

Question 1.

Find the value of the following:

(i) 4^3

(ii) $(-6)^4$

(iii) $\left(\frac{2}{3}\right)^4$

(iv) $(-2)^3 \times 5^2$

Solution:

(i) $4^3 = 4 \times 4 \times 4 = 64$

(ii) $(-6)^4 = (-6) \times (-6) \times (-6) \times (-6) = 1296$

(iii) $\left(\frac{2}{3}\right)^4 = \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}$
 $= \frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{16}{81}$

(iv) $(-2)^3 \times 5^2$

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

$= (-8) \times 25 = -200$

Question 2.

Find the value of:

(i) $3x + 2y$ when $x = 3$ and $y = 2$

(ii) $5x - 3y$ when $x = 2$ and $y = -5$

(iii) $a + 2b - 5c$ when $a = 2$, $b = -3$ and $c = 1$

(iv) $2p + 3q + 4r + pqr$ when $p = -1$, $q = 2$ and $r = 3$

(v) $3ab + 4bc - 5ca$ when $a = 4$, $b = 5$ and $c = -2$.

Solution:

(i) $3x + 2y$, $x = 3$, $y = 2$

$(3 \times 3) + (2 \times 2) = 9 + 4 = 13$

(ii) $5x - 3y$, $x = 2$, $y = -5$

$(5 \times 2) - (3 \times -5) = 10 + 15 = 25$

(iii) $a + 2b - 5c$, $a = 2$, $b = -3$, $c = 1$

$2 + (2 \times -3) - 5 \times (1)$

$= 2 - 6 - 5 = -9$

(iii) $a + 2b - 5c$, $a = 2, b = -3, c = 1$

$$2 + (2 \times -3) - 5 \times (1)$$

$$= 2 - 6 - 5 = -9$$

(iv) $2p + 3q + 4r + pqr$, $p = -1, q = 2, r = 3$

$$= (2 \times -1) + (3 \times 2) + (4 \times 3) + (-1) \times 2 \times 3$$

$$= -2 + 6 + 12 - 6 = 10$$

(v) $3ab + 4bc - 5ca$, $a = 4, b = 5, c = -2$ $(3 \times 4 \times 5) + (4$

$$\times 5 \times -2) - 5 \times -2 \times 4$$

$$= 60 - 40 + 40 = 60$$

Question 3.

Find the value of:

(i) $2x^2 - 3x + 4$ when $x = 2$

(ii) $4x^3 - 5x^2 - 6x + 7$ when $x = 3$

(iii) $3x^3 + 9x^2 - x + 8$ when $x = -2$

(iv) $2x^4 - 5x^3 + 7x - 3$ when $x = -3$

Solution:

(i) $2x^2 - 3x + 4$, $x = 2$

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

$$= 8 - 6 + 4 = 6$$

(ii) $4x^3 - 5x^2 - 6x + 7$, $x = 3$

$$= 4(3)^3 - 5(3)^2 - 6(3) + 7$$

$$= 108 - 45 - 18 + 7 = 52$$

(iii) $3x^3 + 9x^2 - x + 8$, $x = -2$

$$= 3(-2)^3 + 9(-2)^2 - (-2) + 8$$

$$= -24 + 36 + 2 + 8 = 22$$

(iv) $2x^4 - 5x^3 + 7x - 3$, $x = -3$

$$= 2(-3)^4 - 5(-3)^3 + 7(-3) - 3$$

$$= 162 + 135 - 21 - 3 = 273$$

Question 4.

If $x = 5$, find the value of:

(i) $6 - 7x^2$

(ii) $3x^2 + 8x - 10$

(iii) $2x^3 - 4x^2 - 6x + 25$

Solution:

(i) $6 - 7x^2 = 6 - 7(5)^2 = 6 - 7(25)$

$= 6 - 175 = -169$

(ii) $3(5)^2 + 8(5) - 10$

$= 3(25) + 40 - 10$

$= 75 + 40 - 10 = 75 + 30 = 105$

(iii) $2(5)^3 - 4(5)^2 - 6(5) + 25$

$= 2(125) - 4(25) - 30 + 25$

$= 250 - 100 - 30 + 25 = 145$

Question 5.

If $x = 2$, $y = 3$ and $z = -1$, find the values of:

(i) $x + y$

(ii) $\frac{xy}{z}$

(iii) $\frac{2x+3y-4z}{3x-z}$

Solution:

(i) $x + y$

$x = 2, y = 3$

$2 + 3 = \frac{2}{3}$

(ii) $\frac{xy}{z} = \frac{2 \times 3}{-1} = -6$

(iii) $\frac{2x+3y-4z}{3x-z}$

$$= \frac{2 \times 2 + 3 \times 3 - 4 \times (-1)}{3 \times 2 - (-1)}$$

$$= \frac{4 + 9 + 4}{6 + 1} = \frac{17}{7} = 2\frac{3}{7}$$

Question 6.

