TEST: 03 POLYNOMIALS CBSE

TIME ALLOWED: 2 HRS

NUMBER OF QUESTIONS : 52

FULL MARKS: 52

A- MULTIPLE CHOICE QUESTIONS
B-CASE/PASSAGE BASED QUESTIONS

A- MULTIPLE CHOICE QUESTIONS

1. Which of the following is a constant polynomial?

(a) $x+\frac{1}{x}-3$ (b) $\frac{1}{x}+3$

(c) $\sqrt{x}+2$ (d) -4

2. Degree of polynomial $2x^3+\sqrt{3}x+\frac{1}{3}x^5-7$ is

(a) 1 (b) 3 (c) 0 (d) 5

3. The coefficient of the highest power of x in the polynomial $3x^3-4x^4+5x^2-2x^5+3$ is

(a) 2 (b) -4 (c) 3 (d) -2

4. Which of the following polynomials has -5 as its zero?

(a) $(x-5)$ (b) x^2-25

(c) x^2-5x (d) x^2+5

5. If $p(y)=y^2-y+1$, then find the value of $p(0)-p(1)$.

(a) 1 (b) 3 (c) 0 (d) 2

6. If $p(x)=x^2+kx+6$, then for what value of k, $p(3)=0$?

(a) 2 (b) -5 (c) 3 (d) -1

7. If $p(x)=x^{160}+2x^{141}+k$ and $p(-1)=0$, then the value of k is

(a) 1 (b) -3 (c) 2 (d) -2

8. Factors of polynomial $12x^2+7x+1$ are

(a) $(3x-1)(4x+1)$ (b) $(3x-1)(4x-1)$

(c) $(4x-1)(3x-1)$ (d) $(4x+1)(3x+1)$

9. The factors of $x^3+9x^2+23x+15$ are

(a) $(x+1)$, $(x+3)$, $(x+5)$

(b) $(x+1)$, $(x+3)$, $(x-5)$

(c) $(x+1)$, $(x-3)$, $(x-5)$

(d) $(x-1)$, $(x-3)$, $(x-5)$

10. The value of $(369)^2-(368)^2$ is

(a) 1^2 (b) 81 (c) 37 (d) 737

11. Using algebraic identity, find the value of 209×191.

(a) 39851 (b) 39919

(c) 39961 (d) 38951

12. If $a+b+c=13$ and $ab+bc+ca=84$, then find the value of $a^2+b^2+c^2$.

(a) 1 (b) 2 (c) 3 (d) 4

13. If $\frac{a}{b}+\frac{b}{a}=1$, then a^3+b^3 equals

(a) 1 (b) -1 (c) 1/2 (d) 0

14. The value of $(9)^3+(-3)^3$ is

(a) -81 (b) 54

(c) 164 (d) 702

15. If $a^3+b^3+c^3=3abc$, then $\frac{a^2}{bc}+\frac{b^2}{ca}+\frac{c^2}{ab}=$

(a) 0 (b) 1 (c) -1 (d) 3

16. If $p(x)=x+3$, then $p(x)+p(-x)$ is equal to

(a) 3 (b) $2x$ (c) 0 (d) 6

17. One of the zeroes of the polynomial $2x^2+7x-4$ is

(a) 2 (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) -2

18. If $a+b+c=0$, then $a^3+b^3+c^3$ is equal to

(a) 0 (b) abc (c) $3abc$ (d) $2abc$

19. $\sqrt{2}$ is a polynomial of degree

(a) 2 (b) 0 (c) 1 (d) $\frac{1}{2}$

20. Number of terms in the polynomial $4x^3+3x^2-6x+7$ is

(a) 1 (b) 2 (c) 3 (d) 4

21. If $p(x)=x^2-2\sqrt{2}x+1$, then $p(2\sqrt{2})=$

(a) 0 (b) 1 (c) $4\sqrt{2}$ (d) -1

22. A cubic polynomial cannot have more than _____ zeroes.

(a) 0 (b) 1 (c) 2 (d) 3

23. If $p(x)=x^{51}+51$, then value of $p(-1)$ is

(a) 0 (b) 1 (c) 49 (d) 50

24. Degree of the polynomial $p(x)=(x+2)(x-2)$ is

(a) 2 (b) 1 (c) 0 (d) 3

25. Factorise: $x^2 + (a + b + c)x + ab + bc$
(a) $(x + a)(x + b + c)$ (b) $(x + a)(x + a + c)$
(c) $(x + b)(x + a + c)$ (d) $(x + b)(x + b + c)$

