



## Algebraic Identities Ex 4.5 Q1

**Answer :**

In the given problem, we have to find Product of equations

(i) Given  $(3x + 2y + 2z)(9x^2 + 4y^2 + 4z^2 - 6xy - 4yz - 6zx)$

We shall use the identity

$$\begin{aligned} x^3 + y^3 + z^3 - 3xyz &= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx) \\ &= (3x)^3 + (2y)^3 + (2z)^3 - 3(3x)(2y)(2z) \\ &= (3x) \times (3x) \times (3x) + (2y) \times (2y) \times (2y) + (2z) \times (2z) \times (2z) - 3(3x)(2y)(2z) \\ &= 27x^3 + 8y^3 + 8z^3 - 36xyz \end{aligned}$$

Hence the product of  $(3x + 2y + 2z)(9x^2 + 4y^2 + 4z^2 - 6xy - 4yz - 6zx)$  is  $\boxed{27x^3 + 8y^3 + 8z^3 - 36xyz}$

(ii) Given  $(4x - 3y + 2z)(16x^2 + 9y^2 + 4z^2 + 12xy + 6yz - 8zx)$

We shall use the identity

$$\begin{aligned} x^3 + y^3 + z^3 - 3xyz &= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx) \\ &= (4x)^3 + (3y)^3 + (2z)^3 - 3(4x)(3y)(2z) \\ &= (4x) \times (4x) \times (4x) + (-3y) \times (-3y) \times (-3y) + (2z) \times (2z) \times (2z) - 3(4x)(-3y)(2z) \\ &= 64x^3 - 27y^3 + 8z^3 + 72xyz \end{aligned}$$

Hence the product of  $(4x - 3y + 2z)(16x^2 + 9y^2 + 4z^2 + 12xy + 6yz - 8zx)$  is

$$\boxed{64x^3 - 27y^3 + 8z^3 + 72xyz}$$

(iii) Given  $(2a - 3b - 2c)(4a^2 + 9b^2 + 4c^2 + 6ab - 6bc + 8ca)$

We shall use the identity

$$\begin{aligned} x^3 + y^3 + z^3 - 3xyz &= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx) \\ &= (2a)^3 + (3b)^3 + (2c)^3 - 3(2a)(3b)(2c) \\ &= (2a) \times (2a) \times (2a) + (-3b) \times (-3b) \times (-3b) + (-2c) \times (-2c) \times (-2c) - 3(2a)(-3b)(-2c) \\ &= 8a^3 - 27b^3 - 8c^3 - 36abc \end{aligned}$$

Hence the product of  $(2a - 3b - 2c)(4a^2 + 9b^2 + 4c^2 + 6ab - 6bc + 8ca)$  is  $\boxed{8a^3 - 27b^3 - 8c^3 - 36abc}$

(iv) Given  $(3x - 4y + 5z)(9x^2 + 16y^2 + 25z^2 + 12xy - 15zx + 20yz)$

We shall use the identity

$$\begin{aligned} x^3 + y^3 + z^3 - 3xyz &= (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx) \\ &= (3x)^3 + (-4y)^3 + (5z)^3 - 3(3x)(-4y)(5z) \\ &= (3x) \times (3x) \times (3x) + (-4y) \times (-4y) \times (-4y) + (5z) \times (5z) \times (5z) - 3(3x)(-4y)(5z) \\ &= 27x^3 - 64y^3 + 125z^3 + 180xyz \end{aligned}$$

Hence the product of  $(3x - 4y + 5z)(9x^2 + 16y^2 + 25z^2 + 12xy - 15zx + 20yz)$  is

$$\boxed{27x^3 - 64y^3 + 125z^3 + 180xyz}$$

## Algebraic Identities Ex 4.5 Q2

**Answer :**

In the given problem, we have to find value of  $x^3 + y^3 + z^3 - 3xyz$

Given  $x + y + z = 8, xy + yz + zx = 20$

We shall use the identity

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$$

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(20)$$

$$64 = x^2 + y^2 + z^2 + 40$$

$$64 - 40 = x^2 + y^2 + z^2$$

$$24 = x^2 + y^2 + z^2$$

We know that

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

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x^2 + y^2 + z^2) - (xy + yz + zx)]$$

Here substituting  $x + y + z = 8, xy + yz + zx = 20, x^2 + y^2 + z^2 = 24$  we get

$$x^3 + y^3 + z^3 - 3xyz = 8[(24 - 20)]$$

$$= 8 \times 4$$

$$= 32$$

Hence the value of  $x^3 + y^3 + z^3 - 3xyz$  is  $\boxed{32}$ .

Algebraic Identities Ex 4.5 Q3

**Answer :**

In the given problem, we have to find value of  $a^3 + b^3 + c^3 - 3abc$

Given  $a + b + c = 9, ab + bc + ca = 26$

We shall use the identity

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(26)$$

$$(9)^2 = a^2 + b^2 + c^2 + 52$$

$$81 - 52 = a^2 + b^2 + c^2$$

$$29 = a^2 + b^2 + c^2$$

We know that

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

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)[(a^2 + b^2 + c^2) - (ab + bc + ca)]$$

Here substituting  $a + b + c = 9, ab + bc + ca = 26, a^2 + b^2 + c^2 = 29$  we get,

$$a^3 + b^3 + c^3 - 3abc = 9[(29 - 26)]$$

$$= 9 \times 3$$

$$= 27$$

Hence the value of  $a^3 + b^3 + c^3 - 3abc$  is  $\boxed{27}$ .

\*\*\*\*\* END \*\*\*\*\*