If $a = 2$, $b = 3$ and $c = -2$, find the value of $a^2 + b^2 + c^2 - 2ab - 2bc - 2ca + 3abc$.

Solution:

$$a = 2, b = 3, c = -2$$

$$a^2 + b^2 + c^2 - 2ab - 2bc - 2ca + 3abc$$

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

$$= 4 + 9 + 4 - 12 + 12 + 8 - 36$$

$$= 25 - 36 = -11$$

Question 7.

If $p = 4$, $q = -3$ and $r = 2$, find the value of: $p^3 + q^3 - r^3 - 3pqr$.

Solution:

$$p = 4, q = -3, r = 2$$

$$p^3 + q^3 - r^3 - 3pqr$$

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

$$= 64 - 27 - 8 + 72$$

$$= 136 - 35 = 101$$

Question 8.

If $m = 1$, $n = 2$ and $p = -3$, find the value of $2mn^4 - 15m^2n + p$.

Solution:

$$m = 1, n = 2, p = -3$$

$$2mn^4 - 15m^2n + p$$

$$= 2(1)(2)^4 - 15(1)^2(2) + (-3)$$

$$= 32 - 30 - 3 = -1$$

Question 9.

State true or false:

(i) The value of $3x - 2$ is 1 when $x = 0$.

(ii) The value of $2x^2 - x - 3$ is 0 when $x = -1$.

(iii) $p^2 + q^2 - r^2$ when $p = 5$, $q = 12$ and $r = 13$.

(iv) $16 - 3x = 5x$ when $x = 2$.

Solution:

(i) The value of $3x - 2$ is 1 when $x = 0$. False

Correct :

$$\because 3 \times 0 - 2 = -2$$

(ii) The value of $2x^2 - x - 3$ is 0 when $x = -1$. True

$$2(-1)^2 - (-1) - 3$$

$$= 2 + 1 - 3 = 0$$

(iii) $p^2 + q^2 = r^2$ when $p = 5$, $q = 12$ and $r = 13$. True

$$(5)^2 + (12)^2 = (13)^2$$

$$= 25 + 144 = 169$$

$$\Rightarrow 169 = 169$$

(iv) $16 - 3x = 5x$ when $x = 2$. True

$$16 - 3x^2 = 5x^2$$

$$16 - 6 = 10$$

$$\Rightarrow 10 = 10$$

Question 10.

For $x = 2$ and $y = -3$, verify the following:

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

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

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

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

(v) $(x + y)^3 = x^3 + y^3 + 3x^2y + 3xy^2$

Solution:

$x = 2, y = -3$

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

L.H.S. $= (x + y)^2 = (2 - 3)^2 = (-1)^2 = 1$

R.H.S. $= x^2 + 2xy + y^2$

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

$= 4 - 12 + 9 = 13 - 12 = 1$

L.H.S. $=$ R.H.S.

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

L.H.S. $= (x - y)^2 = [2 - (-3)]^2$

$= (2 + 3)^2 = (5)^2 = 25$

R.H.S. $= x^2 - 2xy + y^2$

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

$= 4 + 12 + 9 = 25$

$\therefore$ L.H.S. $=$ R.H.S.

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

L.H.S. $= (x)^2 - (y)^2 = (2)^2 - (-3)^2$

$= 4 - 9 = -5$

R.H.S. $= (x + y)(x - y)$

$= (2 - 3) [2 - (-3)]$

$= (2 - 3) (2 + 3) = -1 \times 5 = -5$

$\therefore$ L.H.S. $=$ R.H.S.

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

$$\text{L.H.S.} = (x + y)^2 = [2 + (-3)]^2$$

$$= (2 - 3)^2 = (-1)^2 = 1$$

$$\text{R.H.S.} = (x - y)^2 + 4xy$$

$$= [2 - (-3)]^2 + 4 \times 2 \times (-3)$$

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

$$= (5)^2 - 24 = 25 - 24 = 1$$

$$\therefore \text{L.H.S.} = \text{R.H.S.}$$

$$(v) (x + y)^3 = x^3 + y^3 + 3x^2y + 3xy^2$$

$$\text{L.H.S.} = (x + y)^3 = [2 + (-3)]^3 = (2 - 3)^3$$

$$= (-1)^3 = (-1) \times (-1) \times (-1) = -1$$

$$\text{R.H.S.} = x^3 + y^3 + 3x^2y + 3xy^2$$

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

$$= 8 - 27 + 3 \times 4 \times (-3) + 6(9)$$

$$= 8 - 27 - 36 + 54 = 62 - 63 = -1$$

$$\therefore \text{L.H.S.} = \text{R.H.S.}$$