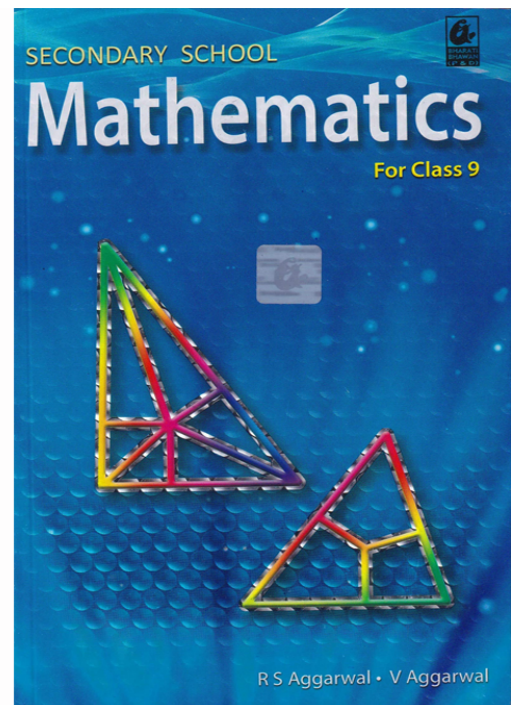


RS Aggarwal Solutions for Class 9 Maths Chapter 2–Polynomials

Class 9 - Chapter 2 Polynomials



For any clarifications or questions you can write to info@indcareer.com

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RS Aggarwal Solutions for Class 9 Maths Chapter 2–Polynomials

Class 9: Maths Chapter 2 solutions. Complete Class 9 Maths Chapter 2 Notes.

RS Aggarwal Solutions for Class 10 Maths Chapter 2–Polynomials

RS Aggarwal 9th Maths Chapter 2, Class 9 Maths Chapter 2 solutions

Ex 2A

Question 1.

Solution:

(i) $x^5 - 2x^3 + x + 7$ is a polynomial and its degree is 5

(ii) $y^3 - \sqrt{3}y$ is a polynomial and its degree is 3

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(iii) $t^2 - \frac{2}{5}t + \sqrt{2}$ is a polynomial and its degree is 2

(iv) $5\sqrt{z} - 6$ is not a polynomial degree of z is $\frac{2}{2}(a)$ true

(v) $x - \frac{1}{x}$ or $x - x^{-1}$ is not a polynomial as degree of x is -1 (negative)

(vi) $x^{108} - 1$ is a polynomial and its degree is 108.

(vii) $\sqrt[3]{x} - 27$ or $x^{\frac{1}{3}} - 27$ is not a polynomial as degree of x is $\frac{1}{3}$ (a fraction)

(viii) $\frac{1}{\sqrt{2}}x^2 - \sqrt{2}x + 2$ is a polynomial and its degree is 2.

(ix) $x^{-2} + 2x^{-1} + 3$ is not a polynomial as its degree is $-2, -1$ which are negative.

(x) 1 It is a polynomial and its degree is zero (0).

(xi) $-\frac{3}{5}$ is a polynomial and its degree is zero (0).

(xii) $\sqrt[3]{2}y^2 - 8$ is a polynomial and its degree is 2.

Question 2.

Solution:

- (i) Degree is 1
- (ii) degree is 3
- (iii) degree is zero
- (iv) degree is 7
- (v) degree is 10
- (vi) degree is 2

Question 3.

Solution:

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- (i) Coefficient of x^3 is -5.
- (ii) Coefficient of x is $-2\sqrt{2}$
- (iii) Coefficient of x^2 is π^3
- (iv) Coefficient of x^2 is 0

Question 4.

Solution:

- (i) Example of a binomial of degree 27 is $4x^{27} - 5$
- (ii) Example of a monomial of degree 16 is x^{16}
- (iii) Example of trinomial of degree 3 is $2x^3 + 7x + 4$

Question 5.

Solution:

- (i) $2x^2 + 4x$ is a quadratic polynomial. (Degree 2)
- (ii) $x - x^3$ is a cubic polynomial (Degree 3)
- (iii) $2 - y - y^2$ is a quadratic polynomial (Degree 2)
- (iv) $-7 + z$ is a linear polynomial (Degree 1)
- (v) $5t$ is a linear polynomial (Degree 1)
- (vi) p^3 is a cubic polynomial (Degree 3)

Ex 2B

Question 1.

Solution:

$$p(x) = 5 - 4x + 2x^2$$

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$$(i) p(0) = 5 - 4(0) + 2(0)^2 \\ = 5 - 0 + 0 = 5$$

$$(ii) p(3) = 5 - 4(3) + 2(3)^2 \\ = 5 - 12 + 2 \times 9 = 5 - 12 + 18 \\ = 23 - 12 = 11$$

$$(iii) p(-2) = 5 - 4(-2) + 2(-2)^2 \\ = 5 + 8 + 2 \times 4 = 5 + 8 + 8 \\ = 21 \text{ Ans.}$$

Question 2.

Solution:

$$p(y) = 4 + 3y - y^2 + 5y^3$$

$$(i) \therefore p(0) = 4 + 3(0) - (0)^2 + 5(0)^3 \\ = 4 + 0 - 0 + 0 = 4$$

$$(ii) p(2) = 4 + 3(2) - (2)^2 + 5(2)^3 \\ = 4 + 6 - 4 + 5 \times 8 \\ = 10 - 4 + 40 \\ = 50 - 4 = 46$$

$$(iii) p(-1) = 4 + 3(-1) - (-1)^2 + 5(-1)^3 \\ = 4 - 3 - 1 - 5 \\ = -9 + 4 = -5 \text{ Ans.}$$

Question 3.

Solution:

$$f(t) = 4t^2 - 3t + 6$$

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$$(i) f(0)$$

$$= 4(0)^2 - 3(0) + 6 = 0 - 0 + 6$$

$$= 6$$

$$(ii) f(4) = 4(4)^2 - 3(4) + 6$$

$$= 4 + 16 - 12 + 6$$

$$= 64 - 12 + 6 = 70 - 12 = 58$$

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

$$= 4 \times 25 + 15 + 6 = 100 + 15 + 6$$

$$= 121 \text{ Ans.}$$

Question 4.

Solution:

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(i) $p(x) = x - 5$ and $p(x) = 0$

$$x - 5 = 0 \Rightarrow x = 5$$

(ii) $q(x) = x + 4$ and $q(x) = 0$

$$\therefore x + 4 = 0 \Rightarrow x = -4$$

(iii) $p(t) = 2t - 3$ and $p(t) = 0$

$$\therefore 2t - 3 = 0$$

$$\Rightarrow 2t = 3 \Rightarrow t = \frac{3}{2}$$

(iv) $f(x) = 3x + 1$ and $f(x) = 0$

$$\therefore 3x + 1 = 0 \Rightarrow 3x = -1$$

$$\Rightarrow x = -\frac{1}{3}$$

(v) $g(x) = 5 - 4x$ and $g(x) = 0$

$$\therefore 5 - 4x = 0 \Rightarrow 5 = 4x$$

$$\Rightarrow x = \frac{5}{4}$$

(v) $g(x) = 5 - 4x$ and $g(x) = 0$

$$\therefore 5 - 4x = 0 \Rightarrow 5 = 4x$$

$$\Rightarrow x = \frac{5}{4}$$

(vi) $h(x) = 6x - 1$ and $h(x) = 0$

$$\therefore 6x - 1 = 0 \Rightarrow 6x = 1$$

$$\Rightarrow x = \frac{1}{6}$$

(vii) $p(x) = ax + b$ and $p(x) = 0$

$$\therefore ax + b = 0 \Rightarrow ax = -b$$

$$\Rightarrow x = \frac{-b}{a}$$

(viii) $q(x) = 4x$ and $q(x) = 0$

$$\therefore 4x = 0$$

$$\Rightarrow x = 0$$

(ix) $p(x) = ax$ and $p(x) = 0$

$$\therefore ax = 0 \Rightarrow x = 0 \text{ Ans.}$$

Question 5.

Solution:

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(i) $p(x) = x - 4$ and $p(x) = 0$

Then $x - 4 = 0 \Rightarrow x = 4$

$\therefore 4$ is a zero of the given polynomial.

(ii) $p(x) = x + 3$ and $p(x) = 0$

Then $x + 3 = 0 \Rightarrow x = -3$

$\therefore -3$ is a zero of the given polynomial.

(iii) $p(y) = 2y + 1$ and $p(y) = 0$

$\therefore 2y + 1 = 0 \Rightarrow 2y = -1$

$$\Rightarrow y = -\frac{1}{2}$$

$\Rightarrow -\frac{1}{2}$ is the zero of the given polynomial.

(iv) $p(x) = 2 - 5x$ and $p(x) = 0$

$\therefore 2 - 5x = 0 \Rightarrow 2 = 5x$

$$\Rightarrow x = \frac{2}{5}$$

$\therefore \frac{2}{5}$ is the zero of the given polynomial.

(v) $p(x) = (x - 1)(x - 2)$ and $p(x) = 0$

$$\therefore (x - 1)(x - 2) = 0$$

Either $x - 1 = 0$ then $x = 1$

or $x - 2 = 0$ then $x = 2$

Hence 1 and 2 are the zeros of the given polynomial.

(vi) $p(x) = x^2 - 3x$, $p(x) = 0$

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

$$\Rightarrow x(x - 3) = 0$$

Either $x = 0$

or $x - 3 = 0$ then $x = 3$

$\therefore$ 0 and 3 are the zeros of the given polynomial.

(vii) $p(x) = x^2 + x - 6$, $p(x) = 0$

$$\therefore x^2 + x - 6 = 0$$

$$\Rightarrow x^2 + 3x - 2x - 6 = 0$$

$$\Rightarrow x(x + 3) - 2(x + 3) = 0$$

$$\Rightarrow (x + 3)(x - 2) = 0$$

Either $x + 3 = 0$, then $x = -3$

or $x - 2 = 0$, then $x = 2$

Hence -3 and 2 are the zeros of the given polynomial. Ans.

Ex 2C

Question 1.

Solution:

$$f(x) = (x^3 - 6x^2 + 9x + 3)$$

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Let $x-1 = 0$, then $x = 1$

Let $x - 1 = 0$, then $x = 1$

$$\text{Then } f(1) = (1)^3 - 6(1)^2 + 9(1) + 3$$

$$= 1 - 6 \times 1 + 9 + 3 = 1 - 6 + 9 + 3$$

$$= 13 - 6 = 7$$

$\therefore$ Remainder = 7 Ans.

Question 2.

Solution:

$$f(x) = 2x^3 - 5x^2 + 9x - 8$$

Let $x-3 = 0$, then $x = 3$

$$\therefore f(3) = 2(3)^3 - 5(3)^2 + 9(3) - 8$$

$$= 2 \times 27 - 5 \times 9 + 9 \times 3 - 8$$

$$= 54 - 45 + 27 - 8 = 81 - 53$$

$$= 28$$

Hence remainder = 28 Ans.

Question 3.

Solution:

$$f(x) = (3x^4 - 6x^2 - 8x + 2)$$

Let $x-2 = 0$, the $x = 2$

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$$\begin{aligned}\therefore f(2) &= 3(2)^4 - 6(2)^2 - 8(2) + 2 \\ &= 3 \times 16 - 6 \times 4 - 8 \times 2 + 2 \\ &= 48 - 24 - 16 + 2 = 50 - 40 \\ &= 10 \\ \therefore \text{Remainder} &= 10 \text{ Ans.}\end{aligned}$$

Question 4.

Solution:

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

Let $x-6 = 0$, then $x=6$

$$\begin{aligned}\text{Let } x - 6 &= 0, \text{ then } x = 6 \\ \therefore f(6) &= (6)^3 - 7(6)^2 + 6 \times 6 + 4 \\ &= 216 - 252 + 36 + 4 \\ &= 256 - 252 = 4 \\ \therefore \text{Remainder} &= 4 \text{ Ans.}\end{aligned}$$

Question 5.

Solution:

$$f(x) = (x^3 - 6x^2 + 13x + 60)$$

Let $x+2=0$, then $x=-2$

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Let $x + 2 = 0$, then $x = -2$

$$\therefore f(-2) = (-2)^3 - 6(-2)^2 + 13(-2) + 60$$

$$= -8 - 6 \times 4 - 26 + 60$$

$$= -8 - 24 - 26 + 60 = -58 + 60$$

$$= 2$$

$\therefore$ Remainder = 2 Ans.

Question 6.

Solution:

$$f(x) = (2x^4 + 6x^3 + 2x^2 + x - 8)$$

Let $x+3=0$, then $x=-3$

$$\therefore f(-3) = 2(-3)^4 + 6(-3)^3 + 2(-3)^2 + (-3) - 8$$

$$= 2 \times 81 + 6 \times (-27) + 2 \times 9 - 3 - 8$$

$$= 162 - 162 + 18 - 3 - 8$$

$$= 180 - 173 = 7$$

$\therefore$ Remainder = 7 Ans.

Question 7.

