CHECK POST–3

1. If $x = 2$, $y = 1$ and $z = -3$ then $x^3 + y^3 + z^3 - 3xyz$ is equal to :
(A) 6 (B) 0 (C) 2 (D) 8

2. If $x - \frac{1}{x} = 3$ then $x^2 + \frac{1}{x^2}$ is equal to :

(A) 7 (B) – 11 (C) 11 (D) – 7

3. Find the value of $27x^3 - 64y^3 - 108x^2y + 144xy^2$, if $x = 3$ and $y = 2$:
(A) 1 (B) 0 (C) 512 (D) 347

4. If $a = 2$, $b = -6$, $c = 4$, then the value of $a^3 + b^3 + c^3$ is equal to :
(A) 144 (B) 288 (C) – 144 (D) – 288

5. Find the value of $(3x + 2y - 3z)(9x^2 + 4y^2 + 9z^2 - 6xy + 6yz + 9xz)$ if $x = 2$, $y = 1$, $z = -1$:
(A) 143 (B) 431 (C) 217 (D) 912

6. Factorize : $x^2 - ab + (a - b)x$ by splitting the middle term.

7. Evaluate 497×503 by using expansion method.

8. Factorize : $x^2 - y^2 - 2x - 4y + 1 - 4$.

9. If $\frac{x^2+1}{x} = 11$, find the value of $x^2 + \frac{1}{x^2}$.

10. Factorize : $3\sqrt{3}a^3 + 5\sqrt{5}b^3 + 9\sqrt{5}a^2b + 15\sqrt{3}ab^2$

GOLDEN KEY POINTS

- A non-zero constant is a polynomial of degree zero, but the degree of zero polynomial is not defined.
- 'If the sum of the co-efficients of polynomial is zero, then $(x - 1)$ is a factor of the polynomial.
- A polynomial in x is said to be a polynomial in standard form, if the powers of x are either in ascending order or in descending order.
- A polynomial of degree $n \geq 1$ can have at the most n real zeros.
- A non-zero constant polynomial has no zero.
- Every linear polynomial has one and only one real zero.
- A quadratic polynomial $ax^2 + bx + c$, $a \neq 0$ can have at most two real zeros. In some cases, it may not have any real zero.

- If the sum of the coefficients of odd powers in a polynomial is equal to sum of coefficients of even powers, then (x + 1) is a factor of the polynomial.

EXERCISE – 1 ELEMENTARY

1. A polynomial of degree 5 in x has at most
(A) 5 terms (B) 4 terms (C) 6 terms (D) 10 terms

2. The value of $P(x) = x^2 - 7x + 12$ at $x = 3$ is
(A) 42 (B) 0 (C) 8 (D) –6

3. The value of k for which $x - 1$ is a factor of the polynomial $4x^3 + 3x^2 - 4x + k$ is
(A) 3 (B) 0 (C) 1 (D) –3

4. When the polynomial $x^3 + 3x^2 + 3x + 1$ is divided by $x + 1$, the remainder is
(A) 1 (B) 8 (C) 0 (D) –6

5. If $p(x) = x^2 - 2\sqrt{2}x + 1$, then $p\left(\frac{2}{\sqrt{}}\right)$ is equal to

(A) 0 (B) –1 (C) $4\sqrt{2}$ (D) $8\sqrt{2} + 1$

6. If $p(x) = x + 3$, then $p(x) + p(-x)$ is equal to -
(A) 3 (B) 2x (C) 0 (D) 6

7. If $x^{51} + 51$ is divided by $x + 1$, the remainder is
(A) 0 (B) 1 (C) 49 (D) 50

8. The value of polynomial $3x + 2x^2 - 6$ at $x = 0$ is :
(A) 2 (B) 3 (C) 6 (D) –6

9. If $(x - 2)$ is a factor of the polynomial $x^4 - 2x^3 + ax - 1$, then the value of a is :
(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

