CLASS IX : CHAPTER - 2
POLYNOMIALS

1. In $2 + x + x^2$ the coefficient of x^2 is:
(a) 2 (b) 1 (c) – 2 (d) –1

2. In $2 – x^2 + x^3$ the coefficient of x^2 is:
(a) 2 (b) 1 (c) – 2 (d) –1

3. In $\frac{\pi x^2}{2} + x + 10$, the coefficient of x^2 is:
(a) $\frac{\pi}{2}$ (b) 1 (c) $-\frac{\pi}{2}$ (d) –1

4. The degree of $5t – 7$ is:
1. 0 (b) 1 (c) 2 (d) 3

5. The degree of $4 – y^2$ is:
(a) 0 (b) 1 (c) 2 (d) 3

6. The degree of 3 is:
(a) 0 (b) 1 (c) 2 (d) 3

7. The value of $p(x) = 5x – 4x^2 + 3$ for $x = 0$ is:
(a) 3 (b) 2 (c) – 3 (d) – 2

8. The value of $p(x) = 5x – 4x^2 + 3$ for $x = – 1$ is:
(a) 6 (b) –6 (c) 3 (d) – 3

9. The value of $p(x) = (x – 1)(x + 1)$ for $p(1)$ is:
(a) 1 (b) 0 (c) 2 (d) – 2

10. The value of $p(t) = 2 + t + 2t^2 – t^3$ for $p(0)$ is:
(a) 1 (b) 2 (c) – 1 (d) 3

11. The value of $p(t) = 2 + t + 2t^2 – t^3$ for $p(2)$ is:
(a) 4 (b) –4 (c) 6 (d) 7

12. The value of $p(y) = y^2 – y + 1$ for $p(0)$ is:
(a) –1 (b) 3 (c) –2 (d) 1

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1. The zero of $p(x) = 2x - 7$ is:

(a) $\frac{7}{2}$ (b) $\frac{2}{7}$ (c) $\frac{-2}{7}$ (d) $\frac{-7}{2}$

2. The zero of $p(x) = 9x + 4$ is:

(a) $\frac{4}{9}$ (b) $\frac{9}{4}$ (c) $\frac{-4}{9}$ (d) $\frac{-9}{4}$

3. Which are the zeroes of $p(x) = x^2 - 1$:

(a) 1, –1 (b) – 1, 2 (c) –2, 2 (d) –3, 3

4. Which are the zeroes of $p(x) = (x - 1)(x - 2)$:

(a) 1, –2 (b) – 1, 2 (c) 1, 2 (d) –1, –2

5. Which one of the following is the zero of $p(x) = lx + m$

(a) $\frac{m}{l}$ (b) $\frac{l}{m}$ (c) $-\frac{m}{l}$ (d) $-\frac{l}{m}$

6. Which one of the following is the zero of $p(x) = 5x - \pi$:

(a) $-\frac{4}{5}\pi$ (b) $\frac{1}{5}\pi$ (c) $\frac{4}{5}\pi$ (d) none of these

7. On dividing $x^3 + 3x^2 + 3x + 1$ by x we get remainder:

(a) 1 (b) 0 (c) – 1 (d) 2

8. On dividing $x^3 + 3x^2 + 3x + 1$ by $x + \pi$ we get remainder:

$(a) - \pi^3 + 3\pi^2 - 3\pi + 1$

$(b) \pi^3 - 3\pi^2 + 3\pi + 1$

$(c) - \pi^3 - 3\pi^2 - 3\pi - 1$

$(d) - \pi^3 + 3\pi^2 - 3\pi - 1$

9. On dividing $x^3 + 3x^2 + 3x + 1$ by $5 + 2x$ we get remainder:

(a) $\frac{8}{27}$ (b) $\frac{27}{8}$ (c) $-\frac{27}{8}$ (d) $-\frac{8}{27}$

10. If $x - 2$ is a factor of $x^3 - 3x + 5a$ then the value of a is:

(a) 1 (b) –1 (c) $\frac{2}{5}$ (d) $\frac{-2}{5}$

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1. $(x + 8)(x - 10)$ in the expanded form is:
(a) $x^2 - 8x - 80$ (b) $x^2 - 2x - 80$ (c) $x^2 + 2x + 80$ (d) $x^2 - 2x + 80$