Solution:

$$f(x) = (4x^3 - 12x^2 + 11x - 5)$$

Let $2x - 1 = 0$, then $2x = 1 \Rightarrow x = \frac{1}{2}$

$$\begin{aligned}\therefore f\left(\frac{1}{2}\right) &= 4\left(\frac{1}{2}\right)^3 - 12\left(\frac{1}{2}\right)^2 + 11 \times \frac{1}{2} - 5 \\&= 4 \times \frac{1}{8} - 12 \times \frac{1}{4} + 11 \times \frac{1}{2} - 5 \\&= \frac{1}{2} - 3 + \frac{11}{2} - 5 \\&= \frac{1}{2} + \frac{11}{2} - 3 - 5 = \frac{12}{2} - 8 \\&= 6 - 8 = -2\end{aligned}$$

Remainder = -2 Ans.

Question 8.

Solution:

$$f(x) = (81x^4 + 54x^3 - 9x^2 - 3x + 2)$$

$$f(x) = (81x^4 + 54x^3 - 9x^2 - 3x + 2)$$

$$\text{Let } 3x + 2 = 0, \text{ then } 3x = -2 \Rightarrow x = -\frac{2}{3}$$

$$\text{Then } f\left(-\frac{2}{3}\right) = 81 \left(-\frac{2}{3}\right)^4 + 54 \left(-\frac{2}{3}\right)^3 -$$

$$9 \left(-\frac{2}{3}\right)^2 - 3 \left(-\frac{2}{3}\right) + 2$$

$$= 81 \times \frac{16}{81} + 54 \times \left(\frac{-8}{27}\right) - 9 \left(\frac{4}{9}\right)$$

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

$$= 16 - 16 - 4 + 2 + 2 = 20 - 20 = 0$$

$\therefore$ Remainder = 0 Ans.

Question 9.

Solution:

$$f(x) = (x^3 - ax^2 + 2x - a)$$

let $x - a = 0$, then $x = a$

$$\therefore f(a) = a^3 - a.a^2 + 2a - a$$

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

$\therefore$ Remainder = a Ans.

Question 10.

Solution:

$$f(x) = (ax^3 + 3x^2 - 3)$$

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$$g(x) = (2x^3 - 5x + a)$$

Let $x - 4 = 0$, then $x = 4$

$$\begin{aligned}\therefore f(4) &= a(4)^3 + 3(4)^2 - 3 \\ &= a \cdot 64 + 3 \times 16 - 3 = 64a + 48 - 3 \\ &= 64a + 45\end{aligned}$$

$$\begin{aligned}g(4) &= 2(4)^3 - 5(4) + a \\ &= 2 \times 64 - 5 \times 4 + a \\ &= 128 - 20 + a = 108 + a\end{aligned}$$

$\therefore$ Remainder is same in both the cases

$$\therefore 64a + 45 = 108 + a$$

$$\Rightarrow 64a - a = 108 - 45$$

$$\Rightarrow 63a = 63 \Rightarrow a = \frac{63}{63} = 1$$

Hence $a = 1$ Ans.

Question 11.

Solution:

$$f(x) = x^4 - 2x^3 + 3x^2 - ax + b$$

let $x - 1 = 0$, then $x = 1$

$$\begin{aligned}f(1) &= (1)^4 - 2(1)^3 + 3(1)^2 - a \times 1 + b \\&= 1 - 2 + 3 - a + b = 2 - a + b\end{aligned}$$

$\therefore$ Remainder is 5

$$\therefore 2 - a + b = 5 \Rightarrow -a + b = 5 - 2 = 3$$

$$\therefore -a + b = 3 \quad \dots(i)$$

Again Let $x + 1 = 0$, then $x = -1$

$$\therefore f(-1) = (-1)^4 - 2(-1)^3 + 3(-1)^2 - a(-1) + b$$

$$= 1 - 2(-1) + 3 \times 1 + a + b$$

$$= 1 + 2 + 3 + a + b = a + b + 6$$

But remainder = 19

$$\therefore a + b + 6 = 19 \Rightarrow a + b = 19 - 6$$

$$\Rightarrow a + b = 13 \quad \dots(ii)$$

Adding (i) and (ii), we get

$$2b = 16 \Rightarrow b = \frac{16}{2} = 8$$

Subtracting, $-2a = -10$

$$\Rightarrow a = \frac{-10}{-2} = 5$$

Hence $a = 5$, $b = 8$

Now, Let $x - 2 = 0$, then $x = 2$

and $f(x) = x^4 - 2x^3 + 3x^2 - 5x + 8$

$$\therefore f(2) = (2)^4 - 2(2)^3 + 3(2)^2 - 5 \times 2 + 8$$

$$= 16 - 2 \times 8 + 3 \times 4 - 5 \times 2 + 8$$

$$= 16 - 16 + 12 - 10 + 8$$

$$= 36 - 26 = 10$$

Hence remainder = 10 Ans.

Question 1.

Solution:

By factor theorem, $x - 2$ will be a factor of $f(x) = x^3 - 8$ if $f(2) = 0$

$$(\because x - 2 = 0 \Rightarrow x = 2)$$

$$\text{Now } f(2) = (2)^3 - 8 = 8 - 8 = 0$$

Hence $(x - 2)$ is a factor of $f(x)$ Ans.

Question 2.

Solution:

By factor theorem,

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$x - 3$ will be a factor of $f(x) = (2x^3 + 7x^2 - 24x - 45)$

if $f(3) = 0$ ($\because x - 3 = 0 \Rightarrow x = 3$)

$$\begin{aligned}\therefore f(3) &= 2(3)^3 + 7(3)^2 - 24 \times 3 - 45 \\ &= 2 \times 27 + 7 \times 9 - 72 - 45 \\ &= 54 + 63 - 72 - 45 \\ &= 117 - 117 = 0\end{aligned}$$

Hence $x - 3$ is a factor of $f(x)$ Ans.

Question 3.

Solution:

By factor theorem,

$(x - 1)$ is a factor of $f(x) = (2x^4 + 9x^3 + 6x^2 - 11x - 6)$

if $f(1) = 0$ ($\because x - 1 = 0 \Rightarrow x = 1$)

$$\begin{aligned}\therefore f(1) &= 2(1)^4 + 9(1)^3 + 6(1)^2 - 11 \times 1 - 6 \\ &= 2 \times 1 + 9 \times 1 + 6 \times 1 - 11 \times 1 - 6 \\ &= 2 + 9 + 6 - 11 - 6 = 17 - 17 = 0\end{aligned}$$

Hence $(x - 1)$ is a factor of $f(x)$ Ans.

Question 4.

Solution:

By factor theorem, $(x + 2)$ will

a factor of $f(x) = x^4 - x^4 + 2$

if $f(-2) = 0$ ($\because x + 2 = 0 \Rightarrow x = -2$)

$$\begin{aligned}\text{Now } f(-2) &= (-2)^4 - (-2)^2 - 12 \\ &= 16 - 4 - 12 = 16 - 16 = 0\end{aligned}$$

Hence $(x + 2)$ is a factor of $f(x)$ Ans.

Question 5.

Solution:

By factor theorem, $(x + 5)$ will be a factor of $f(x) = 2x^3 + 9x^2 - 11x - 30$ if $f(-5) = 0$

$$(\because x + 5 = 0 \Rightarrow x = -5)$$

$$\begin{aligned}\text{Now } f(-5) &= 2(-5)^3 + 9(-5)^2 - 11(-5) - 30 \\ &= 2(-125) + 9 \times 25 + 55 - 30 \\ &= -250 + 225 + 55 - 30 \\ &= 280 - 280 = 0\end{aligned}$$

Hence $(x + 5)$ is a factor of $f(x)$ Ans.

Question 6.

Solution:

By factor theorem, $(2x - 3)$ is a factor of $f(x) = 2x^4 + x^3 - 8x^2 - x + 6$

$$\text{if } f\left(\frac{3}{2}\right) = 0 \quad (\because 2x - 3 = 0 \Rightarrow x = \frac{3}{2})$$

$$\text{Now } f\left(\frac{3}{2}\right) = 2\left(\frac{3}{2}\right)^4 + \left(\frac{3}{2}\right)^3 - 8$$

$$\left(\frac{3}{2}\right)^2 + \frac{3}{2} + 6$$

$$= 2 \times \frac{81}{16} + \frac{27}{8} - 8 \times \frac{9}{4} - \frac{3}{2} + 6$$

$$= \frac{81}{8} + \frac{27}{8} - 18 - \frac{3}{2} + 6$$

$$= \frac{81+27}{8} - \frac{(36+3-12)}{2} = \frac{108}{8} - \frac{27}{2}$$

$$= \frac{27}{2} - \frac{27}{2} = 0$$

Hence $(2x - 3)$ is a factor of $f(x)$ Ans.

Question 7.

Solution:

By factor theorem, $(x - \sqrt{2})$ will be a factor of $f(x) = 7x^2 - 4\sqrt{2}x - 6$

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$$\text{if } f(-\sqrt{2}) = 0$$

$$(\because x + \sqrt{2} = 0 \Rightarrow x = -\sqrt{2})$$

$$\text{Now } f(-\sqrt{2}) = 2\sqrt{2}(-\sqrt{2})^2 + 5(-\sqrt{2})$$

$$+ \sqrt{2}$$

$$= 2\sqrt{2} \times 2 - 5\sqrt{2} + \sqrt{2}$$

$$= 4\sqrt{2} - 5\sqrt{2} + \sqrt{2} = 5\sqrt{2} - 5\sqrt{2}$$

$$= 0$$

Hence $(x + \sqrt{2})$ is a factor of $f(x)$ Ans.

Question 8.

Solution:

By factor theorem, $(x + \sqrt{2})$ will be a factor of $f(x) = 2\sqrt{2}x^3 + 5x + \sqrt{2}$

$$\text{if } f(-\sqrt{2}) = 0$$

$$(\because x + \sqrt{2} = 0 \Rightarrow x = -\sqrt{2})$$

$$\text{Now } f(-\sqrt{2}) = 2\sqrt{2}(-\sqrt{2})^2 + 5(-\sqrt{2})$$

$$+ \sqrt{2}$$

$$= 2\sqrt{2} \times 2 - 5\sqrt{2} + \sqrt{2}$$

$$= 4\sqrt{2} - 5\sqrt{2} + \sqrt{2} = 5\sqrt{2} - 5\sqrt{2}$$

$$= 0$$

Hence $(x + \sqrt{2})$ is a factor of $f(x)$ Ans.

Question 9.

Solution:

Let $f(x) = 2x^3 + 9x^2 + x + k$ and $x - 1$ is a factor of $f(x)$

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$$\text{Now } x - 1 = 0 \Rightarrow x = 1$$

By factor theorem, $f(x)$ is divisible exactly by $(x - 1)$ if $f(1) = 0$

$$\begin{aligned}\text{Now, } f(1) &= 2(1)^3 + 9(1)^2 + 1 + k \\ &= 2 \times 1 + 9 \times 1 + 1 + k \\ &= 2 + 9 + 1 + k = 12 + k\end{aligned}$$

$$\therefore f(1) = 0$$

$$\therefore 12 + k = 0 \Rightarrow k = -12$$

Hence $k = -12$ Ans.

Question 10.

Solution:

Let $f(x) = 2x^3 - 3x^2 - 18x + a$ and $x - 4$ is its factor

$$\text{Now } (x - 4) = 0 \Rightarrow x = 4$$

By factor theorem, $f(x)$ is divisible by $(x - 4)$ if $f(4) = 0$

$$\begin{aligned}\text{Now } f(4) &= 2(4)^3 - 3(4)^2 - 18 \times 4 + a \\ &= 2 \times 64 - 3 \times 16 - 18 \times 4 + a \\ &= 128 - 48 - 72 + a \\ &= 128 - 120 + a = 8 + a\end{aligned}$$

$$\therefore f(4) = 0$$

$$\therefore 8 + a = 0 \Rightarrow a = -8$$

Hence $a = -8$ Ans.

Question 11.

Solution:

Let $f(x) = x^4 - x^3 - 11x^2 - x + a$

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$f(x)$ is divisible by $(x + 3)$

$\therefore (x + 3)$ is its factor

Now $x + 3 = 0 \Rightarrow x = -3$.

By factor theorem, $f(x)$ is divisible by $(x + 3)$

if $f(-3) = 0$

$$\therefore f(-3) = (-3)^4 - (-3)^3 - 11(-3)^2 - (-3) + a$$

$$= 81 - (-27) - 11 \times 9 + 3 + a$$

$$= 81 + 27 - 99 + 3 + a$$

$$= 111 - 99 + a = 12 + a$$

$\therefore (x + 3)$ is the factor of $f(x)$

$$\therefore f(-3) = 0$$

$$\therefore 12 + a = 0 \Rightarrow a = -12$$

Hence $a = -12$ Ans.

Question 12.

