + 6y (3x - 5y)$$
$$= 3x^2 - 5xy + 18xy - 30y^2$$
$$= 3x^2 + 13xy - 30y^2$$

(vii) $(x + 9y) \cdot (x - 5y)$
$$= x \cdot (x + 9y) - 5y (x + 9y)$$
$$= x^2 + 9xy - 5xy - 45y^2$$
$$= x^2 + 4xy - 45y^2$$

(viii) $(2x + 5y) \cdot (2x + 5y)$
$$= 2x \cdot (2x + 5y) + 5y \cdot (2x + 5y)$$
$$= 4x^2 + 10xy + 10xy + 25y^2$$
$$= 4x^2 + 20xy + 25y^2$$

Question 8.
Multiply :

(i) $3abc$ and $-5a^2b^2c$

(ii) $x - y + z$ and $-2x$

(iii) $2x - 3y - 5z$ and $-2y$

(iv) $-8xyz + 10x^2yz^3$ and xyz

(v) xyz and $-13xy^2z + 15x^2yz - 6xyz^2$

(vi) $4abc - 5a^2bc - 6ab^2c$ and $-2abc^2$

Solution:

(i) $3abc \times -5a^2b^2c$

$= 3 \cdot -5 \cdot a^{1+2} \cdot b^{1+2} \cdot c^{1+1}$

$= -15a^3b^3c^2$

(ii) $(x - y + z) \cdot -2x$

$= -2x^2 + 2xy - 2xz$

(iii) $2x - 3y - 5z \cdot -2y$

$= -4xy + 6y^2 + 10yz$

(iv) $-8xyz + 10x^2yz^3 \cdot xyz$

$= -8x^2y^2z^2 + 10x^3y^2z^4$

(v) $-13xy^2z + 15x^2yz - 6xyz^2 \cdot xyz$

$= -13x^2y^3z^2 + 15x^3y^2z^2 - 6x^2y^2z^3$

(vi) $4abc - 5a^2bc - 6ab^2c \cdot -2abc^2$

$= -8a^2b^2c^3 + 10a^3b^2c^3 + 12a^2b^3c^3$

Question 9.

Find the product of :

(i) $xy - ab$ and $xy + ab$

(ii) $2abc - 3xy$ and $2abc + 3xy$

(iii) $a + b - c$ and $2a - 3b$

(iv) $5x - 6y - 7z$ and $2x + 3y$

(v) $5x - 6y - 7z$ and $2x + 3y + z$

(vi) $2a + 3b - 4c$ and $a - b - c$

Solution:

(i) $(xy - ab)\cdot(xy + ab)$

$\qquad = xy\cdot(xy - ab) + ab\,(xy - ab)$

$\qquad = x^2y^2 - abxy + abxy - a^2b^2$

$\qquad \mathbf{= x^2y^2 - a^2b^2}$

(ii) $(2abc - 3xy)\cdot(2abc + 3xy)$

$\qquad = 2abc\cdot(2abc - 3xy) + 3xy\cdot(2abc - 3xy)$

$\qquad = 4a^2b^2c^2 - 6abcxy + 6abcxy - 9x^2y^2$

$\qquad \mathbf{= 4a^2b^2c^2 - 9x^2y^2}$

(iii) $(a + b - c)\cdot(2a - 3b)$

$\qquad = 2a\cdot(a + b - c) - 3b\,(a + b - c)$

$\qquad = 2a^2 + 2ab - 2ac - 3ab - 3b^2 + 3bc$

$\qquad = 2a^2 - ab - 2ac - 3b^2 + 3bc$

$\qquad \mathbf{= 2a^2 - ab - 2ac + 3bc - 3b^2}$

(iv) $(5x - 6y - 7z)\cdot(2x + 3y)$

$\qquad = 2x\cdot(5x - 6y - 7z) + 3y\cdot(5x - 6y - 7z)$

$\qquad = 10x^2 - 12xy - 14xz + 15xy - 18y^2 - 21yz$

$\qquad \mathbf{= 10x^2 + 3xy - 14xz - 18y^2 - 21yz}$

(v) $(5x - 6y - 7z)\cdot(2x + 3y + z)$

$\qquad = 2x\cdot(5x - 6y - 7z) + 3y\cdot(5x - 6y - 7z)$

$\qquad\qquad\qquad\quad + z\,(5x - 6y - 7z)$

$\qquad = 10x^2 - 12xy - 14xz + 15xy - 18y^2$

$\qquad\qquad\qquad - 21yz + 5xz - 6yz - 7z^2$

$\qquad = 10x^2 - 12xy + 15xy - 14xz + 5xz$

$\qquad\qquad\qquad - 18y^2 - 21yz - 6yz - 7z^2$

$\qquad \mathbf{= 10x^2 + 3xy - 9xz - 18y^2 - 27yz - 7z^2}$

(vi) $(2a + 3b - 4c)\cdot(a - b - c)$

$\qquad = a\cdot(2a + 3b - 4c) - b\cdot(2a + 3b - 4c)$

$\qquad\qquad\qquad - c\cdot(2a + 3b - 4c)$

$= 2a^2 + 3ab - 4ac - 2ab - 3b^2 + 4bc$

$\qquad\qquad\qquad - 2ac - 3bc + 4c^2$

$= 2a^2 + 3ab - 2ab - 4ac - 2ac - 3b^2$

$+ 4bc - 3bc + 4c^2$

$= 2a^2 + ab - 6ac - 3b^2 + bc + 4c^2$

EXERCISE 19(D)

Question 1.
Divide :
   (i) $3a$ by a
   (ii) $15x$ by $3x$
  (iii) $16m$ by 4
  (iv) $20x^2$ by $5x$
   (v) $30p^2$ by $10p^2$
  (vi) $14a^3b^3$ by $2a^2$
 (vii) $18pqr^2$ by $3pq$
(viii) 100 by $50b$

Solution:

   (i) $3a \div a = \dfrac{3 \times a}{a} = \mathbf{3}$

  (ii) $15x \div 3x = \dfrac{3 \times 5 \times x}{3 \times x} = \mathbf{5}$

  (iii) $16m \div 4 = \dfrac{4 \times 4 \times m}{4} = \mathbf{4m}$

  (iv) $20x^2 \div 5x = \dfrac{4 \times 5 \times x^{2-1}}{5} = \mathbf{4x}$

   (v) $30p^2 \div 10p^2 = \dfrac{3 \times 10p^2}{10p^2} = \mathbf{3}$

  (vi) $14a^3b^3 \div 2a^2 = \dfrac{2 \times 7a^{3-2}b^3}{2} = \mathbf{7ab^3}$

 (vii) $18pqr^2 \div 3pq = \dfrac{3 \times 6.\, p \times q \times r^2}{3 \times p \times q} = \mathbf{6r^2}$

(viii) $100 \div 50b = \dfrac{2 \times 50}{50 \times b} = \dfrac{\mathbf{2}}{\mathbf{b}}$

Question 2.
Simplify :
  (i) $2x^5 \div x^2$
  (ii) $6a^8 \div 3a^3$
 (iii) $20xy \div -5xy$
 (iv) $-24a^2b^2c^2 \div 6ab$
  (v) $-5x^2y \div xy^2$
 (vi) $40p^3q^4r^5 \div 10p^3q$
(vii) $-64x^4y^3z \div 4x^3y^2z$
(viii) $35xy^5 \div 7x^2y^4$

Solution:

(i) $2x^5 \div x^2 = \dfrac{2x^5}{x^2}$

$= 2x^{5-2} = \mathbf{2x^3}$

(ii) $6a^8 \div 3a^3 = \dfrac{2 \times 3 \times a^{8-3}}{3} = \mathbf{2a^5}$

(iii) $20xy \div -5xy = \dfrac{4 \times 5 \times x \times y}{-5 \times x \times y} = \mathbf{-4}$

