# POLYNOMIALS

## 📥 TRY YOURSELF

### SOLUTIONS

1. (i)  $2\sqrt{2}y^5 + 3y^4$  is a polynomial in *y*, since exponent of *y* in each term is a whole number.

(ii)  $2\sqrt{x} + x\sqrt{2}$  can be written as  $2x^{1/2} + \sqrt{2}x$ . Here, the exponent of variable in  $2x^{1/2}$  is 1/2, which is not a whole number. Therefore, the given expression is not a polynomial.

(iii)  $x^2 + \frac{3}{x^2} + 4$  can be written as  $x^2 + 3x^{-2} + 4$ . Here,

the exponent of variable in term  $3x^{-2}$  is – 2, which is not a whole number. Therefore, the given expression is not a polynomial.

2. There are three terms in the given polynomial, namely,  $x^2$ ,  $\frac{\pi}{2}x$  and – 7.

3. The given polynomial,  $p(x) = 13x^{15} + 12x^{14} + 11x^{13} + 10x^{12} + 9x^{11}$  can be written as  $13x^{15} + 12x^{14} + 11x^{13} + 10x^{12} + 9x^{11} + 0x^{10}$ .

 $\therefore$  Coefficient of  $x^{10}$  is 0.

4. Monomial =  $4x^8$  and binomial = 2x + 7

5. We have,  $(x^3 + 5) (4 - x^5) = 4x^3 - x^8 + 20 - 5x^5$ 

Clearly, the highest power of the variable is 8. Therefore, the degree of the given polynomial is 8.

6. The only term here is 100, which can be written as  $100x^0$ . And exponent of *x* is 0. Therefore, the degree of the given polynomial is 0.

7. (i)  $5x^{28} + 3$  (ii)  $2x^9 + 6x + 7$ 

8. (i) Clearly,  $5x^2 + 8x$  is a polynomial of degree 2. So, it is a quadratic polynomial.

(ii) Clearly,  $2x - x^3$  is a polynomial of degree 3. So, it is a cubic polynomial.

(iii) Clearly, 3 + 2x is a polynomial of degree 1. So, it is a linear polynomial.

(iv) Clearly,  $5x^3$  is a polynomial of degree 3. So, it is a cubic polynomial.

9. (i) Clearly,  $5 - x - x^2$  is a polynomial of degree 2. So, it is a quadratic polynomial.

(ii) Clearly,  $p^4$  is a polynomial of degree 4. So, it is a biquadratic polynomial.

**10.** We have, 
$$p(x) = \sqrt{2}x^2 + \sqrt{2}x + 6$$
  
 $p(\sqrt{2}) = \sqrt{2}(\sqrt{2})^2 + \sqrt{2}(\sqrt{2}) + 6$   
 $= 2\sqrt{2} + 2 + 6 = 2\sqrt{2} + 8$   
**11.** We have,  $p(y) = 3y^4 - 2y^3 + 15y + k$   
 $p(1) = -1 \Rightarrow 3(1)^4 - 2(1)^3 + 15(1) + k = -1$ 

 $\Rightarrow$  3-2+15+k=-1  $\Rightarrow$  16+k=-1  $\Rightarrow$  k=-17

**12.** We have,  $p(t) = 3t^4 + 1$ 

 $\therefore \quad p(0) = 3(0)^4 + 1 = 3 \times 0 + 1 = 1,$   $p(1) = 3(1)^4 + 1 = 3 \times 1 + 1 = 4,$   $p(-1) = 3(-1)^4 + 1 = 3 \times 1 + 1 = 4,$   $p(3) = 3(-3)^4 + 1 = 3 \times 81 + 1 = 244 \text{ and}$  $p(-3) = 3(-3)^4 + 1 = 3 \times 81 + 1 = 244$ 

**13.** Let p(x) = x + 2. Then p(2) = 2 + 2 = 4, p(-2) = -2 + 2 = 0. Therefore, -2 is a zero of the polynomial x + 2, but 2 is not.

**14.** Let 
$$p(x) = x^2 - 2x - 3$$

equation  $x^2 - 2x - 3 = 0$ .

Now,  $p(3) = 3^2 - 2(3) - 3 = 9 - 6 - 3 = 0$ Since, p(3) = 0, therefore x = 3 is a root of the polynomial

**15.** We have, q(x) = 2x - 7. To find its zero, put q(x) = 0.

$$\therefore \quad 2x - 7 = 0 \implies 2x = 7 \implies x = \frac{7}{2}.$$

Thus, zero of polynomial q(x) is  $\frac{7}{2}$ .