Solution:

$$\text{Let } f(x) = 2x^3 + ax^2 + 11x + a + 3$$

and $(2x - 1)$ is its factor

$$\text{Let } 2x - 1 = 0 \text{ then } 2x = 1$$

$$\Rightarrow x = \frac{1}{2}$$

By factor theorem,

$f(x)$ is divisible by $2x - 1$ if $f\left(\frac{1}{2}\right) = 0$

$$\begin{aligned}\text{Now } f\left(\frac{1}{2}\right) &= 2\left(\frac{1}{2}\right)^3 + a\left(\frac{1}{2}\right)^2 + 11\left(\frac{1}{2}\right) \\ &+ a + 3\end{aligned}$$

$$= 2 \times \frac{1}{8} + a \times \frac{1}{4} + \frac{11}{2} + a + 3$$

$$= \frac{1}{4} + \frac{a}{4} + \frac{11}{2} + a + 3$$

$$= \frac{1}{4} + \frac{11}{2} + 3 + \frac{a}{4} + a$$

$$= \frac{1+22+12}{4} + \frac{a+4a}{4}$$

$$= \frac{35}{4} + \frac{5a}{4}$$

$\therefore (2x - 1)$ is the factor of $f(x)$

$$\therefore f\left(\frac{1}{2}\right) = 0$$

$$\therefore \frac{35}{4} + \frac{5a}{4} = 0$$

$$\Rightarrow \frac{5a}{4} = -\frac{35}{4}$$

$$a = -\frac{35}{4} + \frac{4}{5} = -7$$

Hence $a = -7$ Ans.

Question 13.

Solution:

Let $f(x) = x^3 - 10x^2 + ax + b$ and $(x - 1)$ and $(x - 2)$ are its factors

$$\therefore x - 1 = 0 \Rightarrow x = 1$$

$$\text{and } x - 2 = 0 \Rightarrow x = 2$$

By factor theorem,

$f(x)$ is divisible by $(x - 1)$ and $(x - 2)$

if $f(1) = 0$ and $f(2) = 0$

$$\text{Now } f(1) = (1)^3 - 10(1)^2 + a \times 1 + b$$

$$= 1 - 10 + a + b = a + b - 9$$

$$\therefore f(1) = 0$$

$$\therefore a + b - 9 = 0 \Rightarrow a + b = 9 \dots(i)$$

$$\text{and } f(2) = (2)^3 - 10(2)^2 + a \times 2 + b$$

$$= 8 - 40 + 2a + b = 2a + b - 32$$

$$\therefore f(2) = 0$$

$$\therefore 2a + b - 32 = 0$$

$$\Rightarrow 2a + b = 32 \dots(ii)$$

Subtracting (i), from (ii), we get :

$$a = 23,$$

Substituting the value of a in (i),

$$23 + b = 9 \Rightarrow b = a - 23 = -14$$

Hence $a = 23$, $b = -14$ Ans.

Question 14.

Solution:

$$\text{Let } f(x) = x^4 + ax^3 - 7x^2 - 8x + b,$$

and $(x + 2)$ and $(x + 3)$ are its factors

$$\therefore x + 2 = 0 \Rightarrow x = -2$$

$$\text{and } x + 3 = 0 \Rightarrow x = -3$$

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By factor theorem,

$f(x)$ is divisible by $(x + 2)$ as well as by $(x + 3)$

if $f(-2) = 0$ and $f(-3) = 0$

$$\text{Now } f(-2) = (-2)^4 + a(-2)^3 - 7(-2)^2 - 8(-2) + b$$

$$= 16 + a(-8) - 7(4) - 8(-2) + b$$

$$= 16 - 8a - 28 + 16 + b$$

$$= -8a + b + 4$$

$$\therefore -8a + b + 4 = 0 \quad [\because f(-2) = 0]$$

$$\therefore -8a + b = -4 \quad \dots(i)$$

$$\text{Again, } f(-3) = (-3)^4 + a(-3)^3 - 7(-3)^2 - 8(-3) + b$$

$$= 81 + a(-27) - 7(9) - 8(-3) + b$$

$$= 81 - 27a - 63 + 24 + b$$

$$= -27a + b + 105 - 63$$

$$= -27a + b + 42$$

$$-27a + b + 42 = 0 \quad [\because f(-3) = 0]$$

$$-27a + b = -42 \quad \dots(ii)$$

Subtracting (ii) from (i), we get :

$$19a = 38 \quad \Rightarrow \quad a = \frac{38}{19} = 2$$

Substituting the value of a in (i),

$$-8(2) + b = -4$$

$$\Rightarrow -16 + b = -4 \quad \Rightarrow \quad b = -4 + 16 = 12$$

Hence $a = 2$, $b = 12$ Ans.

Question 15.

Solution:

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Let $f(x) = x^3 - 3x^2 - 13x + 15$

Now $x^2 + 2x - 3 = x^2 + 3x - x - 3$

$$= x(x + 3) - 1(x + 3)$$

$$= (x + 3)(x - 1)$$

$f(x)$ is divisible by $(x + 3)$ as well as $(x - 1)$

Let $x + 3 = 0$ then $x = -3$ and

$x - 1 = 0$ then $x = 1$

then $f(-3) = (-3)^3 - 3(-3)^2 - 13(-3) + 15$

$$= -27 - 27 + 39 + 15 = -54 + 54 = 0$$

and $f(1) = (1)^3 - 3(1)^2 - 13(1) + 15$

$$= 1 - 3 - 13 + 15 = 16 - 16 = 0$$

By factor theorem,

$$\therefore f(-3) = 0 \text{ and } f(1) = 0$$

$\therefore (x + 3)$ and $(x - 1)$ are factors of $f(x)$

$(x + 3)(x - 1)$ is factor of $f(x)$

$$\Rightarrow x^2 + 2x - 3 \text{ is a factor of } f(x)$$

Hence $f(x)$ is divisible exactly by $x^2 + 2x - 3$ Ans.

Question 16.

Solution:

Let $f(x) = x^3 + ax^2 + bx + 6$ and $(x - 2)$ is its factor

Let $x - 2 = 0$ then $x = 2$

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$$\therefore f(2) = 0$$

$$\begin{aligned}\text{Now } f(2) &= (2)^3 + a(2)^2 + b(2) + 6 \\ &= 8 + 4a + 2b + 6 = 4a + 2b + 14\end{aligned}$$

$$\therefore f(2) = 0$$

$$\therefore 4a + 2b + 14 = 0$$

$$\Rightarrow 4a + 2b = -14$$

$$\Rightarrow 2a + b = -7 \quad \dots(i)$$

(Dividing by 2)

$\therefore$ Remainder = 3, when $f(x)$ is divided by $(x - 3)$

$$\text{Let } x - 3 = 0 \quad \text{then } x = 3 \text{ and } f(3) = 3$$

$$\begin{aligned}\text{Now } f(3) &= (3)^3 + a(3)^2 + b(3) + 6 \\ &= 27 + 9a + 3b + 6\end{aligned}$$

$$= 33 + 9a + 3b$$

$$\therefore f(3) = 3$$

$$\therefore 33 + 9a + 3b = 3$$

$$\Rightarrow 9a + 3b = 3 - 33 = -30$$

$$\Rightarrow 3a + b = -10 \quad \dots(ii)$$

(Dividing by 3)

Subtracting (i) from (ii), we get :

$$a = -3$$

Substituting the value of a in (i), then

$$2(-3) + b = -7$$

$$\Rightarrow -6 + b = -7$$

$$\Rightarrow b = -7 + 6 = -1$$

Hence $a = -3$, $b = -1$ Ans.

Ex 2E

Factorize:

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Question 1.**Solution:**

$$9x^2 + 12xy$$
$$= 3x (3x + 4y) \text{ Ans.}$$

Question 2.**Solution:**

$$18x^2y - 24xyz$$
$$= 6xy (3x - 4z) \text{ Ans.}$$

Question 3.**Solution:**

$$27a^3b^3 - 45a^4b^2$$
$$= 9a^3b^2 (3b - 5a) \text{ Ans.}$$

Question 4.**Solution:**

$$2a (x + y) - 3b(x + y)$$
$$= (x + y) (2a - 3b) \text{ Ans.}$$

Question 5.**Solution:**

$$2x (p^2 + q^2) + 4y (p^2 + q^2)$$
$$= 2(p^2 + q^2) (x + 2y) \text{ Ans}$$

Question 6.**Solution:**

$$x (a - 5) + y (5 - a)$$

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$$= x(a - 5) - y(a - 5)$$

$$= (a - 5)(x - y) \text{ Ans.}$$

Question 7.**Solution:**

$$4(a + b) - 6(a + b)^2$$

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

$$= 2(a + b)(2 - 3a - 3b) \text{ Ans.}$$

Question 8.**Solution:**

$$8(3a - 2b)^2 - 10(3a - 2b)$$

$$= 2(3a - 2b) \{4(3a - 2b) - 5\}$$

$$= 2(3a - 2b)(12a - 8b - 5) \text{ Ans.}$$

Question 9.**Solution:**

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

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

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

$$= x(x + y)(x^2 + y^2 - xy) \text{ Ans.}$$

Question 10.**Solution:**

$$x^3 + 2x^2 + 5x + 10$$

$$= x^2(x + 2) + 5(x + 2)$$

$$= (x + 2)(x^2 + 5) \text{ Ans.}$$

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Question 11.**Solution:**

$$\begin{aligned} & x^2 + xy - 2xz - 2yz \\ &= x(x + y) - 2z(x + y) \\ &= (x + y)(x - 2z) \text{ Ans.} \end{aligned}$$

Question 12.**Solution:**

$$\begin{aligned} & a^3b - a^2b + 5ab - 5b \\ &= b(a^3 - a^2 + 5a - 5) \\ &= b\{(a^2(a - 1) + 5(a - 1))\} \\ &= b(a - 1)(a^2 + 5) \text{ Ans.} \end{aligned}$$

Question 13.**Solution:**

$$\begin{aligned} & 8 - 4a - 2a^3 + a^4 \\ &= 4(2 - a) - a^3(2 - a) \\ &= (2 - a)(4 - a^3) \text{ Ans.} \end{aligned}$$

Question 14.**Solution:**

$$\begin{aligned} & x^3 - 2x^2y + 3xy^2 - 6y^3 \\ &= x^2(x - 2y) + 3y^2(x - 2y) \\ &= (x - 2y)(x^2 + 3y^2) \text{ Ans} \end{aligned}$$

Question 15.**Solution:**

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$$\begin{aligned} & px - 5q + pq - 5x \\ &= px - 5x + pq - 5q \\ &= x(p - 5) + q(p - 5) \\ &= (p - 5)(x + q) \text{ Ans.} \end{aligned}$$

Question 16.**Solution:**

$$\begin{aligned} & x^2 + y - xy - x \\ &= x^2 - x - xy + y \\ &= x(x - 1) - y(x - 1) \\ &= (x - 1)(x - y) \text{ Ans.} \end{aligned}$$

Question 17.**Solution:**

$$\begin{aligned} & (3a - 1)^2 - 6a + 2 \\ &= (3a - 1)^2 - 2(3a - 1) \\ &= (3a - 1)(3a - 1 - 2) \\ &= (3a - 1)(3a - 3) \\ &= 3(3a - 1)(a - 1) \text{ Ans.} \end{aligned}$$

Question 18.**Solution:**

$$\begin{aligned} & (2x - 3)^2 - 8x + 12 \\ &= (2x - 3)^2 - 4(2x - 3) \\ &= (2x - 3)(2x - 3 - 4) \\ &= (2x - 3)(2x - 7) \text{ Ans.} \end{aligned}$$

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Question 19.**Solution:**

$$a^3 + a - 3a^2 - 3$$

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

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

$$= (a - 3)(a^2 + 1) \text{ Ans.}$$

Question 20.**Solution:**

$$3ax - 6ay - 8by + 4bx$$

$$= 3ax - 6ay + 4bx - 8by$$

$$= 3a(x - 2y) + 4b(x - 2y)$$

$$= (x - 2y)(3a + 4b) \text{ Ans}$$

Question 21.**Solution:**

$$abx^2 + a^2x + b^2x + ab$$

$$= ax(bx + a) + b(bx + a)$$

$$= (bx + a)(ax + b) \text{ Ans.}$$

Question 22.**Solution:**

$$x^3 - x^2 + ax + x - a - 1$$

$$= x^3 - x^2 + ax - a + x - 1$$

$$= x^2(x - 1) + a(x - 1) + 1(x - 1)$$

$$= (x - 1)(x^2 + a + 1) \text{ Ans.}$$

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Question 23.**Solution:**

$$\begin{aligned} & 2x + 4y - 8xy - 1 \\ &= 2x - 8xy - 1 + 4y \\ &= 2x(1 - 4y) - 1(1 - 4y) \\ &= (1 - 4y)(2x - 1) \text{ Ans.} \end{aligned}$$

Question 24.**Solution:**

$$\begin{aligned} & ab(x^2 + y^2) - xy(a^2 + b^2) \\ &= abx^2 + aby^2 - a^2xy - b^2xy \\ &= abx^2 - a^2xy - b^2xy + aby^2 \\ &= ax(bx - ay) - by(bx - ay) \\ &= (bx - ay)(ax - by) \text{ Ans.} \end{aligned}$$

