9th

Ex. 2.5

PAGE NO.:

DATE: / /20

Q.5 गुणनखंड कीजिए :-

(I) $4x^2 + 9y^2 + 16z^2 + 12xy - 24yz - 16zx$

$= (2x)^2 + (3y)^2 + (-4z)^2 + 12xy - 24yz - 16zx$

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

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

$= (2x + 3y - 4z)(2x + 3y - 4z)$ Ans

(II) $2x^2 + y^2 + 8z^2 - 2\sqrt{2}xy + 4\sqrt{2}yz - 8zx$

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

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

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

PAGE NO.:
DATE: / /20

6. (I) $(2x+1)^3$

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

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

$= 2^3x^3+1+3\times 4x^2+6x$

$= 8x^3+1+12x^2+6x$

(II) $(2a-3b)^3$

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

$\therefore (2a-3b)^3 = (2a)^3-(3b)^3-3\times(2a)^2\times 3b + 3\times 2a\times(3b)^2$

$= 2^3a^3-3^3b^3-3\times 4a^2\times 3b+6a\times 9b^2$

$= 8a^3-27b^3-36a^2b+54ab^2$

(III) $\left(\frac{3}{2}x+1\right)^3$

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

$= \frac{3\times3\times3}{2\times2\times2}x^3+1+3\times\frac{3\times3}{2\times2}x^2+\frac{9}{2}x$

$= \frac{27}{8}x^3+1+\frac{27}{2}x^2+\frac{9}{2}x$

PAGE NO.:
DATE: / /20

(IV) $\left(x - \frac{2}{3}y\right)^2$

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

$= x^3 - \frac{2\times2\times2}{3\times3\times3}y^3 - \frac{3\times2}{3}x^2y + 3\times x \times \frac{2\times2}{3\times3}xy^2$

$= x^3 - \frac{8}{27}y^3 - \frac{6}{3}x^2y + \frac{12}{9}xy^2$

7. (I) $(99)^3 = (100-1)^3$
$(a-b)^3 = a^3 - b^3 - 3a^2b + 3ab^2$

$\therefore (100-1)^3 = (100)^3 - (1)^3 - 3 \times (100)^2 \times 1 + 3 \times 100 \times (1)^2$

$= 100 \times 100 \times 100 - 1 - 3 \times 100 \times 100 + 300 \times 1$
$= 1000000 - 1 - 30000 + 300$
$= 970299$ ਉੱਤਰ

ਇਸੇ ਤਰ੍ਹਾਂ ਹੀ ਇਹ ਸਵਾਲ ਹੱਲ ਕਰਕੇ ਦੇਖੋ :-

(II) $(102)^3 = (100+2)^3$

(III) $(998)^3 = (1000-1)^3$

Ex 2.5 Class 9 Maths Question 7

Evaluate the following using suitable:(i) $(99)^3$ (ii) $(102)^3$ (iii) $(998)^3$

Solution:

(i) $(99)^3 = (100 -1)^3 = (100)^3+(1)^3 - 3(100)(1)(100 -1)$ .....Using Identity VII

$= 1000000 - 1 - 300(100 - 1) = 1000000 - 1 - 30000 + 300$

$= 970299$

(ii) $(102)^3 = (100 + 2)^3 = (100)^3 + (2)^3 + 3(100)(2)(100 +2)$ .....Using Identity VI

$= 1000000 + 8 +(600(100 +2) = 1000000 + 8 + 60000+ 1200$

$= 1061208$

(iii) $(998)^3 = (1000 - 2)^3$

$= (1000)^3 - (2)^2 - 3(1000)(2)(1000 - 2)$ ..... Using Identity VII

$= 1000000000 - 8 - 6000(1000 - 2)$

$= 1000000000 - 8 - 6000000 + 12000$

$= 994011992.$

8 **(i)** $8a^3 + b^3 + 12a^2b + 6ab^2$ **(ii)** $8a^3 - b^3 - 12a^2b + 6ab^2$

(iii) $27 - 125a^3 - 135a + 225a^2$ **(iv)** $64a^3 - 27b^3 - 144a^2b + 108ab^2$

(v) $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

Solution:

(i) $8a^3 + b^3 + 12a^2b + 6ab^2 = (2a)^3 + (b)^3 + 3(2a)(b)(2a + b)$

$= (2a + b)^3$

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

(ii) $8a^3 - b^3 - 12a^2b + 6ab^2 = (2a)^3 - (b)^3 - 3(2a)(b)(2a - b)$

$= (2a - b)^3$ ..... (Using Identity VII)

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

(iii) $27 - 125a^3 - 135a + 225a^2 = 27 - 125a^3 - 135a + 225a^2$

$= (3)^3 - (5a)^3 - 3(3)(5a)(3 - 5a)$

$= (3 - 5a)^3$

$= (3 - 5a)(3 - 5a)(3 - 5a)$

(iv) $64a^3 - 27b^3 - 144a^2 + 108ab^2 = (4a)^3 - (3b)^3 - 3(4a)(3b)(4a - 3b)$

$= (4a - 3b)^3$ .....(Using Identity VII)