10. The remainder when $x^3 - px^2 + 6x - p$ is divided by $x - p$ is :
(A) p (B) 5p (C) –5p (D) $5p^2$

11. The factors of $x^3 - 2x^2 - 13x - 10$ are
(A) $(x - 1)(x + 2)(x + 5)$ (B) $(x - 1)(x - 2)(x - 5)$
(C) $(x + 1)(x - 2)(x + 5)$ (D) $(x + 1)(x + 2)(x - 5)$

12. $\frac{0.83 \times 0.83 \times 0.83 + 0.17 \times 0.17 \times 0.17}{0.83 \times 0.83 - 0.83 \times 0.17 + 0.17 \times 0.17}$
is equal to
(A) 1 (B) $(0.83)^3 + (0.17)^3$ (C) 0 (D) None of these

13. One of the zeroes of the polynomial $2x^2 + 7x - 4$ is
(A) 2 (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) – 2

14. One of the factors of $(25x^2 - 1) + (1 + 5x)^2$ is
(A) 5 + x (B) 5 – x (C) 5x – 1 (D) 10x

15. Factors of $a^2 - b + ab - a$ are:
(A) (a – b) (a + 1) (B) (a + b) (a – 1) (C) (a – b) (a – 1) (D) (a + b) (a + 1)

16. If $x^2 - x - 42 = (x + k)(x + 6)$ then the value of k is
(A) 6 (B) –6 (C) 7 (D) –7

17. If $\left(x - \frac{1}{x}\right)^2 = x^2 + k + \frac{1}{x^2}$ then the value of k is

(A) –2 (B) 2 (C) 2x (D) –2x

18. Factor of $x^2 - 7x + 12$ are
(A) (x – 3) (x + 4) (B) (x – 3) (x – 4) (C) (x + 3) (x – 4) (D) (x + 3) (x + 4)

19. If one factor of a(x + y + z) + bx + by + bz is (x + y + z) then the second factor is
(A) ax + ay + az (B) bx + by + bz (C) bx + by – bz (D) a + b

20. If $49x^2 - b = \left(7x + \frac{1}{2}\right)\left(7x - \frac{1}{2}\right)$, then the value of b is

(A) 0 (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$

21. If $98^2 - 82^2 = 3^x \cdot 5^y \cdot 2^z$, then (x, y, z) is equal to :
(A) (1, 2, 6) (B) (6, 1, 2) (C) (2, 1, 6) (D) (2, 6, 1)

22. (2x + 5) (2x + 7) is equal to :
(A) $4x^2 + 12x + 35$ (B) $2x^2 + 12x + 35$ (C) $4x^2 + 24x + 35$ (D) $4x^2 + 24x - 35$

23. On factorising $x^2 + 8x + 15$, we get :
(A) (x + 3) (x – 5) (B) (x – 3) (x + 5) (C) (x + 3) (x + 5) (D) (x – 3) (x – 5)

24. On dividing $x^2 - 2x - 15$ by (x – 5), the quotient is (x + 3) and remainder is 0. Which of the following statement is true?
(A) $x^2 - 2x - 15$ is a multiple of (x – 5) (B) $x^2 - 2x - 15$ is a factor of (x – 5)
(C) (x + 3) is a factor of (x – 5) (D) (x + 3) is a multiple of (x – 5)

25. If $x - \frac{1}{x} = 3$, then $x^2 + \frac{1}{x^2}$ is :

(A) 11 (B) 75 (C) 10 (D) 5

EXERCISE – 2 **SEASONED**

1. If $x^{100} + 2x^{99} + k$ is divisible by $(x + 1)$, then the value of k is :
(A) 1 (B) – 3 (C) 2 (D) – 2

2. Which one of the following is a polynomial ?
(A) $\frac{x^2}{2} - \frac{2}{x^2}$ (B) $\sqrt{2x} - 1$ (C) $x^2 + \frac{3x^{3/2}}{\sqrt{x}}$ (D) $\frac{x-1}{x+1}$

3. $(a - b)^3 + (b - c)^3 + (c - a)^3$ is equal to
(A) 3abc (B) $3a^3b^3c^3$
(C) $3(a - b)(b - c)(c - a)$ (D) $[a - (b + c)]^3$