(iv) $-24a^2b^2c^2 \div 6ab$

$= \dfrac{-4 \times 6 \times a^{2-1}b^{2-1}c^2}{6} = \mathbf{-4abc^2}$

(v) $-5x^2y \div xy^2 = \dfrac{-5x^{2-1}}{y^{2-1}} = \mathbf{-\dfrac{5x}{y}}$

(vi) $40p^3q^4r^5 \div 10p^3q$

$= \dfrac{4 \times 10 \times p^{3-3} \cdot q^{4-1} \cdot r^5}{10}$

$= 4 \times q^{4-1} \times r^5 = \mathbf{4q^3 r^5}$

(vii) $-64x^4y^3z \div 4x^3y^2z$

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

$= -16x^{4-3}y^{3-2} = \mathbf{-16xy}$

(viii) $35xy^5 \div 7x^2y^4$

$= \dfrac{5 \times 7 \times y^{5-4}}{7 \times x^{2-1}} = \mathbf{\dfrac{5y}{x}}$

Question 3.
Divide :

(i) $-\dfrac{3m}{4}$ by $2m$

(ii) $-15p^6q^8$ by $-5p^6q^7$

(iii) $- 21m^5n^7$ by $14m^2n^2$

(iv) $36a^4x^5y^6$ by $4x^2a^3y^2$

(v) $20x^3a^6$ by $5xy$

(vi) $\dfrac{28a^2b^3}{c^2}$ by $4abc$

(vii) $\dfrac{2a^2}{9b^2}$ by $\dfrac{3b}{2a}$

(viii) $\dfrac{-5 \cdot 5x^2}{y}$ by $\dfrac{11x}{y}$

(ix) $\dfrac{64x^2y^2}{z^2}$ by $\dfrac{8xy}{z}$

Solution:

(i) $-\dfrac{3m}{4} \div 2m = \dfrac{-3 \times m}{4 \times 2 \times m} = -\dfrac{3}{8}$

(ii) $- 15p^6q^8 \div - 5p^6q^7 = \dfrac{-5 \times 3 \times p^6 \times q^8}{-5 \times p^6 \times q^7}$

$$= 3q^{8-7} = 3q$$

(iii) $- 21m^5n^7 \div 14m^2n^2$

$$= \dfrac{-3 \times 7 \times m^{5-2}n^{7-2}}{14} = -\dfrac{3}{2}m^3n^5$$

(iv) $36a^4x^5y^6 \div 4x^2a^3y^2$

$$= \dfrac{4 \times 9a^{4-3} \times x^{5-2} \times y^{6-2}}{4} = 9ax^3y^4$$

(v) $20x^3a^6 \div 5xy = \dfrac{4 \times 5x^3a^6}{5xy}$

$$= \dfrac{4 \times 5 \times x^{3-1} \times a^6}{5xy} = \dfrac{4x^2a^6}{y}$$

(vi) $\dfrac{28a^2b^3}{c^2} \div 4abc$

$$= \dfrac{4 \times 7 \times a^{2-1} \times b^{3-1}}{4 \times c^{2+1}} = \dfrac{7ab^2}{c^3}$$

(vii) $\dfrac{2a^2}{9b^2} \div \dfrac{3b}{2a} = \dfrac{2a^2}{9b^2} \times \dfrac{2a}{3b}$

$= \dfrac{2 \times 2 \times a^{2+1}}{9 \times 3b^{2+1}} = \dfrac{4a^3}{27b^3}$

(viii) $\dfrac{-5 \cdot 5x^2}{y} \div \dfrac{11x}{y} = \dfrac{-55x^2}{10y} \times \dfrac{y}{11x}$

$= -\dfrac{5x}{10} = -0 \cdot 5x$

(ix) $\dfrac{64x^2y^2}{z^2} \div \dfrac{8xy}{z}$

$= \dfrac{8 \times 8 \times x^2 \times y^2}{z^2} \times \dfrac{z}{8 \times x \times y}$

