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 $12x^2y + 18x^2y$ = $\mathbf{30x^2y}$

(iii) 7 + 16 = **23** and 7a + 16 b = **7a + 16b**

(iv) 1 + 3 = **4** and $x^2y + 3xy^2$ = $\mathbf{x^2y + 3xy^2}$

(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 $28ax^2 – 13a^2x$ = $\mathbf{28ax^2 – 13a^2x}$

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*) $2a + 3a + 4b$

$= (2 + 3)\ a + 4b$

$= \mathbf{5a + 4b}$

(*iv*) $3x + 2y = \mathbf{3x + 2y}$

(*v*) $5m + 3n + 4p = \mathbf{5m + 3n + 4p}$

(*vi*) $6a + 3a + 9ab$

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

$= \mathbf{9a + 9ab}$

(*vii*) $3p + 4q + 9q$

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

$= \mathbf{3p + 13q}$

(*viii*) $5ab + 4ba + 6b$

$= (5 + 4)\ ab + 6b$

$= \mathbf{9ab + 6b}$

(*ix*) $50pq + 30pq + 10pr$

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

$= \mathbf{80pq + 10pr}$

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

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

$= \mathbf{-6y}$

(*xi*) $(-3b) + (-b)$

$= -(3 + 1)b$

$= \mathbf{-4b}$

(*xii*) $5b + (-4b) + (-10b)$

$= 5b - (4 + 10)b$

$= 5b - 14b = \mathbf{-9b}$

(*xiii*) $(-2c) + (-c) + (-5c)$

$= -(2 + 1 + 5)c = \mathbf{-8c}$

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

$= 6a - 8a = \mathbf{-2a}$

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

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

$= 6b - 4b = \mathbf{2b}$

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

$= 3x + 7x - 2x - 4x$

$= (3 + 7).x - (2 + 4).x$

$= 10x - 6x = \mathbf{4x}$

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

$= 5ab + 2ab + ab - 6ab$

$= 8ab - 6ab = 2ab$

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

$= 8x - 3x + 10y - 5y$

$= \mathbf{5x + 5y}$

Question 5.

Evaluate :

(i) $-7x + 9x + 2x - 2x$

(ii) $5ab - 2ab - 8ab + 6ab$

(iii) $\mathbf{-8a - 3a + 12a + 13a - 6a}$

(iv) $19abc - 11abc - 12abc + 14abc$

Solution:

(i) $-7x + 9x + 2x - 2x$

$= 9x + 2x - 7x - 2x$

$= 11x - 9x = \mathbf{2x}$

(ii) $5ab - 2ab - 8ab + 6ab$

$= 5ab + 6ab - 2ab - 8ab$

$= 11ab - 10ab = \mathbf{ab}$

(iii) $\mathbf{-8a - 3a + 12a + 13a - 6a}$

$\mathbf{= 12a + 13a - (8a + 3a + 6a)}$

$\mathbf{= 25a - 17a = 8a}$

(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*) $4{\cdot}8b, 6{\cdot}8b$

(*iii*) $3{\cdot}5abc, 10{\cdot}5abc$

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

Solution:

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

(*ii*) $6{\cdot}8b - 4{\cdot}8b = \mathbf{2b}$

(*iii*) $10{\cdot}5abc - 3{\cdot}5abc = \mathbf{7abc}$

(*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*) $6 \cdot 4a + 5 \cdot 3b - 2 \cdot 4a - 2 \cdot 2b$

(*xii*) $2 \cdot 5a + 4 \cdot 6b + 1 \cdot 2a - 3 \cdot 6b$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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*) $(3a + 4b + 7c) + (-5a + 3b - 6c)$
$+ (4a - 2b - 4c)$