4. The values of a and b so that the polynomial $x^3 - ax^2 - 13x + b$ is divisible by $(x + 1)$ and $(x - 3)$ are
(A) a = 15, b = 3 (B) a = 0, b = –12 (C) a = –3, b = –15 (D) a = –12, b = 0

5. If we divide the polynomials $4x^3 - 3x^2 + 4x + 4$ and $4x^3 - 3x^2 - 8x + 1$ by $2x + 3a$ then we get the same remainder, then the value of a is
(A) 6 (B) – 6 (C) $-\frac{1}{6}$ (D) $\frac{1}{6}$

6. The factors of $(x^2 + 4y^2 + 4y - 4xy - 2x - 8)$ are :
(A) $(x - 2y - 4)(x - 2y + 2)$ (B) $(x - y + 2)(x - 4y - 4)$
(C) $(x + 2y - 4)(x + 2y + 2)$ (D) None of these

7. If $\frac{x}{y} + \frac{y}{x} = -1$ $(x, y \neq 0)$, the value of $x^3 - y^3$ is
(A) 1 (B) – 1 (C) 0 (D) $\frac{1}{2}$

8. Factorisation of $a^4 + a^2b^2 + b^4$? (A)
$(a^2 + ab + b^2)(a^2 - ab + b^2)$ (C) (B) $(a^2 + b^2 + ab)(a^2 + b^2 + ab)$
$(a^2 - b^2 + ab)(a^2 + b^2 + ab)$ (D) $(a^2 - b^2 + ab)(a^2 - b^2 + ab)$

9. Factorisation of $x^4 + 4$:
(A) $(x^2 + 2)(x^2 - 2)$ (B) $(x^2 + 2 + 2x)(x^2 + 2 - 2x)$
(C) $(x^2 + 2x - 2)(x^2 + 2x + 2)$ (D) $(x^2 + 2)(x^2 + 2)$

10. On factorising $a^3 + 3\ \ b^3$, we get
(A) $\left(a + \ \ b\right)\left(a^2 + \frac{3}{\sqrt{3}}ab + 3b^2\right)$ (B) $\left(a + \ \ b\right)\left(a^2 - 3ab + 3b^2\right)$
(C) $\left(a + \sqrt{3}b\right)\left(a^2 - \sqrt{3}ab - 3b^2\right)$ (D) $\left(\sqrt{3}a + b\right)\left(a^2 - \sqrt{3}ab + 3b^2\right)$

EXERCISE – 3 **CBSE PATTERN**

Very Short answer type questions

1. Which of the following expressions are polynomial ?

(i) $11x + 1$ (ii) $7x^2 - 5x + \sqrt{5}$ (iii) $t^3 - 2t + 1$

(iii) $x^2 - \frac{1}{x^2}$ (iv) $\sqrt{y} + 5y - 1$ (vi) $z^{11} - 5z^7 + \frac{1}{4}$