Question 25.**Solution:**

$$\begin{aligned} & a^2 + ab(b + 1) + b^3 \\ &= a^2 + ab^2 + ab + b^3 \\ &= a(a + b^2) + b(a + b^2) \\ &= (a + b^2)(a + b) \text{ Ans} \end{aligned}$$

Question 26.**Solution:**

$$\begin{aligned} & a^3 + ab(1 - 2a) - 2b^2 \\ &= a^3 + ab - 2a^2b - 2b^2 \end{aligned}$$

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

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

$$= (a - 2b)(a^2 + b) \text{ Ans.}$$

Question 27.**Solution:**

$$2a^2 + bc - 2ab - ac$$

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

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

$$= (a - b)(2a - c) \text{ Ans.}$$

Question 28.**Solution:**

$$(ax + by)^2 + (bx - ay)^2$$

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

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

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

$$= x^2(a^2 + b^2) + y^2(a^2 + b^2)$$

$$= (a^2 + b^2)(x^2 + y^2) \text{ Ans.}$$

Question 29.**Solution:**

$$a(a + b - c) - bc$$

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

$$= a(a + b) - c(a + b)$$

$$(a + b)(a - c) \text{ Ans.}$$

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Question 30.**Solution:**

$$\begin{aligned} & a(a - 2b - c) + 2bc \\ &= a^2 - 2ab - ac + 2bc \\ &= a^2 - ac - 2ab + 2bc \\ &= a(a - c) - 2b(a - c) \\ &= (a - c)(a - 2b) \text{ Ans.} \end{aligned}$$

Question 31.**Solution:**

$$\begin{aligned} & a^2x^2 + (ax^2 + 1)x + a \\ &= a^2x^2 + ax^3 + x + a \\ &= a^2x^2 + ax^3 + a + x \\ &= ax^2(a + x) + 1(a + x) \\ &= (a + x)(ax^2 + 1) \text{ Ans} \end{aligned}$$

Question 32.**Solution:**

$$\begin{aligned} & ab(x^2 + 1) + x(a^2 + b^2) \\ &= abx^2 + ab + a^2x + b^2x \\ &= abx^2 + a^2x + b^2x + ab \\ &= ax(bx + a) + b(bx + a) \\ &= (bx + a)(ax + b) \text{ Ans.} \end{aligned}$$

Question 33.**Solution:**

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$$\begin{aligned} & x^2 - (a + b)x + ab \\ &= x^2 - ax - bx + ab \\ &= x(x - a) - b(x - a) \\ &= (x - a)(x - b) \text{ Ans.} \end{aligned}$$

Question 34.**Solution:**

$$\begin{aligned} & x^2 + \frac{1}{x^2} - 2 - 3x + \frac{3}{x} \\ &= \left(x - \frac{1}{x}\right)^2 - 3\left(x - \frac{1}{x}\right) \\ &= \left(x - \frac{1}{x}\right)\left(x - \frac{1}{x} - 3\right) \text{ Ans.} \end{aligned}$$

Ex 2F**Question 1.****Solution:**

$$\begin{aligned} & 25x^2 - 64y^2 \\ &= (5x)^2 - (8y)^2 \\ &= (5x + 8y)(5x - 8y) \text{ Ans.} \end{aligned}$$

Question 2.**Solution:**

$$\begin{aligned} & 100 - 9x^2 \\ &= (10)^2 - (3x)^2 \\ &= (10 + 3x)(10 - 3x) \text{ Ans.} \end{aligned}$$

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Question 3.**Solution:**

$$\begin{aligned} &5x^2 - 7y^2 \\ &= (\sqrt{5x})^2 - (\sqrt{7y})^2 \\ &= (\sqrt{5x} - \sqrt{7y})(\sqrt{5x} + \sqrt{7y}) \text{ Ans} \end{aligned}$$

Question 4.**Solution:**

$$\begin{aligned} &(3x + 5y)^2 - 4z^2 \\ &= (3x + 5y)^2 - (2z)^2 \\ &= (3x + 5y + 2z)(3x + 5y - 2z) \text{ Ans.} \end{aligned}$$

Question 5.**Solution:**

$$\begin{aligned} &150 - 6x^2 \\ &= 6(25 - x^2) \\ &= 6\{(5)^2 - (x^2)\} \\ &= 6(5 + x)(5 - x) \text{ Ans.} \end{aligned}$$

Question 6.**Solution:**

$$\begin{aligned} &20x^2 - 45 \\ &= 5(4x^2 - 9) \\ &= 5\{(2x)^2 - (3)^2\} \\ &= 5(2x + 3)(2x - 3) \text{ Ans.} \end{aligned}$$

Question 7.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

$$\begin{aligned} & 3x^3 - 48x \\ &= 3x (x^2 - 16) \\ &= 3x \{(x)^2 - (4)^2\} \\ &= 3x (x + 4) (x - 4) \text{ Ans.} \end{aligned}$$

Question 8.

Solution:

$$\begin{aligned} & 2 - 50x^2 \\ &= 2(1 - 25x^2) = 2 \{(1)^2 - (5x)^2\} \\ &= 2 (1 + 5x) (1 - 5x) \text{ Ans.} \end{aligned}$$

Question 9.

Solution:

$$\begin{aligned} & 27a^2 - 48b^2 \\ &= 3(9a^2 - 16b^2) \\ &= 3 \{(3a)^2 - (4b)^2\} \\ &= 3(3a + 4b) (3a - 4b) \text{ Ans.} \end{aligned}$$

Question 10.

Solution:

$$\begin{aligned} & x - 64x^3 \\ &= x (1 - 64x^2) \\ &= x \{(1)^2 - (8x)^2\} \\ &= x (1 + 8x) (1 - 8x) \text{ Ans.} \end{aligned}$$

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Question 11.**Solution:**

$$\begin{aligned} &8ab^2 - 18a^3 \\ &= 2a (4b^2 - 9a^2) \\ &= 2a \{(2b)^2 - (3a)^2\} \\ &= 2a (2b + 3a) (2b - 3a) \text{ Ans} \end{aligned}$$

Question 12.**Solution:**

$$\begin{aligned} &3a^3b - 243ab^3 \\ &= 2ab (a^2 - 81b^2) \\ &= 3ab \{(a)^2 - (9b)^2\} \\ &= 3ab (a + 9b) (a - 9b) \text{ Ans.} \end{aligned}$$

Question 13.**Solution:**

$$\begin{aligned} &(a + b)^3 - a - b \\ &= (a + b)^3 - 1(a + b) \\ &= (a + b) \{(a + b)^2 - 1\} \\ &= (a + b) \{(a + b)^2 - (1)^2\} \\ &= (a + b) (a + b + 1) (a + b - 1) \text{ Ans.} \end{aligned}$$

Question 14.**Solution:**

$$\begin{aligned} &108a^2 - 3(b - c)^2 \\ &= 3 \{36a^2 - (b - c)^2\} \end{aligned}$$

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$$\begin{aligned} &= 3 \{(6a)^2 - (b - c)^2\} \\ &= 3 \{(6a + (b - c)) \{6a - (b - c)\}\} \\ &= 3 (6a + b - c) (6a - b + c) \text{ Ans.} \end{aligned}$$

Question 15.**Solution:**

$$\begin{aligned} &x^3 - 5x^2 - x + 5 \\ &= x^2(x - 5) - 1(x - 5) \\ &= (x - 5) (x^2 - 1) \\ &= (x - 5) \{(x)^2 - (1)^2\} \\ &= (x - 5) (x + 1) (x - 1) \text{ Ans.} \end{aligned}$$

Question 16.**Solution:**

$$\begin{aligned} &a^2 + 2ab + b^2 - 9c^2 \\ &= (a + b)^2 - (3c)^2 \\ &= \{a^2 + b^2 + 2ab - (a + b)^2\} \\ &= (a + b + 3c) (a + b - 3c) \text{ Ans.} \end{aligned}$$

Question 17.**Solution:**

$$\begin{aligned} &9 - a^2 + 2ab - b^2 \\ &= 9 - (a^2 - 2ab + b^2) \\ &= (3)^2 - (a - b)^2 \\ &\{ \therefore a^2 + b^2 - 2ab = (a - b)^2 \} \\ &= (3 + a - b) (3 - a + b) \text{ Ans.} \end{aligned}$$

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Question 18.**Solution:**

$$\begin{aligned} & a^2 - b^2 - 4ac + 4c^2 \\ &= a^2 - 4ac + 4c^2 - b^2 \\ &= (a)^2 - 2 \times a \times 2c + (2c)^2 - (b)^2 \\ &= (a - 2c)^2 - (b)^2 \\ &= (a - 2c + b)(a - 2c - b) \\ &= (a + b - 2c)(a - b - 2c) \text{ Ans.} \end{aligned}$$

Question 19.**Solution:**

$$\begin{aligned} & 9a^2 + 3a - 8b - 64b^2 \\ &= 9a^2 - 64b^2 + 3a - 8b \\ &= (3a)^2 - (8b)^2 + 1(3a - 8b) \\ &= (3a + 8b)(3a - 8b) + 1(3a - 8b) \\ &= (3a - 8b)(3a + 8b + 1) \text{ Ans.} \end{aligned}$$

Question 20.**Solution:**

$$\begin{aligned} & x^2 - y^2 + 6y - 9 \\ &= (x)^2 - (y^2 - 6y + 9) \\ &= (x)^2 - \{(y)^2 - 2 \times y \times 3 + (3)^2\} \\ &= (x)^2 - (y - 3)^2 \\ &= (x + y - 3)(x - y + 3) \text{ Ans.} \end{aligned}$$

Question 21.

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Solution:

$$\begin{aligned} & 4x^2 - 9y^2 - 2x - 3y \\ &= (2x)^2 - (3y)^2 - 1(2x + 3y) \\ &= (2x + 3y)(2x - 3y) - 1(2x + 3y) \\ &= (2x + 3y)(2x - 3y - 1) \text{ Ans.} \end{aligned}$$

Question 22.

Solution:

$$\begin{aligned} & x^4 - 1 \\ &= (x^2)^2 - (1)^2 \\ &= (x^2 + 1)(x^2 - 1) \\ &= (x^2 + 1)\{(x)^2 - (1)^2\} \\ &= (x^2 + 1)(x + 1)(x - 1) \text{ Ans.} \end{aligned}$$

Question 23.

Solution:

$$\begin{aligned} & a - b - a^2 + b^2 \\ &= 1(a - b) - (a^2 - b^2) \\ &= 1(a - b) - (a + b)(a - b) \\ &= (a - b)(1 - a - b) \text{ Ans.} \end{aligned}$$

Question 24.

Solution:

$$\begin{aligned} & x^4 - 625 \\ &= (x^2)^2 - (25)^2 \\ &= (x^2 + 25)(x^2 - 25) \end{aligned}$$

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$$= (x^2 + 25) \{(x)^2 - (5)^2\}$$

$$= (x^2 + 25) (x + 5) (x - 5) \text{ Ans.}$$

Ex 2G

Question 1.

Solution:

$$x^2 + 11x + 30$$

$$= x^2 + 5x + 6x + 30 \left\{ \begin{array}{l} \because 30 = 5 \times 6 \\ 11 = 5 + 6 \end{array} \right\}$$

$$= x (x + 5) + 6 (x + 5)$$

$$= (x + 5) (x + 6) \text{ Ans.}$$

Question 2.

Solution:

$$x^2 + 18x + 32$$

$$= x^2 + 2x + 16x + 32 \left\{ \begin{array}{l} \because 32 = 2 \times 16 \\ 18 = 2 + 16 \end{array} \right\}$$

$$= x (x + 2) + 16 (x + 2)$$

$$= (x + 2) (x + 16) \text{ Ans.}$$

Question 3.

Solution:

$$x^2 + 7x - 18$$

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$$\begin{aligned} &= x^2 + 9x - 2x - 18 \left\{ \begin{array}{l} \because -18 = 9 \times (-2) \\ 7 = 9 - 2 \end{array} \right\} \\ &= x(x + 9) - 2(x + 9) \\ &= (x + 9)(x - 2) \text{ Ans.} \end{aligned}$$

Question 4.

Solution:

$$x^2 + 5x - 6$$

$$\begin{aligned} &= x^2 + 6x - x - 6 \left\{ \begin{array}{l} \because -6 = 6 \times (-1) \\ 5 = 6 - 1 \end{array} \right\} \\ &= x(x + 6) - 1(x + 6) \\ &= (x + 6)(x - 1) \text{ Ans.} \end{aligned}$$

Question 5.

Solution:

$$y^2 - 4y + 3$$

$$\begin{aligned} &= y^2 - y - 3y + 3 \left\{ \begin{array}{l} \because 3 = (-1) \times (-3) \\ -4 = -1 - 3 \end{array} \right\} \\ &= y(y - 1) - 3(y - 1) \\ &= (y - 1)(y - 3) \text{ Ans.} \end{aligned}$$

Question 6.