16. We have, p(y) = ly - m;  $l \neq 0$ . To find its zero, put p(y) = 0.

$$\therefore \quad ly - m = 0 \implies ly = m \implies y = \frac{m}{l}.$$

Thus,  $y = \frac{m}{l}$  is the zero of the polynomial p(y) = ly - m.

**17.** Here, degree of p(x) = 4 and degree of g(x) = 1. So degree of g(x) < degree of p(x). By long division method, we get

$$x + 3)7x^{4} + 3x^{3} - 2x^{2} + x - 4 (7x^{3} - 18x^{2} + 52x - 155)$$

$$-7x^{4} + 21x^{3}$$

$$-18x^{3} - 2x^{2}$$

$$-18x^{3} - 54x^{2}$$

$$+$$

$$-52x^{2} + x$$

$$-52x^{2} + 156x$$

$$-155x - 4$$

$$-155x - 4$$

$$-155x - 4$$

$$-465$$

$$+$$

Thus, quotient is  $7x^3 - 18x^2 + 52x - 155$  and remainder is 461.

**18.** To check if x + 1 is a factor of  $x^3 + 1$ , we divide  $x^3 + 1$  by x + 1. Therefore, by long division method, we get

$$x+1)x^{3}+1 (x^{2}-x+1)$$

$$-\frac{x^{3}+x^{2}}{-x^{2}+1}$$

$$-\frac{x^{2}+1}{x+1}$$

$$x+1$$

$$-\frac{x+1}{-x^{2}-x}$$

So, we find that the remainder is 0. Therefore, x + 1 is a factor of  $x^3 + 1$ .

**19.** 
$$x + 1$$
)  $5x^2 + x - 1$  ( $5x - 4$   
 $-5x^2 + 5x$   
 $-4x - 1$   
 $-4x - 4$   
 $+$   
 $+$   
 $-4x - 4$   
 $+$   
 $-4x - 4$   
 $+$   
 $-4x - 4$ 

Here, Dividend  $p(x) = 5x^2 + x - 1$ , Divisor g(x) = x + 1, Quotient q(x) = 5x - 4, Remainder r(x) = 3 $\therefore$  R.H.S. = g(x) q(x) + r(x) = (x + 1) (5x - 4) + 3

 $= 5x^{2} - 4x + 5x - 4 + 3 = 5x^{2} + x - 1 = L.H.S.$ 

**20.** Let  $p(x) = ax^3 + 4x^2 + 3x - 4$  and  $q(x) = x^3 - 4x + a$  be the given polynomials.

Since zero of (x - 3) is 3, therefore remainders when p(x)and q(x) are divided by (x - 3) are given by p(3) and q(3)respectively.

By the given condition, we have p(3) = q(3)

- $\Rightarrow a \times 3^3 + 4 \times 3^2 + 3 \times 3 4 = 3^3 4 \times 3 + a$
- 27a + 36 + 9 4 = 27 12 + a $\Rightarrow$
- $26a + 26 = 0 \Longrightarrow 26a = -26 \Longrightarrow a = -1.$  $\rightarrow$

**21.** Clearly, q(t) will be a multiple of 2t - 1 only if 2t - 1divides q(t) leaving remainder zero.

Now, zero of 2t - 1 is  $\frac{1}{2}$ .

$$\therefore \text{ Remainder } = q\left(\frac{1}{2}\right) = 4\left(\frac{1}{2}\right)^3 + 3\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right) - 2$$
$$= \frac{1}{2} + \frac{3}{4} + \frac{1}{2} - 2 = \frac{-1}{4} \neq 0$$

Since the remainder obtained on dividing q(t) by 2t - 1 is not 0. Therefore, q(t) is not a multiple of 2t - 1.

**22.** Let  $p(x) = x^4 - k^2 x^2 + 2x - k$ 

Zero of the polynomial x - k is k, therefore by remainder theorem, reminder when p(x) is divided by (x - k) is given by p(k).

$$\therefore \quad p(k) = k^4 - k^2(k)^2 + 2k - k = k^4 - k^4 + k = k$$

So, the remainder is *k*.