$= \dfrac{8x^{2-1}y^{2-1}}{z^{2-1}} = \dfrac{8xy}{z}$

Question 4.
Simplify :

(i) $\dfrac{-15m^5n^2}{-3m^5}$ (ii) $\dfrac{35x^4y^2}{-15x^2y^2}$

(iii) $\dfrac{-24x^6y^2}{6x^6y}$

Solution:

(i) $\dfrac{-15m^5n^2}{-3m^5} = \dfrac{-3 \times 5 \times m^5 \times n^2}{-3 \times m^5} = 5n^2$

(ii) $\dfrac{35x^4y^2}{-15x^2y^2} = \dfrac{-5 \times -7 \times x^4 \times y^2}{3 \times -5 \times x^2 \times y^2}$

$= \dfrac{-7x^{4-2}}{3} = -\dfrac{7x^2}{3}$

(iii) $\dfrac{-24x^6y^2}{6x^6y} = \dfrac{-4 \times 6 \times x^6 \times y^2}{6 \times x^6 \times y}$

$= -4y^{2-1} = -4y$

Question 5.
Divide :

(i) $9x^3 - 6x^2$ by $3x$

(ii) $6m^2 - 16m^3 + 10m^4$ by $-2m$

(iii) $15x^3y^2 + 25x^2y^3 - 36x^4y^4$ by $5x^2y^2$

(iv) $36a^3x^5 - 24a^4x^4 + 18a^5x^3$ by $-6a^3x^3$.

Solution:

(i) $9x^3 - 6x^2$ by $3x$

$$= \frac{9x^3 - 6x^2}{3x} = \frac{9x^3}{3x} - \frac{6x^2}{3x}$$

$$= 3x^{3-1} - 2x^{2-1}$$

$$= 3x^2 - 2x$$

(ii) $6m^2 - 16m^3 + 10m^4$ by $-2m$

$$= \frac{6m^2 - 16m^3 + 10m^4}{-2m}$$

$$= \frac{6m^2}{-2m} - \frac{6m^3}{-2m} + \frac{10m^4}{-2m}$$

$$= -3m^{2-1} + 8m^{3-1} - 5m^{4-1}$$

$$= -3m + 8m^2 - 5m^3$$

(iii) $15x^3y^2 + 25x^2y^3 - 36x^4y^4$ by $5x^2y^2$

$$= \frac{15x^3y^2 + 25x^2y^3 - 36x^4y^4}{5x^2y^2}$$

$$= \frac{15x^3y^2}{5x^2y^2} + \frac{25x^2y^3}{5x^2y^2} - \frac{36x^4y^4}{5x^2y^2}$$

$= 3x^{3-2}.y^{2-2} + 5x^{2-2}.y^{3-2}$

$$- \frac{36}{5}x^{4-2}.y^{4-2}$$

$= 3x^1 y^0 + 5x^0 y^1 - \frac{36}{5}x^2 y^2$

$= 3x + 5y - \frac{36}{5}x^2 y^2 \qquad (\because x^0 \text{ or } y^0 = 1)$

(iv) $36a^3 x^5 - 24a^4 x^4 + 18a^5 x^3$ by $-6a^3 x^3$

$$= \frac{36a^3 x^5 - 24a^4 x^4 + 18a^5 x^3}{-6a^3 x^3}$$

$$= \frac{36a^3 x^5}{-6a^3 x^3} - \frac{24a^4 x^4}{-6a^3 x^3} + \frac{18a^5 x^3}{-6a^3 x^3}$$

$= -6a^{3-3} x^{5-3} + 4a^{4-3} x^{4-3}$

$$- 3a^{5-3} x^{3-3}$$

$= -6a^0 x^2 + 4a^1 x^2 - 3a^2 x^0$

$= -6x^2 + 4ax - 3a^2 \qquad (\because x^0 \text{ or } y^0 = 1)$