Solution:

$$x^2 - 21x + 108$$

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$$= x^2 - 12x - 9x + 108$$

$$\left\{ \begin{array}{l} \because 108 = (-12)(-9) \\ -21 = -12 - 9 \end{array} \right\}$$

$$= x(x - 12) - 9(x - 12)$$

$$= (x - 12)(x - 9) \text{ Ans.}$$

Question 7.

Solution:

$$x^2 - 11x - 80$$

$$= x^2 - 16x + 5x - 80$$

$$\left\{ \begin{array}{l} \because -80 = -16 \times 5 \\ -11 = -16 + 5 \end{array} \right\}$$

$$= x(x - 16) + 5(x - 16)$$

$$= (x - 16)(x + 5) \text{ Ans.}$$

Question 8.

Solution:

$$x^2 - x - 156$$

$$= x^2 - 13x + 12x - 156$$

$$\left\{ \begin{array}{l} \because -156 = -13 \times 12 \\ -1 = -13 + 12 \end{array} \right\}$$

$$= x(x - 13) + 12(x - 13)$$

$$= (x - 13)(x + 12) \text{ Ans.}$$

Question 9.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

$$z^2 - 32z - 105$$

$$= z^2 - 35z + 3z - 105$$

$$\left\{ \begin{array}{l} \because -105 = -35 \times 3 \\ -32 = -35 + 3 \end{array} \right\}$$

$$= z(z - 35) + 3(z - 35)$$

$$= (z - 35) (z + 3) \text{ Ans.}$$

Question 10.

Solution:

$$40 + 3x - x^2$$

$$= -x^2 + 3x + 40 = -1 (x^2 - 3x - 40)$$

$$= -1 (x^2 - 8x + 5x - 40)$$

$$= -1 \{x (x - 8) + 5 (x - 8)\}$$

$$= -1 (x - 8) (x + 5)$$

$$= (8 - x) (5 + x) \text{ Ans.}$$

Question 11.

Solution:

$$6 - x - x^2$$

$$\begin{aligned} &= -1 \{x^2 + x - 6\} \\ &= -1 \{x^2 + 3x - 2x - 6\} \left\{ \begin{array}{l} \because -6 = 3 \times (-2) \\ 1 = 3 - 2 \end{array} \right\} \\ &= -1 \{x(x + 3) - 2(x + 3)\} \\ &= -1 (x + 3) (x - 2) \\ &= (x + 3) (2 - x) = (3 + x) (2 - x) \text{ Ans.} \end{aligned}$$

Question 12.

Solution:

$$7x^2 + 49x + 84$$

$$\begin{aligned} &= 7 \{x^2 + 7x + 12\} \left\{ \begin{array}{l} \because 12 = 3 \times 4 \\ 7 = 3 + 4 \end{array} \right\} \\ &= 7 \{x^2 + 3x + 4x + 12\} \\ &= 7 \{x(x + 3) + 4(x + 3)\} \\ &= 7 (x + 3) (x + 4) \text{ Ans.} \end{aligned}$$

Question 13.

Solution:

$$m^2 + 17mn - 84n^2$$

$$\begin{aligned} &= m^2 + 21mn - 4mn - 84n^2 \\ &\quad \left\{ \begin{array}{l} \because -84 = 21 \times (-4) \\ 17 = 21 - 4 \end{array} \right\} \\ &= m(m + 21n) - 4n(m + 21n) \\ &= (m + 21n) (m - 4n) \text{ Ans.} \end{aligned}$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Question 14.

Solution:

$$5x^2 + 16x + 3$$

$$\begin{aligned} &= 5x^2 + 15x + x + 3 \left\{ \begin{array}{l} \because 5 \times 3 = 15 \\ \therefore 15 = 15 \times 1 \\ 16 = 15 + 1 \end{array} \right\} \\ &= 5x(x + 3) + 1(x + 3) \\ &= (x + 3)(5x + 1) \text{ Ans.} \end{aligned}$$

Question 15.

Solution:

$$6x^2 + 17x + 12$$

$$\begin{aligned} &= 6x^2 + 9x + 8x + 12 \left\{ \begin{array}{l} \because 6 \times 12 = 72 \\ \therefore 72 = 9 \times 8 \\ \text{and } 17 = 9 + 8 \end{array} \right\} \\ &= 3x(2x + 3) + 4(2x + 3) \\ &= (2x + 3)(3x + 4) \text{ Ans.} \end{aligned}$$

Question 16.

Solution:

$$9x^2 + 18x + 8$$

$$= 9x^2 + 12x + 6x + 8 \left\{ \begin{array}{l} \because 9 \times 8 = 72 \\ \therefore 72 = 12 \times 6 \\ \text{and } 18 = 12 + 6 \end{array} \right\}$$

$$= 3x (3x + 4) + 2 (3x + 4)$$

$$= (3x + 4) (3x + 2) \text{ Ans.}$$

Question 17.

Solution:

$$14x^2 + 9x + 1$$

$$= 14x^2 + 7x + 2x + 1 \left\{ \begin{array}{l} \because 14 \times 1 = 14 \\ \therefore 14 = 7 \times 2 \\ \text{and } 9 = 7 + 2 \end{array} \right\}$$

$$= 7x (2x + 1) + 1 (2x + 1)$$

$$= (2x + 1) (7x + 1) \text{ Ans.}$$

Question 18.

Solution:

$$2x^2 + 3x - 90$$

$$= 2x^2 + 15x - 12x - 90$$

$$\left\{ \begin{array}{l} \because 2 \times (-90) = -180 \\ \therefore -180 = 15 \times (-12) \\ \text{and } 3 = 15 - 12 \end{array} \right\}$$

$$= x(2x + 15) - 6 (2x + 15)$$

$$= (2x + 15) (x - 6) \text{ Ans.}$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Question 19.

Solution:

$$2x^2 + 11x - 21$$

$$= 2x^2 + 14x - 3x - 21$$

$$\left\{ \begin{array}{l} \because 2 \times (-21) = -42 \\ \therefore -42 = 14 \times (-3) \\ \text{and } 11 = 14 - 3 \end{array} \right\}$$

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

$$= (x + 7)(2x - 3) \text{ Ans.}$$

Question 20.

Solution:

$$3x^2 - 14x + 8$$

$$= 3x^2 - 12x - 2x + 8$$

$$\left\{ \begin{array}{l} \because 3 \times 8 = 24 \\ \therefore 24 = (-12) \times (-2) \\ \text{and } -14 = -12 - 2 \end{array} \right\}$$

$$= 3x(x - 4) - 2(x - 4)$$

$$= (x - 4)(3x - 2) \text{ Ans.}$$

Question 21.

Solution:

$$18x^2 + 3x - 10$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 18x^2 + 15x - 12x - 10$$

$$\left\{ \begin{array}{l} \because 18 \times (-10) = -180 \\ \therefore -180 = 15 \times (-12) \\ +3 = 15 - 12 \end{array} \right\}$$

$$= 3x(6x + 5) - 2(6x + 5)$$

$$= (6x + 5)(3x - 2)$$

Question 22.

Solution:

$$15x^2 + 2x - 8$$

$$= 15x^2 + 12x - 10x - 8$$

$$, \left\{ \begin{array}{l} \because 15 \times (-8) = -120 \\ \therefore -120 = -12 \times (-10) \\ \text{and } 2 = 12 - 10 \end{array} \right\}$$

$$= 3x(5x + 4) - 2(5x + 4)$$

$$= (5x + 4)(3x - 2) \text{ Ans.}$$

Question 23.

Solution:

$$6x^2 + 11x - 10$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 6x^2 + 15x - 4x - 10$$

$$\left\{ \begin{array}{l} \because 6 \times (-10) = -60 \\ \therefore -60 = 15 \times (-4) \\ \text{and } 11 = 15 - 4 \end{array} \right\}$$

$$= 3x(2x + 5) - 2(2x + 5)$$

$$= (2x + 5)(3x - 2) \text{ Ans.}$$

Question 24.

Solution:

$$30x^2 + 7x - 15$$

$$= 30x^2 + 25x - 18x - 15$$

$$\left\{ \begin{array}{l} \because 30 \times (-15) = -450 \\ \therefore -450 = 25 \times (-18) \\ \text{and } 7 = 25 - 18 \end{array} \right\}$$

$$= 5x(6x + 5) - 3(6x + 5)$$

$$= (6x + 5)(5x - 3) \text{ Ans.}$$

Question 25.

Solution:

$$24x^2 - 41x + 12$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\left\{ \begin{array}{l} \because 24 \times 12 = 288 \\ \therefore 288 = (-32) \times (-9) \\ -41 = -32 - 9 \end{array} \right\}$$
$$= 24x^2 - 32x - 9x + 12$$
$$= 8x(3x - 4) - 3(3x - 4)$$
$$= (3x - 4)(8x - 3) \text{ Ans.}$$

Question 26.

Solution:

$$2x^2 - 7x - 15$$

$$\left\{ \begin{array}{l} \because 2 \times (-15) = -30 \\ \therefore -30 = -10 \times 3 \\ \text{and } -7 = -10 + 3 \end{array} \right\}$$
$$= 2x^2 - 10x + 3x - 15$$
$$= 2x(x - 5) + 3(x - 5)$$
$$= (x - 5)(2x + 3) \text{ Ans.}$$

Question 27.

Solution:

$$6x^2 - 5x - 21$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 6x^2 - 14x + 9x - 21$$

$$\left\{ \begin{array}{l} \because 6 \times (-21) = -126 \\ \therefore -126 = -14 \times 9 \\ \text{and } -5 = -14 + 9 \end{array} \right\}$$

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

$$= (3x - 7) (2x + 3) \text{ Ans.}$$

Question 28.

Solution:

$$10x^2 - 9x - 7$$

$$= 10x^2 - 14x + 5x - 7$$

$$\left\{ \begin{array}{l} \because 10 \times (-7) = -70 \\ \therefore -70 = -14 \times 5 \\ \text{and } -9 = -14 + 5 \end{array} \right\}$$

$$= 2x (5x - 7) + 1 (5x - 7)$$

$$= (5x - 7) (2x + 1) \text{ Ans.}$$

Question 29.

Solution:

$$5x^2 - 16x - 21$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 5x^2 - 21x + 5x - 21$$

$$\left\{ \begin{array}{l} \because 5 \times (-21) = -105 \\ \therefore -105 = -21 \times 5 \\ \text{and } -16 = -21 + 5 \end{array} \right\}$$

$$= x(5x - 21) + 1(5x - 21)$$

$$= (5x - 21)(x + 1) \text{ Ans.}$$

Question 30.

Solution:

$$2x^2 - x - 21$$

$$\left\{ \begin{array}{l} \because 2 \times (-21) = -42 \\ \therefore -42 = -7 \times 6 \\ \text{and } -1 = -7 + 6 \end{array} \right\}$$

$$= 2x^2 - 7x + 6x - 21$$

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

$$= (2x - 7)(x + 3) \text{ Ans.}$$

Question 31.

Solution:

$$15x^2 - x - 28$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 15x^2 - 21x + 20x - 28$$

$$\left\{ \begin{array}{l} \because 15 \times (-28) = -420 \\ \therefore -420 = -21 \times 20 \\ \text{and } -1 = -21 + 20 \end{array} \right\}$$

$$= 3x(5x - 7) + 4(5x - 7)$$

$$= (5x - 7)(3x + 4) \text{ Ans.}$$

Question 32.

Solution:

$$8a^2 - 27ab + 9b^2$$

$$= 8a^2 - 24ab - 3ab + 9b^2$$

$$\left\{ \begin{array}{l} \because 8 \times 9 = 72 \\ \therefore 72 = (-24) \times (-3) \\ \text{and } -27 = -24 - 3 \end{array} \right\}$$

$$= 8a(a - 3b) - 3b(a - 3b)$$

$$= (a - 3b)(8a - 3b) \text{ Ans.}$$

Question 33.

Solution:

$$5x^2 + 33xy - 14y^2$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 5x^2 + 35xy - 2xy - 14y^2$$

$$\left\{ \begin{array}{l} \because 5 \times (-14) = -70 \\ \therefore -70 = 35 \times (-2) \\ 33 = 35 - 2 \end{array} \right\}$$

$$\begin{aligned} &= 5x(x + 7y) - 2y(x + 7y) \\ &= (x + 7y)(5x - 2y) \end{aligned}$$

Question 34.

Solution:

$$3x^3 - x^2 - 10x$$

$$= x(3x^2 - x - 10)$$

$$\left\{ \begin{array}{l} \because 3 \times (-10) = -30 \\ \therefore -30 = -6 \times 5 \\ \text{and } -1 = -6 + 5 \end{array} \right\}$$

$$\begin{aligned} &= x(3x^2 - 6x + 5x - 10) \\ &= x\{3x(x - 2) + 5(x - 2)\} \\ &= x(x - 2)(3x + 5) \text{ Ans.} \end{aligned}$$

Question 35.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\frac{1}{3}x^2 - 2x - 9$$

$$= \frac{1}{3} (x^2 - 6x - 27) \left\{ \begin{array}{l} \because -27 = -9 \times 3 \\ -6 = -9 + 3 \end{array} \right\}$$

$$= \frac{1}{3} (x^2 - 9x + 3x - 27)$$

$$= \frac{1}{3} \{x(x - 9) + 3(x - 9)\}$$

$$= \frac{1}{3} (x - 9)(x + 3) \text{ Ans.}$$

Question 36.