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

(v) $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p = (3p)^3 - \left(\frac{1}{6}\right)^3 - 3(3p)\left(\frac{1}{6}\right)\left(3p - \frac{1}{6}\right)$

$= \left(3p - \frac{1}{6}\right)^3$ .....(Using Identity VII)

$= \left(3p - \frac{1}{6}\right)\left(3p - \frac{1}{6}\right)\left(3p - \frac{1}{6}\right)$

Ex 2.5 Class 9 Maths Question 9

Verify: (i) $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$ (ii) $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$.

Solution:

(i) We know that

$(x + y)^3 = x^3 + y^3 + 3xy(x + y)$ ..... Using Identity VI

$\Rightarrow x^3 + y^3 = (x + y)^3 - 3xy(x + y) \Rightarrow x^3 + y^3 = (x + y)[(x + y)^2 - 3xy)$

$\Rightarrow x^3 + y^3 = (x + y)(x^2 + 2xy + y^2 - 3xy)$ ..... (Using Identity I)

$\Rightarrow x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

(ii) We know that

$(x - y)^3 = x^3 - y^3 - 3xy(x - y)$ (Using Identity VII)

$\Rightarrow x^3 - y^3 = (x - y)^3 + 3xy(x - y) \Rightarrow x^3 - y^3 = (x - y)[(x - y)^2 + 3xy)$

$\Rightarrow x^3 - y^3 = (x - y)(x^2 - 2xy + y^2 + 3xy)$ ..... (Using Identity I)

$\Rightarrow x^3 + y^3 = (x - y)(x^2 + xy + y^2)$

Ex 2.5 Class 9 Maths Question 10

Factorise each of the following:

(i) $27y^3 + 125z^3$ (ii) $64m^3 - 343n^3$.

Solution:

(i) $27y^3 + 125z^3$

$27y^3 + 125z^3 = (3y)^3 + (5z)^3 = (3y + 5z)\{(3y)^2 - (3y)(5z) + (5z)^2\}$

$= (3y + 5z)(9y^2 - 15yz + 25z^2)$

(ii) $64m^3 - 343n^3$

$64m^3 - 343n^3 = (4m)^3 - (7n)^3 = (4m - 7n)\{(4m)^2 + (4m)(7n) + (7n)^2\}$

$= (4m - 7n)(16m^2 + 28mn + 49n^2)$.

Ex 2.5 Class 9 Maths Question 11

Factorise : $27x^3 + y^3 + z^3 - 9xyz$.

Solution:

$27x^3 + y^3 + z^3 - 9xyz = (3x)^3 + (y)^3 + (z)^3 - 3(3x)(y)(z)$

$= \{(3x)^2 + (y)^2 + (z)^2 - (3x)(y) - (y)(z) - (z)(3x)\}$ (Using Identity VIII)

$= (3x + y + z)\ (9x^2 + y^2 + z^2 - 3xy - yz - 3zx)$.

Ex 2.5 Class 9 Maths Question 12

Verify that $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$.

Solution:

L.H.S.

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$.....(Using Identity VIII)

$= \frac{1}{2}(x+ y + z)\{2(x^2 + y^2 + z^2 -xy - yz - zx)\}$

$= \frac{1}{2}(x + y + z)(2x^2 + 2y^2 + 2z^2 - 2xy -2yz - 2zx)$

$= \frac{1}{2}(x + y + z)\{(x^2 - 2xy + y^2) + (y^2- 2yz + z^2) + (z^2 -2zx + x^2)\}$

$= \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$.....(Using Identity II)

13 If $x + y + z = 0$, show that $x^3 + y^3 + z^3 = 3xyz$

Solution:

We know that

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$ (Using Identity VIII)

$= (0)(x^2 + y^2 + z^2 - xy - yz - zx)$ ($\because x + y + z = 0$)

$= 0$

$\Rightarrow x^3 + y^3 + z^3 = 3xyz$

14 Without actually calculating the cubes, find the value of each of the following:

(i) $(- 12)^3 + (7)^3 + (5)^3$ (ii) $(28)^3 + (-15)^3 + (-13)^3$.

Solution:

(i) $(-12)^3 + (7)^3 + (5)^3$

$(-12)^3+(7)^3+(5)^3 = 0 + 3(-12)(7)(5)$ .....($\because (- 12) + (7) + (5) = 0$) Using identity VIII

$= -1260$

(ii) $(28)^3+(-15)^3+(-13)^3 = 0 + 3(28)(-15)(-13)$..... ($\because (28)+(-15)+(-13) = 0$) - Using identity VIII

$= 16380$