**23.** Let  $p(x) = 3x^2 + kx + 6$  be the given polynomial. As, (x + 3) is a factor of p(x), therefore p(-3) = 0.

 $\Rightarrow$  3(-3)<sup>2</sup> + k(-3) + 6 = 0  $\Rightarrow$  27 - 3k + 6 = 0

 $\Rightarrow$  33 - 3k = 0  $\Rightarrow$  k = 11

**24.** Let 
$$p(x) = 4x^2 - bx - ca$$
.

As (x - a) is a factor of p(x), therefore p(a) = 0.  $\therefore 4a^2 - ba - ca = 0$ 

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 $[:: a \neq 0]$ 

- $\Rightarrow a(4a b c) = 0$
- $\Rightarrow 4a b c = 0$  $\Rightarrow 4a = b + c$
- $a = \frac{b+c}{4}$
- **25.** Let  $p(x) = 2x^3 + 6x + 8$ .

In order to prove that (x + 1) is a factor of p(x), it is sufficient to show that p(-1) = 0.

Now,  $p(-1) = 2(-1)^3 + 6(-1) + 8 = -2 - 6 + 8 = 0$ Hence, (x + 1) is a factor of the given polynomial.

**26.** Let  $p(x) = x^3 - 3x^2 - 10x + 24$ 

In order to prove that (x - 2), (x + 3) and (x - 4) are factors of p(x), it is sufficient to show that p(2), p(-3) and p(4) are equal to zero.

Now,  $p(2) = 2^3 - 3(2)^2 - 10(2) + 24 = 8 - 12 - 20 + 24 = 0$ ,  $p(-3) = (-3)^3 - 3(-3)^2 - 10(-3) + 24$ = -27 - 27 + 30 + 24 = 0

And  $p(4) = 4^3 - 3(4)^2 - 10(4) + 24 = 64 - 48 - 40 + 24 = 0$ Hence, (x - 2), (x + 3) and (x - 4) are factors of the given polynomial.

**27.** Given polynomial is  $2r^2 + 5r - 3$ 

On comparing it with  $ax^2 + bx + c$ , we get

$$a = 2, b = 5 \text{ and } c = -3$$

Here, ac = -6

So, we need to find two numbers whose sum is 5 and product is - 6. One such pair is 6 and (-1).

So, 
$$2r^2 + 5r - 3 = 2r^2 + (6 - 1)r - 3 = 2r^2 + 6r - r - 3$$
  
=  $2r(r + 3) - 1(r + 3) = (2r - 1)(r + 3)$ 

**28.** Given polynomial is  $x^2 + 3\sqrt{3}x + 6$ 

On comparing it with  $ax^2 + bx + c$ , we get

 $a = 1, b = 3\sqrt{3}$  and c = 6Here, ac = 6.

So, we need to find two numbers whose sum is  $3\sqrt{3}$  and product is 6. One such pair is  $\sqrt{3}$  and  $2\sqrt{3}$ .

So, 
$$x^2 + 3\sqrt{3}x + 6 = x^2 + (\sqrt{3} + 2\sqrt{3})x + 6$$
  
 $= x^2 + \sqrt{3}x + 2\sqrt{3}x + 6 = x(x + \sqrt{3}) + 2\sqrt{3}(x + \sqrt{3})$   
 $= (x + 2\sqrt{3})(x + \sqrt{3})$   
So, factors of  $x^2 + 3\sqrt{3}x + 6$  are  $(x + 2\sqrt{3})$  and  $(x + \sqrt{3})$ .  
29. Area =  $16a^2 - 32a + 15$   
 $= 16a^2 - 20a - 12a + 15$  (By splitting the middle term)  
 $= 4a(4a - 5) - 3(4a - 5) = (4a - 3)(4a - 5)$ 

[Here, 
$$4a - 3 > 0$$
 and  $4a - 5 > 0$  because  $a > \frac{5}{4}$ .]

= (Length) × (Breadth)  
∴ Length = 
$$4a - 3$$
  
and Breadth =  $4a - 5$  (∵  $4a - 3 > 4a - 5$ ).  
30. Let  $p(y) = 15y^2 - 8y + 1$   
 $= 15\left(y^2 - \frac{8}{15}y + \frac{1}{15}\right) = 15q(y)$ , (say)  
where  $q(y) = y^2 - \frac{8}{15}y + \frac{1}{15}$ .