Solution:

$$x^2 - 2x + \frac{7}{16}$$

$$= \frac{1}{16} (16x^2 - 32x + 7)$$

$$\left\{ \begin{array}{l} \because -16 \times 7 = 112 \\ \text{and } 112 = (-28) \times (-4) \end{array} \right\}$$

$$= \frac{1}{16} \{16x^2 - 28x - 4x + 7\}$$

$$= \frac{1}{16} \{4x(4x - 7) - 1(4x - 7)\}$$

$$= \frac{1}{16} (4x - 7)(4x - 1) \text{ Ans.}$$

Question 37.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

$$\sqrt{2}x^2 + 3x + \sqrt{2}$$

$$= \sqrt{2}x^2 + 2x + x + \sqrt{2}$$

$$\left\{ \begin{array}{l} \because \sqrt{2} \times \sqrt{2} = 2 \\ \therefore 2 = 2 \times 1 \\ \text{and } 3 = 2 + 1 \end{array} \right\}$$

$$= \sqrt{2}x(x + \sqrt{2}) + 1(x + \sqrt{2})$$

$$= (x + \sqrt{2})(\sqrt{2}x + 1) \text{ Ans.}$$

Question 38.

Solution:

$$\sqrt{5}x^2 + 2x - 3\sqrt{5}$$

$$= \sqrt{5}x^2 + 5x - 3x - 3\sqrt{5}$$

$$\left\{ \begin{array}{l} \because \sqrt{5} \times (-3\sqrt{5}) = -15 \\ \therefore -15 = 5 \times (-3) \\ \text{and } 2 = 5 - 3 \end{array} \right\}$$

$$= \sqrt{5}x(x + \sqrt{5}) - 3(x + \sqrt{5})$$

$$= (x + \sqrt{5})(\sqrt{5}x - 3) \text{ Ans.}$$

Question 39.

Solution:

$$2a^2 + 3\sqrt{3}a + 3$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 2x^2 + 2\sqrt{3}x + \sqrt{3}x + 3$$

$$\left\{ \begin{array}{l} \because 2 \times 3 = 6 \\ \therefore 6 = 2\sqrt{3} \times \sqrt{3} \\ 3\sqrt{3} = 2\sqrt{3} + \sqrt{3} \end{array} \right\}$$

$$= 2x(x + \sqrt{3}) + \sqrt{3}(x + \sqrt{3})$$

$$= (x + 3\sqrt{x})(2x + \sqrt{3})$$

Question 40.

Solution:

$$2\sqrt{3}x^2 + x - 5\sqrt{3}$$

$$= 2\sqrt{3}x^2 + 6x - 5x - 5\sqrt{3}$$

$$\left\{ \begin{array}{l} \because 2\sqrt{3} \times (-5\sqrt{3}) = -30 \\ \therefore -30 = 6 \times (-5) \\ \text{and } 1 = 6 - 5 \end{array} \right\}$$

$$= 2\sqrt{3}x(x + \sqrt{3}) - 5(x + \sqrt{3})$$

$$= (x + \sqrt{3})(2\sqrt{3}x - 5) \text{ Ans.}$$

Question 41.

Solution:

$$5\sqrt{5}x^2 + 20x + 3\sqrt{5}$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$5\sqrt{5}x^2 + 20x + 3\sqrt{5}$$

$$= 5\sqrt{5}x^2 + 15x + 5x + 3\sqrt{5}$$

$$\left\{ \begin{array}{l} \because 5\sqrt{5} \times 3\sqrt{5} = 75 \\ \therefore 75 = 15 \times 5 \\ \text{and } 20 = 15 + 5 \end{array} \right\}$$

$$= \sqrt{5}x (5x + 3\sqrt{5}) + 1 (5x + 3\sqrt{5})$$

$$= (5x + 3\sqrt{5}) (\sqrt{5}x + 1) \text{ Ans.}$$

Question 42.

Solution:

$$7\sqrt{x^2} - 10x - 4\sqrt{2}$$

$$= 7\sqrt{2}x^2 - 14x + 4x - 4\sqrt{2}$$

$$\left\{ \begin{array}{l} \because 7\sqrt{2} \times (-4\sqrt{2}) \\ = -56 \\ \therefore -56 = -14 \times 4 \\ \text{and } -10 = -14 + 4 \end{array} \right\}$$

$$= 7\sqrt{2}x (x - \sqrt{2}) + 4 (x - \sqrt{2})$$

$$= (x - \sqrt{2}) (7\sqrt{2}x + 4) \text{ Ans.}$$

Question 43.

Solution:

$$6\sqrt{3}x^2 - 47x + 5\sqrt{3}$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$= 6\sqrt{3}x^2 - 45x - 2x + 5\sqrt{3}$$

$$\left\{ \begin{array}{l} \therefore 6\sqrt{3} \times (5\sqrt{3}) = 90 \\ \therefore 90 = -45 \times -2 \\ \text{and } -47 = -45 - 2 \end{array} \right\}$$

$$= 3\sqrt{3}x(2x - 5\sqrt{3}) - 1(2x - 5\sqrt{3})$$

$$= (2x - 5\sqrt{3})(3\sqrt{3}x - 1) \text{ Ans.}$$

Question 44.

Solution:

$$7x^2 + 2\sqrt{14}x + 2$$

$$= 7x^2 + \sqrt{14}x + \sqrt{14}x + 2$$

$$\left\{ \begin{array}{l} \therefore 7 \times 2 = 14 \\ \therefore 14 = \sqrt{7} \times \sqrt{2} \times \sqrt{2} \times \sqrt{7} \\ 2\sqrt{14} = \sqrt{7}\sqrt{2} + \sqrt{7}\sqrt{2} \end{array} \right\}$$

$$= \sqrt{7}x(\sqrt{7}x + \sqrt{2}) + \sqrt{2}(\sqrt{7}x + \sqrt{2})$$

$$= (\sqrt{7}x + 2)(\sqrt{7}x + \sqrt{2})$$

$$= (\sqrt{7}x + \sqrt{2})^2$$

Question 45.

Solution:

$$2(x + y)^2 - 9(x + y) - 5$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$2a^2 - 9a - 5$$

$$= 2a^2 - 10a + a - 5$$

$$\left\{ \begin{array}{l} \because 2 \times (-5) = -10 \\ \therefore -10 = -10 \times 1 \\ \text{and } -9 = -10 + 1 \end{array} \right\}$$

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

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

Substituting the value of a ,

$$2(x + y)^2 - 9(x + y) - 5$$

$$= (x + y - 5) \{2(x + y) + 1\}$$

$$= (x + y - 5)(2x + 2y + 1) \text{ Ans.}$$

Question 46.

Solution:

$$9(2a-b)^2 - 4(2a-b) - 13$$

Let $2a - b = x$, then

$$9x^2 - 4x - 13$$

$$= 9x^2 - 13x + 9x - 13$$

$$\left\{ \begin{array}{l} \because 9 \times (-13) = -117 \\ \therefore -117 = -13 \times 9 \\ \text{and } -4 = -13 + 9 \end{array} \right\}$$

$$= x(9x - 13) + 1(9x - 13)$$

$$= (9x - 13)(x + 1)$$

Now, substituting the value of x ,

$$9(2a - b)^2 - 4(2a - b) - 13$$

$$= \{9(2a - b) - 13\} \{2a - b + 1\}$$

$$= (18a - 9b - 13)(2a - b + 1) \text{ Ans.}$$

Question 47.

Solution:

$$7(x - 2y)^2 - 25(x - 2y) + 12$$

Let $x - 2y = a$, then

$$\begin{aligned} & 7a^2 - 25a + 12 \\ &= 7a^2 - 21a - 4a + 12 \end{aligned}$$

$$\left\{ \begin{array}{l} \because 7 \times 12 = 84 \\ \therefore 84 = (-21) \times (-4) \\ \text{and } -25 = -21 - 4 \end{array} \right\}$$

$$\begin{aligned} &= 7a(a - 3) - 4(a - 3) \\ &= (a - 3)(7a - 4) \end{aligned}$$

Substituting the value of a ,

$$\begin{aligned} & 7(x - 2y)^2 - 25(x - 2y) + 12 \\ &= (x - 2y - 3) \{7(x - 2y) - 4\} \\ &= (x - 2y - 3)(7x - 14y - 4) \text{ Ans.} \end{aligned}$$

Question 48.

Solution:

$$4x^4 + 7x^2 - 2$$

$$4x^4 + 7x^2 - 2 = 4(x^2)^2 + 7(x^2) - 2$$

$$\text{Let } x^2 = y$$

$$= 4y^2 + 7y - 2$$

$$= 4y^2 + 8y - y - 2 \quad \left\{ \begin{array}{l} \because 4 \times (-2) = -8 \\ \therefore -8 = 8 \times (-1) \\ 7 = 8 - 1 \end{array} \right\}$$

Ex 2H

Question 1.

Solution:

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$$\begin{aligned}(i) (a + 2b + 5c)^2 &= (a)^2 + (2b)^2 \\ &+ (5c)^2 + 2 \times a \times 2b + 2 \times 2b \times 5c + 2 \\ &\times 5c \times a \\ &= a^2 + 4b^2 + 25c^2 + 4ab + 20bc + 10ca\end{aligned}$$

Ans.

$$\begin{aligned}(ii) (2a - b + c)^2 &= (2a)^2 + (b)^2 + (c)^2 - 2 \\ &\times 2a \times b - 2 \times b \times c + 2 \times c \times 2a \\ &= 4a^2 + b^2 + c^2 - 4ab - 2bc + 4ca\end{aligned}$$

Ans.

$$\begin{aligned}(iii) (a - 2b - 3c)^2 &= (a)^2 + (2b)^2 + (3c)^2 \\ &- 2 \times a \times 2b + 2 \times 2b \times 3c - 2 \times 3c \times a \\ &= a^2 + 4b^2 + 9c^2 - 4ab + 12bc - 6ca\end{aligned}$$

Ans.

Question 2.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned}(i) (2a - 5b - 7c)^2 &= (2a)^2 + (5b)^2 + (7c)^2 - 2 \times 2a \times 5b + 2 \times 5b \times 7c \\ &\quad - 2 \times 7c \times 2a \\ &= 4a^2 + 25b^2 + 49c^2 - 20ab + 70bc - 28ca\end{aligned}$$

$$\begin{aligned}(ii) (-3a + 4b - 5c)^2 &= (-3a)^2 + (4b)^2 + (5c)^2 - 2 \times 3a \times 4b - 2 \times 4b \times 5c + 2 \times 5c \times 3a \\ &= 9a^2 + 16b^2 + 25c^2 - 24ab - 40bc + 30ca\end{aligned}$$

$$\begin{aligned}(iii) \left(\frac{1}{2}a - \frac{1}{4}b + 2\right)^2 &= \left(\frac{1}{2}a\right)^2 + \left(\frac{1}{4}b\right)^2 + (2)^2 \\ &\quad - 2 \times \frac{1}{2}a \times \frac{1}{4}b - 2 \times \frac{1}{4}b \times 2 + 2 \times 2 \times \frac{1}{2}a \\ &= \frac{1}{4}a^2 + \frac{1}{16}b^2 + 4 - \frac{1}{4}ab - b + 2a \\ &= \frac{a^2}{4} + \frac{b^2}{16} + 4 - \frac{ab}{4} - b + 2a \text{ Ans.}\end{aligned}$$

Question 3.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} & 4x^2 + 9y^2 + 16z^2 + 12xy - 24yz - 16xz \\ &= (2x)^2 + (3y)^2 + (-4z)^2 + 2 \times 2x \times 3y - \\ & 2 \times 3y \times (-4z) - 2 \times (-4z) \times 2x \\ &= (2x + 3y - 4z)^2 \\ & \{\because a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = (a + b + c)^2\} \end{aligned}$$

Question 4.

Solution:

$$\begin{aligned} & 9x^2 + 16y^2 + 4z^2 - 24xy + 16yz - 12xz \\ &= (-3x)^2 + (4y)^2 + (2z)^2 + 2 \times (-3x) \times \\ & 4y + 2 \times 4y \times 2z + 2 \times 2z \times (-3x) \\ &= (-3x + 4y + 2z)^2 \text{ Ans.} \end{aligned}$$

Question 5.