26. Factors of $(42 - x - x^2)$ are
(a) $(x - 7), (x - 6)$ (b) $(x + 7), (x - 6)$
(c) $(x + 7), (6 - x)$ (d) $(x - 7), (x + 6)$

27. The common quantity that must be added to each term of $a^2 : b^2$ to make it equal to $a : b$ is
(a) ab (b) $a + b$ (c) $a - b$ (d) $\frac{a}{b}$

28. Find the value of $x + y + z$, if $x^2 + y^2 + z^2 = 18$ and $xy + yz + zx = 9$.
(a) 9 (b) 3 (c) 6 (d) 8

29. If $f(x) = x^3 - 3x^2 + 4x + 50$, then $f(-3) =$
(a) –16 (b) –12 (c) –20 (d) –10

30. If $x = -2$ and $x^2 + y^2 + 3xy = -5$, then find y.
(a) –2 (b) 3 (c) – 4 (d) 9

31. Simplify : $\frac{x^3 - 4 - x + 4x^2}{x^2 + 3x - 4}$
(a) $4 + x$ (b) $2 + x$ (c) $1 - x$ (d) $x + 1$

32. If $p(x) = x^3 + 3x^2 - 2x + 4$, then find the value of $[p(2) + p(-2) - p(0)]$.
(a) 28 (b) 14 (c) 12 (d) 16

33. Which of the following is a cubic polynomial?
(a) $2x + \sqrt{3} + x^4$ (b) $-x - x^2 - 7x^3$
(c) 9 (d) $2 - 3x^2 - 9x$

34. The value of the polynomial $5x - 4x^2 + 3$, when $x = -1$ is
(a) – 6 (b) 6 (c) 2 (d) – 2

35. $(x + y)^3 - (x - y)^3 - 6y(x^2 - y^2) =$
(a) y^3 (b) $2y^3$ (c) $4y^3$ (d) $8y^3$

36. If the volume of a cuboid is $x^3 + x^2 - 9x - 9$, then its possible dimensions are
(a) $x + 1, x^2, x + 3$ (b) $x + 1, x - 3, x + 3$
(c) $3, x^2, 9x$ (d) 3, 3, 3

37. The degree of the polynomial $(y^3 - 3)(y^2 + 8)$ is
(a) 2 (b) 3 (c) 0 (d) 5

B-CASE/PASSAGE BASED QUESTIONS

Case I : Read the following passage and answer the questions from 38 to 42.

Ankur and Ranjan start a new business together. The amount invested by both partners together is given by the polynomial $p(x) = 4x^2 + 12x + 5$, which is the product of their individual shares.

38. Coefficient of x^2 in the given polynomial is
(a) 2 (b) 3 (c) 4 (d) 12

39. Total amount invested by both, if $x = 1000$ is
(a) ₹301506 (b) ₹370561
(c) ₹4012005 (d) ₹490621

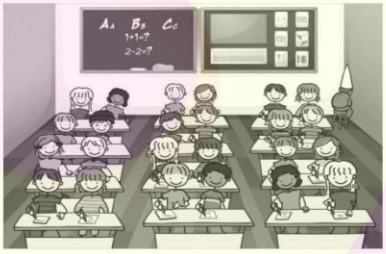
40. The shares of Ankur and Ranjan invested individually are
(a) $₹(2x + 1), ₹(2x + 5)$ (b) $₹(2x + 3), ₹(x + 1)$
(c) $₹(x + 1), ₹(x + 3)$ (d) None of these

41. Name the polynomial of amounts invested by each partner.
(a) Cubic (b) Quadratic
(c) Linear (d) None of these

42. Find the value of x, if the total amount invested is equal to 0.
(a) –1/2 (b) –5/2
(c) Both (a) and (b) (d) None of these

Case II : Read the following passage and answer the questions from 43 to 47.