Now, factors of 1 are  $\pm 1$  and factors of 15 are  $\pm 1$ ,  $\pm 3$ ,  $\pm 5$ ,  $\pm 15$ . So, some possibilities for the zeroes of q(y) are

 $\pm 1, \pm \frac{1}{3}, \pm \frac{1}{5}, \pm \frac{1}{15}$ 

Now, we find that

$$q\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^2 - \frac{8}{15}\left(\frac{1}{3}\right) + \frac{1}{15} = \frac{1}{9} - \frac{8}{45} + \frac{1}{15} = \frac{5 - 8 + 3}{45} = 0$$
  
and  $q\left(\frac{1}{5}\right) = \left(\frac{1}{5}\right)^2 - \frac{8}{15}\left(\frac{1}{5}\right) + \frac{1}{15}$   
 $= \frac{1}{25} - \frac{8}{75} + \frac{1}{15} = \frac{3 - 8 + 5}{75} = 0$ 

 $\therefore$  By factor theorem,  $\left(y - \frac{1}{3}\right)$  and  $\left(y - \frac{1}{5}\right)$  are the factors of q(y)

Hence, 
$$p(y) = 15\left(y - \frac{1}{3}\right)\left(y - \frac{1}{5}\right)$$
  
=  $15\left(\frac{3y - 1}{3}\right)\left(\frac{5y - 1}{5}\right) = (3y - 1)(5y - 1)$ 

**31.** Let  $p(x) = x^2 - 22x + 120$ 

Now, if  $p(x) = (x - \alpha) (x - \beta)$ , we know that constant term will be  $\alpha\beta = 120$ . So, look for the factors of 120. Some of these are  $\pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \pm 6, \pm 10, \pm 12, \pm 20$ Now,  $p(10) = (10)^2 - 22(10) + 120 = 0$ 

 $\therefore$  (x – 10) is a factor of p(x).

Now to find, the other factor, divide p(x) by (x - 10).

$$x - 10)\overline{x^{2} - 22x + 120}(x - 12)$$

$$x^{2} - 10x$$

$$- +$$

$$- 12x + 120$$

$$- 12x + 120$$

$$+ -$$

$$- 0$$

So, other factor of p(x) = (x - 12)Hence p(x) = (x - 12) (x - 10).

32. Since, (2x + 3) is a factor of the given polynomial, therefore let us divide  $4x^3 + 12x^2 + 5x - 6$  by 2x + 3 to get the other factors.

$$2x + 3\overline{\smash{\big)}4x^3 + 12x^2 + 5x - 6(2x^2 + 3x - 2)}$$

$$4x^3 + 6x^2$$

$$-\frac{6x^2 + 5x}{6x^2 + 9x}$$

$$-\frac{-4x - 6}{-4x - 6}$$

$$4x^3 + 12x^2 + 5x - 6 = (2x + 3)(2x^2 + 3x - 2)$$

 $\therefore 4x^3 + 12x^2 + 5x - 6 = (2x + 3)(2x^2 + 3x - 2)$ Now, we will factorise  $2x^2 + 3x - 2$  to find the other two factors, by splitting its middle term.

$$\therefore 2x^2 + 3x - 2 = 2x^2 + 4x - x - 2$$
  
= 2x (x + 2) - 1 (x + 2) = (2x - 1)(x + 2)  
Hence, 4x<sup>3</sup> + 12x<sup>2</sup> + 5x - 6 = (2x + 3)(2x - 1)(x + 2)

**33.** Let  $p(x) = x^3 - 6x^2 + 3x + 10$ All possible factors of 10 are  $\pm 1, \pm 2, \pm 5$  and  $\pm 10$ . Now, we find that  $p(-1) = (-1)^3 - 6(-1)^2 + 3(-1) + 10$ = -1 - 6 - 3 + 10 = 0,  $p(2) = 2^3 - 6(2)^2 + 3(2) + 10 = 8 - 24 + 6 + 10 = 0$  and  $p(5) = 5^3 - 6(5)^2 + 3(5) + 10 = 125 - 150 + 15 + 10 = 0$ So, by factor theorem, (x + 1), (x - 2) and (x - 5) are the factors of p(x).