Solution:

$$\begin{aligned} & 25x^2 + 4y^2 + 9z^2 - 20xy - 12yz + 30xz \\ &= (5x)^2 + (-2y)^2 + (3z)^2 + 2 \times 5x \times (-2y) \\ & + 2 \times (-2y) (3z) + 2 (3z) (5x) \\ &= (5x - 2y + 3z)^2 \text{ Ans.} \end{aligned}$$

Question 6.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned}(i) (99)^2 &= (100 - 1)^2 \\ &= (100)^2 + (1)^2 - 2 \times 100 \times 1 \\ &\quad \{ (a - b)^2 = a^2 + b^2 - 2ab \}\end{aligned}$$

$$\begin{aligned}&= 10000 + 1 - 200 \\ &= 10001 - 200 = 9801 \text{ Ans.}\end{aligned}$$

$$\begin{aligned}(ii) (998)^2 &= (1000 - 2)^2 \\ &= (1000)^2 + (2)^2 - 2 \times 1000 \times 2 \\ &\quad \{ (a - b)^2 = a^2 + b^2 - 2ab \} \\ &= 1000000 + 4 - 4000 \\ &= 1000004 - 4000 = 996004 \text{ Ans.}\end{aligned}$$

Ex 2I

Question 1.

Solution:

$$(i) (3x+2)^3$$

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

$$= 27x^3 + 8 + 18x(3x + 2)$$

$$= 27x^3 + 8 + 54x^2 + 36x$$

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

$$= 27a^3 - 8b^3 - 18ab(3a - 2b)$$

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

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

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

$$= \frac{8}{27}x^3 + 1 + 2x \left(\frac{2}{3}x + 1\right)$$

$$= \frac{8}{27}x^3 + 1 + \frac{4}{3}x^2 + 2x$$

Question 2.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

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

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

$$= 8x^3 - \frac{8}{x^3} - 12 \left(2x - \frac{2}{x}\right)$$

$$= 8x^3 - \frac{8}{x^3} - 24x + \frac{24}{x} \text{ Ans.}$$

$$(ii) \left(3a \times \frac{1}{4b}\right)^3 = (3a)^3 + \left(\frac{1}{4b}\right)^3 + 3 \times 3a$$

$$\times \frac{1}{4b} \left(3a + \frac{1}{4b}\right)$$

$$= 27a^3 + \frac{1}{64b^3} + \frac{9a}{4b} \left(3a + \frac{1}{4b}\right)$$

$$= 27a^3 + \frac{1}{64b^3} + \frac{27a^2}{4b} + \frac{9a}{16b^2} \text{ Ans.}$$

$$\begin{aligned} \text{(iii)} \quad & \left(\frac{4}{5}x - 2\right)^3 \\ &= \left(\frac{4}{5}x\right)^3 - (2)^3 - 3 \times \frac{4}{5}x \times 2 \left(\frac{4}{5}x - 2\right) \\ &= \frac{64}{125}x^3 - 8 - \frac{24x}{5} \left(\frac{4}{5}x - 2\right) \\ &= \frac{64}{125}x^3 - 8 - \frac{96x^2}{25} + \frac{48x}{5} \\ &= \frac{64}{125}x^3 - 8 - \frac{96}{25}x^2 + \frac{48}{5}x \quad \text{Ans.} \end{aligned}$$

Question 3.

Solution:

$$\text{(i)} (95)^3 = (100 - 5)^3$$

$$\begin{aligned} &= (100)^3 - (5)^3 - 3 \times 100 \times 5 (100 - 5) \\ &= 1000000 - 125 - 1500 \times 95 \\ &= 1000000 - 125 - 142500 \\ &= 1000000 - 142625 \\ &= 857375 \text{ Ans.} \end{aligned}$$

$$\begin{aligned} \text{(ii) } (999)^3 &= (1000 - 1)^3 \\ &= (1000)^3 - (1)^3 - 3 \times 1000 \times 1(1000 - 1) \\ &\quad \{(a - b)^3 = a^3 - b^3 - 3ab(a - b)\} \\ &= 1000000000 - 1 - 3000 \times 999 \\ &= 1000000000 - 1 - 2997000 \\ &= 1000000000 - 2997001 \\ &= 997002999 \text{ Ans.} \end{aligned}$$

Ex 2J

Question 1.

Solution:

$$\begin{aligned} &x^3 + 27 \\ &= (x)^3 + (3)^3 \\ &= (x + 3) \{(x)^2 - x \times 3 + (3)^2\} \\ &= (x + 3) (x^2 - 3x + 9) \end{aligned}$$

Question 2.

Solution:

$$8x^3 + 27y^3$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= (2x)^3 + (3y)^3 \\ &= (2x + 3y) \{(2x)^2 - 2x \times 3y + (3y)^2\} \\ &= (2x + 3y) (4x^2 - 6xy + 9y^2) \text{ Ans.} \end{aligned}$$

Question 3.

Solution:

$$343 + 125b^3$$

$$\begin{aligned} &= (7)^3 + (5b)^3 = (7 + 5b) \{(7)^2 - 7 \times 5b \\ &\quad + (5b)^2\} \\ &= (7 + 5b) (49 - 35b + 25b^2) \text{ Ans.} \end{aligned}$$

Question 4.

Solution:

$$(1)^3 + (4x)^3$$

$$\begin{aligned} &= (1 + 4x) \{(1)^2 - 1 \times 4x + (4x)^2\} \\ &= (1 + 4x) (1 - 4x + 16x^2) \text{ Ans.} \end{aligned}$$

Question 5.

Solution:

$$125a^3 + 18$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= (5a)^3 + \left(\frac{1}{2}\right)^3 \\ &= \left(5a + \frac{1}{2}\right) \left\{ (5a)^2 - 5a \times \frac{1}{2} + \left(\frac{1}{2}\right)^2 \right\} \\ &= \left(5a + \frac{1}{2}\right) \left(25a^2 - \frac{5}{2}a + \frac{1}{4}\right) \text{ Ans.} \end{aligned}$$

Question 6.

Solution:

$$216x^3 + 1125$$

$$\begin{aligned} &= (6x)^3 + \left(\frac{1}{5}\right)^3 \\ &= \left(6x + \frac{1}{5}\right) \left\{ (6x)^2 - 6x \times \frac{1}{5} + \left(\frac{1}{5}\right)^2 \right\} \\ &= \left(6x + \frac{1}{5}\right) \left(36x^2 - \frac{6}{5}x + \frac{1}{25}\right) \text{ Ans.} \end{aligned}$$

Question 7.

Solution:

$$16x^4 + 54x$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= 2x (8x^3 + 27) = 2x \{(2x)^3 + (3)^3\} \\ &= 2x (2x + 3) \{(2x)^2 - 2x \times 3 + (3)^2\} \\ &\quad [(x^3 + y^3) = (x + y) (x^2 - y + y^2)] \\ &= 2x (2x + 3) (4x^2 - 6x + 9) \text{ Ans.} \end{aligned}$$

Question 8.

Solution:

$$7a^3 + 56b^3$$

$$= 7(a^3 + 8b^3)$$

$$\begin{aligned} &= 7 \{(a)^3 + (2b)^3\} \\ &= 7 (a + 2b) \{(a)^2 - a \times 2b + (2b)^2\} \\ &= 7 (a + 2b) (a^2 - 2ab + 4b^2) \text{ Ans.} \end{aligned}$$

Question 9.

Solution:

$$x^5 + x^2$$

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

$$\begin{aligned} &= x^2 \{(x)^3 + (1)^3\} \\ &= x^2 (x + 1) (x^2 - x + 1) \text{ Ans.} \end{aligned}$$

Question 10.

Solution:

$$a^3 + 0.008$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= (a^3) + (0.2)^3 \\ &= (a + 0.2) \{(a)^2 - a \times 0.2 + (0.2)^2\} \\ &= (a + 0.2) (a^2 - 0.2a + 0.04) \text{ Ans.} \end{aligned}$$

Question 11.

Solution:

$$x^6 + y^6$$

$$\begin{aligned} &= (x^2)^3 + (y^2)^3 \\ &= (x^2 + y^2) \{(x^2)^2 - x^2 \times y^2 + (y^2)^2\} \\ &= (x^2 + y^2) (x^4 - x^2y^2 + y^4) \text{ Ans.} \end{aligned}$$

Question 12.

Solution:

$$2a^3 + 16b^3 - 5a - 10b$$

$$\begin{aligned} &= 2(a^3 + 8b^3) - 5(a + 2b) \\ &= 2\{(a)^3 + (2b)^3\} - 5(a + 2b) \\ &= 2(a + 2b) \{(a)^2 - a \times 2b + (2b)^2\} - 5(a + 2b) \\ &= 2(a + 2b) (a^2 - 2ab + 4b^2) - 5(a + 2b) \\ &= (a + 2b) \{2(a^2 - 2ab + 4b^2) - 5\} \text{ Ans.} \end{aligned}$$

Question 13.

Solution:

$$x^3 - 512$$

$$= (x)^3 - (8)^3$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= (x - 8) \{(x)^2 + x \times 8 + (8)^2\} \\ &= (x - 8) (x^2 + 8x + 64) \text{ Ans.} \end{aligned}$$

Question 14.

Solution:

$$64x^3 - 343$$

$$= (4x)^3 - (7)^3$$

$$\begin{aligned} &= (4x - 7) \{(4x)^2 + 4x \times 7 + (7)^2\} \\ &= (4x - 7) (16x^2 + 28x + 49) \text{ Ans.} \end{aligned}$$

Question 15.

Solution:

$$1 - 27x^3$$

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

$$\begin{aligned} &= (1 - 3x) \{(1)^2 + 1 \times 3x + (3x)^2\} \\ &= (1 - 3x) (1 + 3x + 9x^2) \text{ Ans.} \end{aligned}$$

Question 16.

Solution:

$$x^3 - 125y^3$$

$$\begin{aligned} &= (x)^3 - (5y)^3 \\ &= (x - 5y) \{(x)^2 + x + 5y + (5y)^2\} \\ &= (x - 5y) (x^2 + 5xy + 25y^2) \text{ Ans.} \end{aligned}$$

Question 17.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

$$8x^3 - 127y^3$$

$$= (2x)^3 - \left(\frac{1}{3y}\right)^3$$

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

$$= \left(2x - \frac{1}{3y}\right) \left(4x^2 + \frac{2x}{3y} + \frac{1}{9y^2}\right) \text{ Ans.}$$

Question 18.

Solution:

$$a^3 - 0.064$$

$$= (a)^3 - (0.4)^3$$

$$= (a - 0.4) \{ (a)^2 \times a \times 0.4 + (0.4)^2 \}$$

$$= (a - 0.4) (a^2 + 0.4a + 0.16) \text{ Ans.}$$

Question 19.

Solution:

$$(a + 6)^3 - 8$$

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

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned} &= (a + b - 2) \{(a + b)^2 + (a + b) \times 2 + (2)^2\} \\ &= (a + b - 2) (a^2 + b^2 + 2ab + 2a + 2b + 4) \text{ Ans.} \end{aligned}$$

Question 20.

Solution:

$$x^6 - 729$$

$$=(x^2)^3 - (9)^3$$

$$\begin{aligned} &= (x^2 - 9) \{(x^2)^2 + x^2 \times 9 + (9)^2\} \\ &= (x^2 - 9) (x^4 + 9x^2 + 81) \\ &= \{(x)^2 - (3)^2\} \{(x^2)^2 + (9)^2 + 18x^2 - 9x^2\} \\ &= (x + 3) (x - 3) \{(x + 9)^2 - (3x)^2\} \\ &= (x + 3) (x - 3) (x^2 + 9 + 3x) (x^2 + 9 - 3x) \\ &= (x + 3) (x - 3) (x^2 + 3x + 9) (x^2 - 3x + 9) \\ &\hspace{15em} \text{Ans.} \end{aligned}$$

Question 21.

Solution:

$$(a + b)^3 - (a - b)^3$$

$$\begin{aligned} &= (a + b - a + b) \{(a + b)^2 + (a + b)(a - b) + (a - b)^2\} \\ &= 2b (a^2 + b^2 + 2ab + a^2 - b^2 + a^2 + b^2 - 2ab) = 2b (3a^2 + b^2) \text{ Ans.} \end{aligned}$$

Question 22.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$x - 8xy^3$$

$$=x(1 - 8y^3)$$

$$=x\{(1)^3 - (2y)^3\}$$

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

$$= x(1 - 2y) (1 + 2y + 4y^2) \text{ Ans.}$$

Question 23.

Solution:

$$32x^4 - 500x$$

$$= 4x\{(2x)^3 - (5)^3\}$$

$$= 4x(2x - 5) \{(2x)^2 + 2x \times 5 + (5)^2\}$$

$$= 4x (2x - 5) (4x^2 + 10x + 25) \text{ Ans.}$$

Question 24.

Solution:

$$3a^7b - 81a^4b^4$$

$$= 3a^4b (a^3 - 27b^3)$$

$$= 3a^4b \{(a)^3 - (3b)^3\}$$

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

$$= 3a^4b (a - 3b) (a^2 + 3ab + 9b^2) \text{ Ans.}$$

Question 25.