A class teacher decided to organise an educational trip for his class. He asked the students for their preferences, where they want to go. $\frac{1}{12}$ th times the square of total number of students want to go to old age home, $\frac{7}{12}$ th times the total number of students plan to visit historical monuments, while 15 students decide to teach children of orphanage home.



43. Which of the following polynomial represents the above situation, if x is the total number of students?

(a) $\frac{7}{12}x^2+\frac{1}{12}x+15$ (b) $\frac{1}{12}x^2+\frac{7}{12}x+15$

(c) $7x^2 + 12x + 15$ (d) None of these

44. The coefficient of x^2 in the above polynomial is

(a) $\frac{7}{12}$ (b) $-\frac{1}{12}$ (c) $-\frac{7}{12}$ (d) $\frac{1}{12}$

45. Write the coefficient of x in the polynomial.

(a) $-\frac{1}{12}$ (b) $\frac{1}{12}$ (c) $\frac{7}{12}$ (d) $-\frac{7}{12}$

46. Value of the polynomial at $x = 1$, is

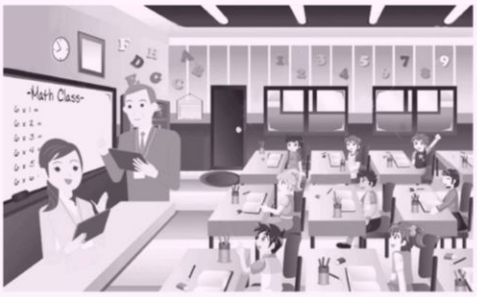
(a) 172 (b) 150 (c) $\frac{176}{12}$ (d) $\frac{47}{3}$

47. Value of the polynomial at $x = 2$ is

(a) $\frac{170}{12}$ (b) $\frac{182}{12}$ (c) 190 (d) $\frac{33}{2}$

Case III : Read the following passage and answer the questions from 48 to 52.

On one day, principal of a particular school visited the classroom. Class teacher was teaching the concept of polynomial to students. He was very much impressed by her way of teaching. To check, whether the students also understand the concept taught by her or not, he asked various questions to students. Some of them are given below. Answer them.



48. Which one of the following is not a polynomial?

(a) $4x^2 + 2x - 1$ (b) $y+\frac{3}{y}$

(c) $x^3 - 1$ (d) $y^2 + 5y + 1$

49. The polynomial of the type $ax^2 + bx + c$, $a = 0$ is called

(a) Linear polynomial
(b) Quadratic polynomial
(c) Cubic polynomial
(d) Biquadratic polynomial

50. The value of k, if $(x - 1)$ is a factor of $4x^3 + 3x^2 - 4x + k$, is

(a) 1 (b) –2 (c) –3 (d) 3

51. If $x + 2$ is the factor of $x^3 - 2ax^2 + 16$, then value of a is

(a) –7 (b) 1 (c) –1 (d) 7

52. The number of zeroes of the polynomial $x^2 + 4x + 2$ is

(a) 1 (b) 2 (c) 3 (d) 4

ANSWERS AND EXPLANATIONS

OBJECTIVE TYPE QUESTIONS

1. **(d) :** Clearly, –4 is a constant polynomial as its degree is 0.

2. **(d) :** Degree of polynomial $2x^3 + \sqrt{3}x + \frac{1}{3}x^5 - 7$ is 5.

3. **(d) :** Term with highest power of x is $-2x^5$.