2. Write the coefficient of x^3 in each of the following :

(i) $3x^3 - 3x + 2$ (ii) $14x^4 - 2x^3 + 5x - 7x^2$

(iii) $\sqrt{2}x^2 + 1$ (iv) $\frac{3}{4}x^3 + 2x - 3$

3. Write the degree of each of the following polynomials :

(i) $3x^2 - 4x + 2$ (ii) $7x^3 + 2x^2 + x$

(iii) $5 - x^2$ (iv) $1 + 2x + 3x^2 - 11x^4$

4. Classify the following as linear, quadratic and cubic polynomials :

(i) $x^3 - 4$ (ii) $x^2 + 1$ (iii) $5x^2 - 3x + \sqrt{7}$

(iv) $1 + 5x$ (v) $4r^3$

Short answer type questions

5. Find the value of the following polynomial at the indicate value of variables :

(i) $p(x) = 5x^2 - 3x + 7$ at $x = 1$

(ii) $q(y) = 3y^2 - 4y + \sqrt{11}$ at $y = 2$

(iii) $p(t) = 4t^4 + 5t^3 - t^2 + 6$ at $t = 1$

6. Find the zeroes of each of the following polynomials :

(i) $p(x) = x - 4$ (ii) $g(x) = 2x + 1$

(iii) $p(x) = (x + 1)(x + 2)$ (iv) $p(x) = (x - 1)(x - 2)(x - 3)$

(v) $p(x) = 7x^2$ (vi) $p(x) = rx + s, r \neq 0$

7. Verify whether the following are zeroes of the polynomial indicated against them :

(i) $p(x) = 5x - 1, x = \frac{1}{5}$

(ii) $p(x) = (x - 2)(x - 5), x = 2, 5$

(iii) $s(x) = x^2, x = 0, 1$

(iv) $p(x) = 3x^2 - 1, x = -\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

(v) $g(x) = 5x^2 + 7x, x = 0, -\frac{7}{5}$

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8. Use remainder theorem to find remainder when p(x) is dividedby q(x) in the following questions:

(i) $p(x) = 2x^2 - 5x + 7$, $q(x) = x - 1$

(ii) $p(x) = x^9 - 5x^4 + 1$, $q(x) = x + 1$

(iii) $p(x) = 4x^3 - 12x^2 + 11x - 5$, $q(x) = x - \frac{1}{2}$

(iv) $p(x) = x^4 + x^3 + x^2 - 5x + 1$, $q(x) = x + 1$

9. Use factor theorem to verify in each of the following that q(x) is a factor of p(x)

(i) $p(x) = 3x^2 - 5x + 2$, $q(x) = 3x - 2$

(ii) $p(x) = x^4 - x^3 + x - 1$, $q(x) = x + 1$

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

Long answer type questions

10. Let A and B are the remainders when the polynomial $y^3 + 2y^2 - 5ay - 7$ and $y^3 + ay^2 - 12y + 6$ are divided by $y + 1$ and $y - 2$ respectively. If $2A + B = 6$, find the value of a

11. Simplify :

(i) $(a + b)^3 + (a - b)^3 + 6a(a^2 - b^2)$

(ii) $(2a + b + c)^2 + (2a - b - c)^2$

12. Find the value of :

(i) $x^3 + y^3 - 12xy + 64$ when $x + y = -4$

(ii) $x^3 - 8y^3 - 36xy - 216$ when $x = 2y + 6$

(iii) $(25)^3 - (29)^3 + (4)^3$

13. Prove that $a^3 + b^3 + c^3 - 3abc = \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$

High Order Thinking Skills (HOTS)

14. Find the value of $(x - a)^3 + (x - b)^3 + (x - c)^3 - 3(x - a)(x - b)(x - c)$ when $a+b+c=3x$

15. If k and 2k are zeros of $f(x) = x^3 + 4x^2 + 9kx - 90$, find k and all three zeros of f(x).

EXERCISE – 4 COMPETITIVE ASSESSMENT

1. If $9x^2 - 15x + 6 = 0$ and $\left(3x - \frac{5}{2}\right)^2 = k$ are identical, then the value of k is– ***[STSE Stage-1 2015]***

(A) $\frac{1}{4}$ (B) 4 (C) 9 (D) $\frac{1}{9}$

2. If one of the factors of $x^3 - 2x^2 - x + 2$ is (x + 1), then another factor will be ***[STSE Stage-1 2015]***

(A) $x^2 - 3x + 2$ (B) $x^2 + 3x - 2$ (C) $x^2 - 3x - 2$ (D) $x^2 + 3x + 2$

3. If (x + 2) is a factor of $2x^3 - 5x + k$, then the value of k is ***[NTSE Stage-1 2016]***

(A) 6 (B) – 6 (C) 26 (D) –26

4. If a = x – y, b = y – z and c = z – x then the value of $a^3 + b^3 + c^3$ is : ***[NTSE Stage-1 2016]***

(A) 3(x–y) (y–z) (z–x) (B) $(x-y)^3 (y-z)^3 (z-x)^3$

(C) $(x + y + z)^3$ (D) $x^3 + y^3 + z^3$

5. If $(x+\sqrt{2})$ is a factor of $kx^2 - \sqrt{2x+1}$, then the value of k is ***[NTSE Stage-1 2016]***

(A) $-\frac{3}{2}$ (B) $-\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $\frac{2}{3}$