Solution:

$$a^3 - 1a^3 - 2a + 2a$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned}&= \left\{ (a)^3 - \left(\frac{1}{a} \right)^3 \right\} - 2 \left(a - \frac{1}{a} \right) \\&= \left(a - \frac{1}{a} \right) \left(a^2 + 1 + \frac{1}{a^2} \right) - 2 \left(a - \frac{1}{a} \right) \\&= \left(a - \frac{1}{a} \right) \left(a^2 + 1 + \frac{1}{a^2} - 2 \right) \\&= \left(a - \frac{1}{a} \right) \left(a^2 - 1 + \frac{1}{a^2} \right) \text{ Ans.}\end{aligned}$$

Question 26.

Solution:

$$8a^3 - b^3 - 4ax + 2bx$$

$$\begin{aligned}&= \{(2a)^3 - (b)^3\} - 2x(2a - b) \\&= (2a - b) \{(2a)^2 - 2a \times b + (b)^2\} - 2x(2a - b) \\&= (2a - b) (4a^2 + 2ab + b^2) - 2x(2a - b) \\&= (2a - b) (4a^2 + 2ab + b^2 - 2x) \text{ Ans.}\end{aligned}$$

Question 27.

Solution:

$$a^3 + 3a^2b + 3ab^2 + b^3 - 8$$

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$\begin{aligned}(a + b)^3 - (2)^3 &= (a + b - 2) \{(a + b)^2 + (a + b) \times 2 + (2)^2\} \\&= (a + b - 2) (a + b)^2 + 2(a + b) + 4\} \\&= (a + b - 2) \{a^2 + b^2 + 2a + 2b + 4\} \text{ Ans.}\end{aligned}$$

Ex 2K

Question 1.

Solution:

$$\begin{aligned}125a^3 + b^3 + 64c^3 - 60abc &= (5a)^3 + (b)^3 + (4c)^3 - 3 \times 5a \times b \times 4c \\&= (5a + b + 4c) \{(5a)^2 + (b)^2 + (4c)^2 - 5a \\&\times b - b \times 4c - 4c \times 5a\} \\&= (5a + b + 4c) (25a^2 + b^2 + 16c^2 - 5ab \\&- 4bc - 20ca) \text{ Ans.}\end{aligned}$$

Question 2.

Solution:

$$\begin{aligned}a^3 + 8b^3 + 64c^3 - 24abc &= (a)^3 + (2b)^3 + (4c)^3 - 3 \times a \times 2b \times 4c \\&= (a + 2b + 4c) \{(a)^2 + (2b)^2 + (4c)^2 - a \\&\times 2b - 2b \times 4c - 4c \times a\} \\&= (a + 2b + 4c) (a^2 + 4b^2 + 16c^2 - 2ab - \\&8bc - 4ca) \text{ Ans.}\end{aligned}$$

Question 3.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$1 + b^3 + 8c^3 - 6bc$$

$$\begin{aligned} &= (1)^3 + (b)^3 + (2c)^3 - 3 \times 1 \times b \times 2c \\ &= (1 + b + 2c) \{(1)^2 + (b)^2 + (2c)^2 - 1 \times b - b \times 2c - 2c \times 1\} \\ &= (1 + b + 2c) (1 + b^2 + 4c^2 - b - 2bc - 2c) \text{ Ans.} \end{aligned}$$

Question 4.

Solution:

$$216 + 27b^3 + 8c^3 - 108bc$$

$$\begin{aligned} &= (6)^3 + (3b)^3 + (2c)^3 - 3 \times 6 \times 3b \times 2c \\ &= (6 + 3b + 2c) \{(6)^2 + (3b)^2 + (2c)^2 - 6 \times 3b - 3b \times 2c - 2c \times 6\} \\ &= (6 + 3b + 2c) (36 + 9b^2 + 4c^2 - 18b - 6bc - 12c) \text{ Ans.} \end{aligned}$$

Question 5.

Solution:

$$27a^3 - b^3 + 8c^3 + 18abc$$

$$\begin{aligned} &= (3a)^3 + (-b)^3 + (2c)^3 - 3 \times 3a \times (-b) \times 2c \\ &= (3a - b + 2c) \{(3a)^2 + (-b)^2 + (2c)^2 - 3a \times (-b) - (-b) (2c) - 2c \times 3a\} \\ &= (3a - b + 2c) (9a^2 + b^2 + 4c^2 + 3ab + 2bc - 6ca) \text{ Ans.} \end{aligned}$$

Question 6.

Solution:

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

$$8a^3 + 125b^3 - 64c^3 + 120abc$$

$$\begin{aligned} &= (2a)^3 + (5b)^3 + (-4c)^3 - 3 \times 2a \times 5b \times (-4c) \\ &= (2a + 5b - 4c) \{(2a)^2 + (5b)^2 + (-4c)^2 - 2a \times 5b - 5b(-4c) - (-4c)(2a)\} \\ &= (2a + 5b - 4c) (4a^2 + 25b^2 + 16c^2 - 10ab + 20bc + 8ca) \text{ Ans.} \end{aligned}$$

Question 7.

Solution:

$$8 - 27b^3 - 343c^3 - 126bc$$

$$\begin{aligned} &= (2)^3 + (-3b)^3 + (-7c)^3 - 3 \times 2 \times (-3b) \times (-7c) \\ &= (2 - 3b - 7c) \{(2)^2 + (-3b)^2 + (-7c)^2 - 2(-3b) - (-3b)(-7c) - (-7c)(2)\} \\ &= (2 - 3b - 7c) (4 + 9b^2 + 49c^2 + 6b - 21bc + 14c) \text{ Ans.} \end{aligned}$$

Question 8.

Solution:

$$125 - 8x^3 - 27y^3 - 90xy$$

$$\begin{aligned} &= (5)^3 + (-2x)^3 + (-3y)^3 - 3 \times 5(-2) \times (-3y) \\ &= (5 - 2x - 3y) \{(5)^2 + (-2x)^2 + (-3y)^2 - 5 \times (-2x) - (-2x)(-3y) - (-3y)(5)\} \\ &= (5 - 2x - 3y) (25 + 4x^2 + 9y^2 + 10x - 6xy + 15y) \text{ Ans.} \end{aligned}$$

Question 9.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

$$2\sqrt{2}a^3 + 16\sqrt{2}b^3 + c^3 - 12abc$$

$$= (\sqrt{2}a)^3 + (2\sqrt{2}b)^3 + (c)^3 - 3 \times \sqrt{2}a \times 2\sqrt{2}b \times c$$

$$= (\sqrt{2}a + 2\sqrt{2}b + c) \{(\sqrt{2}a)^2 + (2\sqrt{2}b)^2 + c^2 - \sqrt{2}a \times 2\sqrt{2}b - 2\sqrt{2}b \times c - c \times \sqrt{2}a\}$$

$$= (\sqrt{2}a + 2\sqrt{2}b + c) (2a^2 + 8b^2 + c^2 - 4ab - 2\sqrt{2}bc - \sqrt{2}ca) \text{ Ans.}$$

Question 10.

Solution:

$$x^3 + y^3 - 12xy + 64$$

$$\begin{aligned} &= (x)^3 + (y)^3 + (4)^3 - 3 \times x \times y \times 4 \\ &= (x + y + 4) \{(x)^2 + (y)^2 + (4)^2 - xy - y \times 4 - 4 \times x\} \\ &= (x + y + 4) \{x^2 + y^2 + 16 - xy - 4y - 4x\} \text{ Ans.} \end{aligned}$$

Question 11.

Solution:

$$(a - b)^3 + (b - c)^3 + (c - a)^3$$

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$$\text{Let } a - b = x, b - c = y, c - a = z$$

$$\text{Then } x + y + z = a - b + b - c + c - a = 0$$

We know that if $x + y + z = 0$, then

$$\begin{aligned} x^3 + y^3 + z^3 &= 3xyz \\ \Rightarrow (a - b)^3 + (b - c)^3 + (c - a)^3 \\ &= 3(a - b)(b - c)(c - a) \text{ Ans.} \end{aligned}$$

Question 12.

Solution:

$$(3a - 2b)^3 + (2b - 5c)^3 + (5c - 3a)^3$$

$$\text{Let } 3a - 2b = x, 2b - 5c = y \text{ and } 5c - 3a = z$$

$$\text{then } x + y + z = 3a - 2b + 2b - 5c + 5c - 3a = 0$$

We know that,

$$\begin{aligned} \text{If } x + y + z = 0, \text{ then } x^3 + y^3 + z^3 &= 3xyz \\ \Rightarrow (3a - 2b)^3 + (2b - 5c)^3 + (5c - 3a)^3 \\ &= 3(3a - 2b)(2b - 5c)(5c - 3a) \text{ Ans.} \end{aligned}$$

Question 13.

Solution:

$$a^3(b - c)^3 + b^3(c - a)^3 + c^3(a - b)^3$$

Let $a(b - c) = x$, $b(c - a) = y$
and $c(a - b) = z$

Now, $x + y + z = a(b - c) + b(c - a) + c(a - b)$

$$= ab - ac + bc - ab + ca - bc \\ = 0$$

We know that if $x + y + z = 0$, then

$$x^3 + y^3 + z^3 = 3xyz, \\ \Rightarrow \{a(b - c)\}^3 + \{b(c - a)\}^3 + \{c(a - b)\}^3 \\ = 3 a(b - c) b(c - a) c(a - b) \\ \Rightarrow a^3(b - c)^3 + b^3(c - a)^3 + c^3(a - b)^3 \\ = 3abc(a - b)(b - c)(c - a) \text{ Ans.}$$

Question 14.

Solution:

$$(5a - 7b)^3 + (9c - 5a)^3 + (7b - 9c)^3$$

Let $5a - 7b = x$, $7b - 9c = y$
and $9c - 5a = z$

Then $x + y + z = 5a - 7b + 7b - 9c + 9c - 5a = 0$

We know that if $x + y + z = 0$, then

$$x^3 + y^3 + z^3 = 3xyz \\ \Rightarrow (5a - 7b)^3 + (7b - 9c)^3 + (9c - 5a)^3 \\ = 3(5a - 7b)(7b - 9c)(9c - 5a) \\ \Rightarrow (5a - 7b)^3 + (9c - 5a)^3 + (7b - 9c)^3 \\ = 3(5a - 7b)(9c - 5a)(7b - 9c) \text{ Ans.}$$

Question 15.

<https://www.indcareer.com/schools/rs-aggarwal-solutions-for-class-9-maths-chapter-2-polynomials/>

Solution:

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

$$\begin{aligned} &\Rightarrow \{x + y + (-z)\} \{(x)^2 + (y)^2 + (-z)^2 - \\ &x \times y - y \times (-z) - (-z) \times x \\ &= x^3 + y^3 + (-z)^3 - 3xy(-z) = x^3 + y^3 + \\ &z^3 + 3xyz \text{ Ans.} \end{aligned}$$

Question 16.

Solution:

$$(x - 2y + 3) (x^2 + 4y^2 + 2xy - 3x + 6y + 9)$$

$$\begin{aligned} &= \{x + (-2y) + 3\} \{(x)^2 + (-2y)^2 + (3)^2 - \\ &2x(-2y) - (-2y)^3 - 3 \times x \\ &= x^3 + (-2y)^3 + (3)^3 - 3 \times x(-2y) \times 3 \\ &= x^3 - 8y^3 + 27 + 18xy \text{ Ans.} \end{aligned}$$

Question 17.

Solution:

$$(x - 2y - z) (x^2 + 4y^2 + z^2 + 2xy + zx - 2yz)$$

$$\begin{aligned} &= [x + (-2y) + (-z)] [(x)^2 + (-2y)^2 + (-z)^2 \\ &- x(-2y) - (-z)x(-2y) - (-z)] \\ &= x^3 + (-2y)^3 + (-z)^3 - 3(x)(-2y)(-z) \\ &= x^3 - 8y^3 - z^3 - 6xyz \text{ Ans.} \end{aligned}$$

Question 18.

Solution:

$$x + y + 4 = 0,$$

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We know that,

$$\begin{aligned}x^3 + y^3 + (4)^3 - 3 \times x \times y \times 4 \\&= (x + y + 4) [x^2 + y^2 + 16 - xy - 4y - 4x] \\&\Rightarrow x^3 + y^3 + 64 - 12xy = 0 \times x[x^2 + y^2 + 16 - xy - 4y - 4x] \\&\Rightarrow x^3 + y^3 - 12xy + 64 = 0 \text{ Ans.}\end{aligned}$$

Question 19.

Solution:

$$x = 2y + 6$$

$$\Rightarrow x - 2y - 6 = 0$$

We know that,

$$\begin{aligned}(x)^3 + (-2y)^3 + (-6)^3 - 3 \times x \times (-2y) \times (-6) \\&= (x - 2y - 6) [x^2 + 4y^2 + 36 + 2xy - 12y + 6x] \\&\Rightarrow x^3 - 8y^3 - 216 - 36xy = 0 \times [x^2 + 4y^2 + 36 + 2xy - 12y + 6x] \\&\Rightarrow x^3 - 8y^3 - 216 - 36xy = 0 \\&\quad x^3 - 8y^3 - 36xy - 216 = 0 \text{ Ans.}\end{aligned}$$



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