$\therefore$ Coefficient of $x^5 = -2$

4. **(b) :** Put $x = -5$ in each of the given polynomials, we get

(a) $-5 - 5 = -10 \neq 0$

(b) $(-5)^2 - 25 = 0$

(c) $(-5)^2 - 5(-5) = 25 + 25 = 50 \neq 0$

(d) $(-5)^2 + 5 = 25 + 5 = 30 \neq 0$

5. **(c) :** We have, $p(y) = y^2 - y + 1$

Now, $p(0) = (0)^2 - (0) + 1 = 1$

Also, $p(1) = (1)^2 - (1) + 1 = 1$

$\therefore$ $p(0) - p(1) = 1 - 1 = 0$

6. **(b) :** $p(x) = x^2 + kx + 6$

Now, $p(3) = 0 \Rightarrow 3^2 + k \times 3 + 6 = 0$

$\Rightarrow$ $3k = -15 \Rightarrow k = -5$

7. **(a) :** We have, $p(-1) = 0$

$\Rightarrow$ $(-1)^{160} + 2(-1)^{141} + k = 0$

$\Rightarrow$ $1 - 2 + k = 0 \Rightarrow k - 1 = 0$

$\therefore$ $k = 1$

8. **(d) :** We have, $12x^2 + 7x + 1$

$= 12x^2 + 3x + 4x + 1$

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

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

9. **(a) :** Let $f(x) = x^3 + 9x^2 + 23x + 15$

Here, constant term of $f(x)$ is 15

$\because$ Factors of 15 are ± 1, ± 3, ± 5 and ± 15

$\therefore$ $f(-1) = (-1)^3 + 9(-1)^2 + 23(-1) + 15 = 0$

$f(-3) = (-3)^3 + 9(-3)^2 + 23(-3) + 15 = 0$

$f(-5) = (-5)^3 + 9(-5)^2 + 23(-5) + 15 = 0$

$\therefore$ $(x + 1)$, $(x + 3)$, $(x + 5)$ are the factors of $f(x)$.

10. **(d) :** Since $a^2 - b^2 = (a + b)(a - b)$

$\therefore$ $(369)^2 - (368)^2 = (369 + 368)(369 - 368)$

$= 737 \times 1 = 737$

11. **(b) :** We have, $209 \times 191 = (200 + 9)(200 - 9)$

$= (200)^2 - (9)^2$ $[\because (a + b)(a - b) = a^2 - b^2]$

$= 40000 - 81 = 39919$

12. **(a) :** Given that, $a + b + c = 13$

Squaring both sides, we get

$(a + b + c)^2 = (13)^2$

$\Rightarrow$ $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = 169$

$\Rightarrow$ $a^2 + b^2 + c^2 + 2(ab + bc + ca) = 169$

Putting $ab + bc + ca = 84$, we get

$a^2 + b^2 + c^2 + 2 \times 84 = 169$

$\therefore$ $a^2 + b^2 + c^2 = 169 - 168 = 1$

13. **(d) :** $\left(\frac{a}{b}\right) + \left(\frac{b}{a}\right) = 1$

$\Rightarrow$ $\frac{a^2 + b^2}{ab} = 1 \Rightarrow a^2 + b^2 = ab$

$\therefore$ $a^2 + b^2 - ab = 0$ ...(i)

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

$\Rightarrow \quad a^3 + b^3 = (a + b) \times 0$ [Using eq. (i)]

$= 0$

$\therefore \quad a^3 + b^3 = 0$

14. (d) : $\therefore\ (9)^3 + (-3)^3 = (9 + (-3))\ (9^2 + (-3)^2 - (9)\ (-3))$

$= 6 \times (81 + 9 + 27)$

$= 6 \times 117 = 702$

15. (d) : We have, $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3 + b^3 + c^3}{abc} = \frac{3abc}{abc} = 3$

16. (d) : We have, $p(x) = x + 3$ ... (i)

Substitute $x = -x$ in (i), we get

$p(-x) = -x + 3$ ... (ii)