6. If a polynomial $x^4 - 4x^2 + x^3 + 2x + 1$ is divided by x – 1, then remainder will be ***[NTSE/Stage-1/2018]***

(A) 0 (B) 1 (C) 9 (D) –1

7. If $x^2 + 4y^2 + 9z^2 - 4xy - 12yz + 6xz = 0$, ***[NTSE/Stage-1/2018]***

(A) x = 2y – 3z (B) x = y – 3z (C) 2x = y – 3z (D) x = 3y – 2z.

ANSWERS

CHECK POST-1

1. (C) ***2.*** (B) ***3.*** (B) ***4.*** (A)

5. (A) ***6. (i)*** 2 ***(ii)*** 7

7. (i) 2 ***(ii)*** $x^3 + 5x^2$ ***(iii)*** $7x^{10} + 5x^4 + 1$

8. (i) π ***(ii)*** -1 ***9. (i)*** $-\frac{\pi}{3}$ ***(ii)*** $-3, 4$

CHECK POST-2

1. (A) ***2.*** (B) ***3.*** (B) ***4.*** (C)

5. (D) ***6.*** $\frac{5}{9}$ ***7.*** -12 ***8.*** Yes

9. -7 ***10.*** -2

CHECK POST-3

1. (B) ***2.*** (C) ***3.*** (A) ***4.*** (C)

5. (A) ***6.*** $(x + a)(x - b)$ ***7.*** 249991 ***8.*** $(x + y + 1)(x - y - 3)$

9. 119 ***10.*** $\left(\sqrt{3}a + \sqrt{5}b\right)^3$

EXERCISE-1 (ELEMENTARY)

Que.	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Ans.	C	B	D	C	B	D	D	D	C	B
Que.	***11***	***12***	***13***	***14***	***15***	***16***	***17***	***18***	***19***	***20***
Ans.	D	A	B	D	B	D	A	B	D	C
Que.	***21***	***22***	***23***	***24***	***25***					
Ans.	C	C	C	A	A					

EXERCISE-2 (SEASONED)

Que.	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Ans.	A	C	C	C	D	A	C	A	B	B

EXERCISE-3 (CBSE PATTERN)

1. (i), (ii), (iii), (vi)

2. (i) 3 ***(ii)*** –2 ***(iii)*** 0 ***(iv)*** $\frac{3}{4}$

3. (i) 2 ***(ii)*** 3 ***(iii)*** 2 ***(iv)*** 4

4. (i) cubic ***(ii)*** quadratic ***(iii)*** quadratic ***(iv)*** linear ***(v)*** cubic

5. (i) 9 ***(ii)*** $4+\sqrt{11}$ ***(iii)*** 14

6. (i) 4 ***(ii)*** $-\frac{1}{2}$ ***(iii)*** –1, –2 ***(iv)*** 1, 2, 3

(v) 0, 0 ***(vi)*** $-\frac{s}{r}$

7. (i) yes ***(ii)*** both ***(iii)*** only 0 ***(iv)*** only $-\frac{1}{\sqrt{3}}$ ***(v)*** both

8. (i) 4 ***(ii)*** –5 ***(iii)*** –2 ***(iv)*** 7

9. (i) yes ***(ii)*** yes ***(iii)*** yes

10. a= 2 ***11. (i)*** $8a^3$ ***(ii)*** $2(4a^2 + b^2 + c^2 + 2bc)$

12. (i) 0 ***(ii)*** 0 ***(iii)*** –8700

14. 0

15. k = –3 and zeroes are –3, –6, 5

EXERCISE-4 (COMPETITIVE ASSESSMENT)

Que.	***1***	***2***	***3***	***4***	***5***	***6***	***7***	
Ans.	A	A	A	A	A	B	A	

IMPORTANT NOTES