34. Let 
$$p(t) = 2t^3 - 5t^2 - 19t + 42$$
  
=  $2\left[t^3 - \frac{5}{2}t^2 - \frac{19}{2}t + 21\right] = 2q(t)$ , (say)  
where  $q(t) = t^3 - \frac{5}{2}t^2 - \frac{19}{2}t + 21$ 

Factors of 21 are  $\pm 1$ ,  $\pm 3$ ,  $\pm 7$  and  $\pm 21$ 

Now, we can find that  $q(-3) = (-3)^3 - \frac{5}{2}(-3)^2 - \frac{19}{2}(-3) + 21$ 

$$= -27 - \frac{45}{2} + \frac{57}{2} + \frac{21}{2} = 0$$

So, (t + 3) is one of the factor of q(t). Let us divide q(t) by (t + 3) to find other factors.

$$t+3 \int t^3 - \frac{5}{2}t^2 - \frac{19}{2}t + 21(t^2 - \frac{11}{2}t + 7)$$

$$\frac{t^3 + 3t^2}{-1} - \frac{11}{2}t^2 - \frac{19}{2}t$$

$$-\frac{11}{2}t^2 - \frac{33}{2}t$$

$$\frac{t}{-1} + \frac{t}{2}t^2 - \frac{33}{2}t$$

$$\frac{t}{-1} + \frac{t}{2}t^2 - \frac{33}{2}t$$

$$\frac{t}{-1} + \frac{t}{2}t^2 - \frac{11}{2}t + 7$$
So,  $q(t) = (t+3)(t^2 - \frac{11}{2}t + 7)$ 
Now,  $t^2 - \frac{11}{2}t + 7 = t^2 - \frac{7}{2}t - 2t + 7$ 

$$= t(t - \frac{7}{2}) - 2(t - \frac{7}{2}) = (t - \frac{7}{2})(t - 2)$$
So,  $p(t) = 2(t+3)(t - \frac{7}{2})(t - 2)$ 

$$= (t+3)(2t - 7)(t - 2)$$
Short cut method : We have  $p(t) = 2t^3 - 5t^2 - 19t + 42$ 
By hit and trial method, we have
$$p(2) = 2(2)^3 - 5(2)^2 - 19(2) + 42 = 16 - 20 - 38 + 42 = 0$$

$$\therefore (t-2) \text{ is one of the factors of } p(t).$$
So,  $2t^3 - 5t^2 - 19t + 42 = 2t^2(t - 2) - t(t - 2) - 21(t - 2)$ 

$$= (t - 2)[2t^2 - t - 21] = (t - 2)(2t^2 - 7t + 6t - 21)$$

$$= (t - 2)[t(2t - 7) + 3(2t - 7)] = (t - 2)(2t - 7)(t + 3)$$
35.  $(2x - 3y)(2x - 3y) = (2x - 3y)^2$ 

$$= (2x)^2 - 2(2x)(3y) + (3y)^2 \qquad [\because (x - y)^2 = x^2 - 2xy + y^2]$$
36. We have,  $101 \times 103 = (100 + 1) \times (100 + 3)$ 

$$= (100)^2 + (1 + 3)(100) + (1)(3)$$

$$[\because (x + a)(x + b) = x^2 + (a + b) x + ab]$$

$$= 10000 + 400 + 3 = 10403$$

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37. (i) We have, 
$$0.54 \times 0.54 - 0.46 \times 0.46$$
  
=  $(0.54)^2 - (0.46)^2 = (0.54 + 0.46)(0.54 - 0.46) = 1 \times 0.08 = 0.08.$   
[ $\because x^2 - y^2 = (x - y) (x + y)$ ]  
(ii) We have,  $(0.99)^2 = (1 - 0.01)^2$   
=  $(1)^2 - 2 \times 1 \times 0.01 + (0.01)^2 = 1 - 0.02 + 0.0001$   
[ $\because (x - y)^2 = x^2 - 2xy + y^2$ ]  
=  $1.0001 - 0.02 = 0.9801$   
38. We have,  $(3x + 2y)^2 = (3x)^2 + (2y)^2 + 2 \times 3x \times 2y$   
[ $\because (x + y)^2 = x^2 + 2xy + y^2$ ]  
 $\Rightarrow (3x + 2y)^2 = 9x^2 + 4y^2 + 12xy$   
 $\Rightarrow 12^2 = 9x^2 + 4y^2 + 12xy$   
 $\Rightarrow 12^2 = 9x^2 + 4y^2 + 12xy$   
 $\Rightarrow 144 = 9x^2 + 4y^2 + 72$   
 $\Rightarrow 144 - 72 = 9x^2 + 4y^2 \Rightarrow 9x^2 + 4y^2 = 72$   
39. We have,  $x - \frac{1}{x} = -1$   
 $\Rightarrow \left(x - \frac{1}{x}\right)^2 = (-1)^2$  [On squaring both sides]  
 $\Rightarrow x^2 + \frac{1}{x^2} - 2 \times x \times \frac{1}{x} = 1$  [ $\because (x - y)^2 = x^2 - 2xy + y^2$ ]  
 $\Rightarrow x^2 + \frac{1}{x^2} - 2 = 1 \Rightarrow x^2 + \frac{1}{x^2} = 1 + 2 = 3$   
40.  $49a^2 + 70ab + 25b^2 = (7a)^2 + 2(7a)(5b) + (5b)^2$   
 $= (7a + 5b)(7a + 5b)$   
41. (i) We have,  $(x - 2y - 3z)^2$   
 $= \{x + (-2y) + (-3z)\}^2$ 