Adding (i) and (ii), we get

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

17. (b) : Let $p(x) = 2x^2 + 7x - 4$

$= 2x^2 + 8x - x - 4 = 2x(x + 4) - 1(x + 4)$

$= (2x - 1)(x + 4)$

To find zeroes of the polynomial, put $p(x) = 0$

$\Rightarrow \quad (2x - 1)(x + 4) = 0$

$\Rightarrow \quad 2x - 1 = 0$ and $x + 4 = 0$

$\Rightarrow \quad x = \frac{1}{2}$ and $x = -4$

18. (c) : We have, $a + b + c = 0$ ...(i)

$\Rightarrow a + b = -c$

Cubing both sides, we get

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

$\Rightarrow \quad a^3 + b^3 + c^3 = -3ab(a + b)$

$\Rightarrow \quad a^3 + b^3 + c^3 = -3ab\ (-c)$ [Using (i)]

$\Rightarrow \quad a^3 + b^3 + c^3 = 3abc$

19. (b) : The given polynomial, $\sqrt{2}$ can be written as $\sqrt{2}x^0$. Since exponent of x is 0, therefore, $\sqrt{2}$ is a polynomial of degree 0.

20. (d) : There are four terms in the polynomial $4x^3 + 3x^2 - 6x + 7$.

21. (b) : $p(2\sqrt{2}) = (2\sqrt{2})^2 - (2\sqrt{2})(2\sqrt{2}) + 1 = 1.$

22. (d) : A cubic polynomial cannot have more than three zeroes.

23. (d) : Let $p(x) = x^{51} + 51$

Now, $p(-1) = (-1)^{51} + 51 = -1 + 51 = 50$

24. (a) : $p(x) = (x + 2)(x - 2) = x^2 - 4$

$\therefore$ Degree of $p(x) = 2$.

25. (c) : $x^2 + (a + b + c)x + ab + bc$

$= x^2 + (a + c)x + bx + b(a + c) = x^2 + bx + (a + c)(x + b)$

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

26. (c) : $42 - x - x^2 = 42 - 7x + 6x - x^2$

$= 7(6 - x) + x(6 - x) = (6 - x)(7 + x)$

27. (a) : Consider $a^2 : b^2$,

Adding ab on both sides, we get

$(a^2 + ab) : (b^2 + ab) = a(a + b) : b(a + b) = a : b.$

28. (c) : $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$= 18 + 2(9) = 36$

$\Rightarrow \quad x + y + z = 6$

29. (a) : $f(-3) = [(-3)^3 - 3 \times (-3)^2 + 4 \times (-3) + 50]$

$= (-27 - 27 - 12 + 50) = -16.$

30. (b) : We have, $x^2 + y^2 + 3xy = -5$ and $x = -2$

$\Rightarrow \quad (-2)^2 + y^2 - 6y = -5$

$\Rightarrow \quad y^2 - 6y + 9 = 0 \Rightarrow (y - 3)^2 = 0$

$\Rightarrow \quad y - 3 = 0 \Rightarrow y = 3$

31. (d) : $\frac{x^3 - 4 - x + 4x^2}{x^2 + 3x - 4}$

$= \frac{x^3 + 4x^2 - x - 4}{x^2 + 4x - x - 4} = \frac{x^2(x+4) - 1(x+4)}{x(x+4) - 1(x+4)}$

$= \frac{(x^2 - 1)(x + 4)}{(x - 1)(x + 4)} = \frac{(x+1)(x-1)(x+4)}{(x-1)(x+4)} = x + 1.$

32. (a) : Here, $p(x) = x^3 + 3x^2 - 2x + 4$

Now, $p(2) = 2^3 + 3(2)^2 - 2(2) + 4 = 8 + 12 - 4 + 4 = 20$

$p(-2) = (-2)^3 + 3(-2)^2 - 2(-2) + 4 = -8 + 12 + 4 + 4 = 12$

and $p(0) = 0 + 0 - 0 + 4 = 4$

$\therefore \quad p(2) + p(-2) - p(0) = 20 + 12 - 4 = 28.$

33. (b) : Clearly, $-x - x^2 - 7x^3$ is a polynomial of degree 3. So, it is a cubic polynomial.