$= 3a + 4b + 7c - 5a + 3b - 6c$
$+ 4a - 2b - 4c$

$= 3a + 4a - 5a + 4b + 3b - 2b$
$+ 7c - 6c - 4c$

$= 7a - 5a + 7b - 2b + 7c - 10c$

$= \mathbf{2a + 5b - 3c}$

(*ii*) $(2x^2 + xy - y^2) + (-x^2 + 2xy + 3y^2)$
$+ (3x^2 - 10xy + 4y^2)$

$= 2x^2 + xy - y^2 - x^2 + 2xy + 3y^2$
$+ 3x^2 - 10xy + 4y^2$

$= 2x^2 + 3x^2 - x^2 + xy + 2xy - 10xy$
$+ 3y^2 + 4y^2 - y^2$

$= 5x^2 - x^2 + 3xy - 10xy + 7y^2 - y^2$

$= \mathbf{4x^2 - 7xy + 6y^2}$

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

$= x^2 - x + 1 - 5x^2 + 2x - 2 + 3x^2$
$- 3x + 1$

$= x^2 + 3x^2 - 5x^2 + 2x - x - 3x + 1 + 1 - 2$

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

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

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

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

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

$= \mathbf{2a^2 + 2ab - bc}$

(v) $(4x^2 + 7 - 3x) + (4x - x^2 + 8)$

$+ (-10 + 5x - 2x^2)$

$= 4x^2 + 7 - 3x + 4x - x^2 + 8$

$- 10 + 5x - 2x^2$

$= 4x^2 - x^2 - 2x^2 + 7 + 8 - 10$

$+ 4x + 5x - 3x$

$= 4x^2 - 3x^2 + 15 - 10 + 9x - 3x$

$= \mathbf{x^2 + 5 + 6x}$

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

$+ (3y^2 - xy + 6x)$

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

$+ 3y^2 - xy + 6x$

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

$+ 2y^2 + 3y^2 - y^2$

$= 9x - 4x + 5xy - xy + 5y^2 - y^2$

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

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*) $(-17x^2-2xy+23y^2)+(-9y^2+15x^2+7xy)$
$+(13x^2+3y^2-4xy)$

$=-17x^2-2xy+23y^2-9y^2+15x^2$
$+7xy+13x^2+3y^2-4xy$

$=-17x^2+15x^2+13x^2-2xy-4xy$
$+7xy+23y^2+3y^2-9y^2$

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

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

$=-x^2-3xy+3y^2+8+3x^2-5y^2-3$
$+4xy-6xy+2x^2-2+y^2$

$=-x^2+3x^2+2x^2-3xy-6xy+4xy$
$+3y^2+y^2-5y^2+8-3-2$

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

(*iii*) $(a^3-2b^3+a)+(b^3-2a^3+b)$
$+(-2b+2b^3-5a+4a^3)$

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

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

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

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

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

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

$= \mathbf{-4a - b - 4c.}$

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

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

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

$= \mathbf{8x + 13y - 24z.}$

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

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

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

$= \mathbf{6a - 3b - 2c - 5.}$

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

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

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

$= \mathbf{9x + 11y - 18z.}$

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

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

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

$+ ac + 2bd$

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

$+ ac + bd + 2bd$

$= \mathbf{-ab - 3cd + 3ac + 3bd}$

Question 5.

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

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

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

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

Solution:

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

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

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

$= \mathbf{2ab}$

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

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

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

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

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

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

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

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

[Since L.C.M. = 6]

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

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

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

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

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

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:

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

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:

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

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 $5x^2 - 3y^2$. If one of them is $3x^2 + 4xy - y^2$, find the other.

Solution:

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

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:

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

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

(ii) $6 \times 3 = \mathbf{18}$ and $6x^2 \times 3x^3$
$= 6 \times 3 \times x^2 \times x^3 = \mathbf{18x^5}$

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

(iv) $4 \times 7 = \mathbf{28}$ and $4ax \times 7x$
$= 4 \times 7 \times a \times x \times x = \mathbf{28ax^2}$

(v) $6 \times 2 = \mathbf{12}$ and $6xy \times 2xy$
$= 6 \times 2 \times x \times x \times y \times y = \mathbf{12x^2y^2}$

(vi) $12 \times 4 = \mathbf{48}$ and $12ax^2 \times 4ax$
$= 12 \times 4 \times a \times a \times x^2 \times x$
$= \mathbf{48a^2x^3}$

(vii) $1 \times 8 = \mathbf{8}$ and $a^2xy^2 \times 8a^3x^2y$
$= 1 \times 8 \times a^2 \times a^3 \times x \times x^2 \times y^2 \times y$
$= \mathbf{8a^5x^3y^3}$

(viii) $15 \times 3 = \mathbf{45}$ and $15x \times 3x^5y^2$
$= 15 \times 3 \times x \times x^5 \times y^2$
$= \mathbf{45x^6y^2}$

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*) $4x \times 6x \times 2 = 4 \times 6 \times 2 \times x \times x$

$= \mathbf{48x^2}$

(*ii*) $3ab \times 6ax = 3 \times 6 \times a \times a \times b \times x$

$= \mathbf{18a^2bx}$

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

$= \mathbf{6x^6}$

(*iv*) $5 \times 5a^3 = \mathbf{25a^3}$

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

$= \mathbf{216x^4y^2}$

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

$= \mathbf{24x^2}$

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

$= \mathbf{75x^3}$

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

$= 8 \times -4 \times 3 \times x^{1+3}y^{2+2}$

$= \mathbf{-96x^4y^4}$

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

$= -4 \times 5 \times 3 \times x^{1+1} \times y \times z$

$= \mathbf{-60x^2yz}$

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

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

$= \mathbf{-140x^6y^6}$

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*) $(a + b) \times ab = a \cdot ab + b \cdot ab$