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

$$[:: (x + y + z)^{2} = x^{2} + y^{2} + z^{2} + 2xy + 2yz + 2zx]$$

$$= x^{2} + 4y^{2} + 9z^{2} - 4xy + 12yz - 6zx$$
(ii) We have,  $(-x + 2y + z)^{2} = \{(-x) + 2y + z\}^{2}$ 

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

$$= x^{2} + 4y^{2} + z^{2} - 4xy + 4yz - 2zx$$
42. We have,  $9x^{2} + 4y^{2} + 16z^{2} + 12xy - 16yz - 24xz$ 

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

$$= (3x + 2y - 4z)^{2} = (3x + 2y - 4z)(3x + 2y - 4z)$$
43. (i) We have,  $21^{3} - 15^{3}$ 

$$= (21 - 15) \{(21)^{2} + 21 \times 15 + (15)^{2}\}$$

$$[: x^{3} - y^{3} = (x - y)(x^{2} + xy + y^{2})]$$

$$= 6 \times (441 + 315 + 225) = 6 \times 981 = 5886$$
(ii) We have,  $(999)^{3} = (1000 - 1)^{3}$ 

$$= (1000)^{3} - (1)^{3} - 3(1000)(1)(1000 - 1)$$

$$[: (x - y)^{3} = x^{3} - y^{3} - 3xy (x - y)]$$

$$= 1000000000 - 1 - 3000000 + 3000 = 997002999$$
44. We have,  $8x^{3} + y^{3} + 27z^{3} - 18xyz$ 

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

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

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

$$= (2x + y + 3z)(4x^{2} + y^{2} + 9z^{2} - 2xy - 3yz - 6zx)$$
45. We have,  $8x^{3} - (2x - y)^{3} = (2x)^{3} - (2x - y)^{3}$ 

$$= [2x - (2x - y)] [(2x)^{2} + 2x \times (2x - y) + (2x - y)^{2}]$$

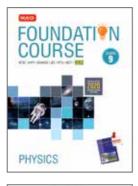
$$= y[4x^{2} + 4x^{2} - 2xy + 4x^{2} + y^{2} - 4xy]$$

$$= y[12x^{2} - 6xy + y^{2}]$$

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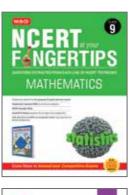


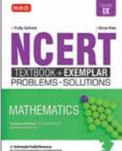


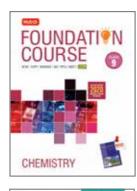




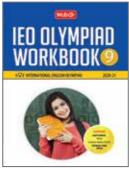


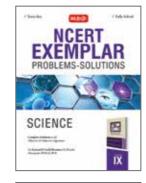


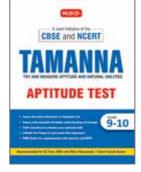


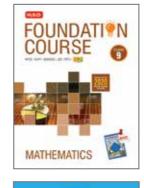


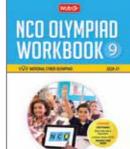


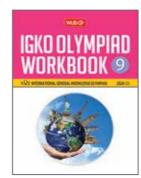




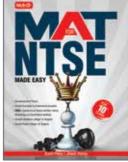


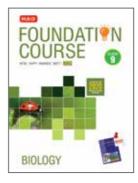


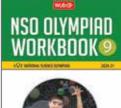




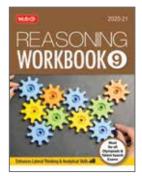












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