34. (a) : Let $p(x) = 5x - 4x^2 + 3$

Now, value of $p(x)$ at $x = -1$ is,

$p(-1) = 5\ (-1) - 4(-1)^2 + 3 = -5 - 4 + 3 = -6$

35. (d) : We have, $(x + y)^3 - (x - y)^3 - 6y(x^2 - y^2)$

$= x^3 + y^3 + 3xy\ (x + y) - [x^3 - y^3 - 3xy\ (x - y)] - 6x^2y + 6y^3$

$= x^3 + y^3 + 3x^2y + 3xy^2 - x^3 + y^3 + 3x^2y - 3xy^2 - 6x^2y + 6y^3$

$= 8y^3$

36. (b) : We have, $x^3 + x^2 - 9x - 9$

$= x^2\ (x + 1) - 9\ (x + 1) = (x + 1)(x^2 - 9)$

$= (x + 1)(x - 3)(x + 3)$ [$\because\ a^2 - b^2 = (a - b)(a + b)$]

37. (d) : We have, $(y^3 - 3)(y^2 + 8) = y^5 + 8y^3 - 3y^2 - 24$

$\therefore$ Degree of given polynomial = 5

38. (c)

39. (c) : We have, $p(x) = 4x^2 + 12x + 5$

At $x = 1000$,

$p(1000) = 4(1000)^2 + 12(1000) + 5 = ₹\,4012005.$

40. (a) : We have, $p(x) = 4x^2 + 12x + 5$

$= 4x^2 + 10x + 2x + 5 = 2x(2x + 5) + 1(2x + 5)$

$= (2x + 1)\ (2x + 5)$

$\therefore$ Their individual shares are ₹ $(2x + 1)$ and ₹ $(2x + 5)$.

41. **(c)**

42. **(c) :** We have, total amount invested = 0

$\Rightarrow$ $4x^2 + 12x + 5 = 0$

$\Rightarrow$ $(2x + 1)(2x + 5) = 0$

$\Rightarrow$ $x = -1/2$ or $x = -5/2$

43. **(b) :** Required polynomial,

$$p(x) = \frac{1}{12}x^2 + \frac{7}{12}x + 15$$

44. **(d) :** Coefficient of x^2 in $p(x) = \frac{1}{12}$

45. **(c) :** Coefficient of x in $p(x) = \frac{7}{12}$

46. **(d) :** We have, $p(x) = \frac{1}{12}x^2 + \frac{7}{12}x + 15$

$$\text{At } x = 1,\ p(1) = \frac{1}{12}(1)^2 + \frac{7}{12}(1) + 15$$

$$= \frac{1 + 7 + 180}{12} = \frac{188}{12} = \frac{47}{3}$$

47. **(d) :** At $x = 2$, we have

$$p(2) = \frac{1}{12}(2)^2 + \frac{7}{12}(2) + 15$$

$$= \frac{4 + 14 + 180}{12} = \frac{198}{12} = \frac{33}{2}$$

48. **(b)**

49. **(a) :** $\because$ $a = 0$. So, the given polynomial becomes $bx + c$, which is a linear polynomial.

50. **(c) :** Let $p(x) = 4x^3 + 3x^2 - 4x + k$.

If $(x - 1)$ is a factor of $p(x)$, then by factor theorem $p(1) = 0$.

$\Rightarrow$ $p(1) = 4(1)^3 + 3(1)^2 - 4(1) + k$

$\Rightarrow$ $0 = 4 + 3 - 4 + k$

$\Rightarrow$ $k = -3$

51. **(b) :** Let $p(x) = x^3 - 2ax^2 + 16$

If $x + 2$ is a factor of $p(x)$, then by factor theorem $p(-2) = 0$.

$\Rightarrow$ $p(-2) = (-2)^3 - 2a(-2)^2 + 16 = 0$

$\Rightarrow$ $-8 - 8a + 16 = 0$

$\Rightarrow$ $8a = 8 \quad \Rightarrow \quad a = 1$

52. **(b)**