$= \mathbf{a^2b + ab^2}$

(*ii*) $(3ab - 4b) \times 3ab = 3ab \times 3ab - 4b \times 3ab$

$= 3 \times 3a^{1+1}b^{1+1} - 4 \times 3 \times a \times b^{1+1}$

$= \mathbf{9a^2b^2 - 12ab^2}$

(*iii*) $(2xy - 5by) \times 4bx = 2xy \cdot 4bx - 5by \cdot 4bx$

$= \mathbf{8bx^2y - 20b^2xy}$

(*iv*) $(4x + 2y) \times 3xy = 4x.3xy + 2y \cdot 3xy$

$= 12x^2y + 6xy^2$

(*v*) $(x^2 - x) \times 2x = x^2.2x - x \cdot 2x$

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

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

$= \mathbf{x + 4x^2}$

(*vii*) $(9xy^2 + 3x^2y) \times 5xy$

$= 9xy^2 \cdot 5xy + 3x^2y \cdot 5xy$

$= \mathbf{45x^2y^3 + 15x^3y^2}$

(*viii*) $(6x - 5y) \times 3axy$

$= 6x \cdot 3axy - 5y \cdot 3axy$

$= \mathbf{18ax^2y - 15axy^2}$

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

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

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

$= \mathbf{x^3y^2z^2 - x^2y^2z^3}$

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

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

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

$= \mathbf{-4xy^3z^2 - 6xy^3z}$

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

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

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

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

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

$= \mathbf{-4x^3y^2 - 12x^3y^3}$

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*) $(x + 2)\cdot(x + 10)$

$= x\cdot(x + 2) + 10\cdot(x + 2)$

$= x^2 + 2x + 10x + 20$

$= \mathbf{x^2 + 12x + 20}$

(*ii*) $(x + 5)\cdot(x - 3)$

$= x\cdot(x + 5) - 3\cdot(x + 5)$

$= x^2 + 5x - 3x - 15$

$= \mathbf{x^2 + 2x - 15}$

(*iii*) $(x - 5)\cdot(x + 3) = x\cdot(x - 5) + 3\cdot(x - 5)$

$= x^2 - 5x + 3x - 15$

$= \mathbf{x^2 - 2x - 15}$

(*iv*) $(x - 5)\cdot(x - 3) = x\cdot(x - 5) - 3\cdot(x - 5)$

$= x^2 - 5x - 3x + 15$

$= \mathbf{x^2 - 8x + 15}$

(*v*) $(2x + y)\cdot(x + 3y)$

$= x\cdot(2x + y) + 3y\,(2x + y)$

$= 2x^2 + xy + 6xy + 3y^2$

$= \mathbf{2x^2 + 7xy + 3y^2}$

(*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*) $(x + 9y)\cdot(x - 5y)$

$= x\cdot(x + 9y) - 5y\,(x + 9y)$

$= x^2 + 9xy - 5xy - 45y^2$

$= \mathbf{x^2 + 4xy - 45y^2}$

(*viii*) $(2x + 5y)\cdot(2x + 5y)$

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

$= 4x^2 + 10xy + 10xy + 25y^2$

$= \mathbf{4x^2 + 20xy + 25y^2}$

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

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

$= \mathbf{-15a^3b^3c^2}$

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

$= \mathbf{-2x^2 + 2xy - 2xz}$

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

$= \mathbf{-4xy + 6y^2 + 10yz}$

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

$= \mathbf{-8x^2y^2z^2 + 10x^3y^2z^4}$

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

$= \mathbf{-13x^2y^3z^2 + 15x^3y^2z^2 - 6x^2y^2z^3}$

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

$= \mathbf{-8a^2b^2c^3 + 10a^3b^2c^3 + 12a^2b^3c^3}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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*) $3a \div a = \dfrac{3 \times a}{a} = 3$

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

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

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

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

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

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

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

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

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

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

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

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

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

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) $\frac{28a^2b^3}{c^2}$ by $4abc$

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

(viii) $\frac{-5\cdot5x^2}{y}$ by $\frac{11x}{y}$

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

Solution:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$= -\frac{5x}{10} = \mathbf{-0{\cdot}5x}$

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

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

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

Question 4.

Simplify :

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

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

Solution:

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

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

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

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

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

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 $5x^2y^2$

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

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

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

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

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

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

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

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

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

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

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