2. The value of 95 x 96 is:
(a) 9020 (b) 9120 (c) 9320 (d) 9340

3. The value of 104 x 96 is:
(a) 9984 (b) 9624 (c) 9980 (d) 9986

4. Without actual calculating the cubes the value of $28^3 + (-15)^3 + (-13)^3$ is:
(a) 16380 (b) –16380 (c) 15380 (d) –15380

5. If $x - 2$ is a factor of $x^3 - 2ax^2 + ax - 1$ then the value of a is:
(a) $\frac{7}{6}$ (b) $\frac{-7}{6}$ (c) $\frac{6}{7}$ (d) $\frac{-6}{7}$

6. If $x + 2$ is a factor of $x^3 + 2ax^2 + ax - 1$ then the value of a is:
(a) $\frac{2}{3}$ (b) $\frac{3}{5}$ (c) $\frac{3}{2}$ (d) $\frac{1}{2}$

7. If $x + y + z = 0$ then $x^3 + y^3 + z^3$ is equal to
(a) 3xyz (b) – 3xyz (c) xy (d) –2xy

8. The factors of $2x^2 - 7x + 3$ are:
(a) $(x - 3)(2x - 1)$ (b) $(x + 3)(2x + 1)$
(c) $(x - 3)(2x + 1)$ (d) $(x + 3)(2x - 1)$

9. The factors of $6x^2 + 5x - 6$ are:
(a) $(2x - 3)(3x - 2)$ (b) $(2x - 3)(3x + 2)$
(c) $(2x + 3)(3x - 2)$ (d) $(2x + 3)(3x + 2)$

10. The factors of $3x^2 - x - 4$ are:
(a) $(3x - 4)(x - 1)$ (b) $(3x - 4)(x + 1)$
(c) $(3x + 4)(x - 1)$ (d) $(3x + 4)(x + 1)$

11. The factors of $12x^2 - 7x + 1$ are:
(a) $(4x - 1)(3x - 1)$ (b) $(4x - 1)(3x + 1)$
(c) $(4x + 1)(3x - 1)$ (d) $(4x + 1)(3x + 1)$

12. The factors of $x^3 - 2x^2 - x + 2$ are:
(a) $(x - 1)(x - 1)(x - 5)$ (b) $(x + 1)(x + 1)(x + 5)$
(c) $(x + 1)(x - 1)(x + 5)$ (d) $(x + 1)(x + 1)(x - 5)$

CLASS IX : CHAPTER - 2
POLYNOMIALS

1. Which of the following is not a polynomial?

(a) $x^2+\sqrt{2}x+3$ (b) $x^2+\sqrt{2x}+6$ (c) x^3+3x^2-3 (d) $6x+4$

2. The degree of the polynomial $3x^3 - x^4 + 5x + 3$ is

(a) –4 (b) 4 (c) 1 (d) 3

3. Zero of the polynomial $p(x) = a^2x$, $a \neq 0$ is

(a) $x = 0$ (b) $x = 1$ (c) $x = -1$ (d) $a = 0$

4. Which of the following is a term of a polynomial?

(a) 2x (b) $\frac{3}{x}$ (c) $x^{\sqrt{x}}$ (d) $\sqrt{x}$

5. If $p(x) = 5x^2 - 3x + 7$, then $p(1)$ equals

(a) –10 (b) 9 (c) –9 (d) 10

6. Factorisation of $x^3 + 1$ is

(a) $(x + 1)(x^2 - x + 1)$ (b) $(x + 1)(x^2 + x + 1)$
(c) $(x + 1)(x^2 - x - 1)$ (d) $(x + 1)(x^2 + 1)$

7. If $x + y + 2 = 0$, then $x^3 + y^3 + 8$ equals

(a) $(x + y + 2)^3$ (b) 0 (c) 6xy (d) –6xy

8. If $x = 2$ is a zero of the polynomial $2x^2 + 3x - p$, then the value of p is

(a) –4 (b) 0 (c) 8 (d) 14

9. $x+\frac{1}{x}$ is

(a) a polynomial of degree 1 (b) a polynomial of degree 2
(c) a polynomial of degree 3 (d) not a polynomial

10. Integral zeroes of the polynomial $(x + 3)(x - 7)$ are

(a) –3, –7 (b) 3, 7 (c) –3, 7 (d) 3, –7

11. The remainder when $p(x) = 2x^2 - x - 6$ is divided by $(x - 2)$ is

(a) p(– 2) (b) p(2) (c) p(3) (d) p(–3)

12. If $2\left(a^2+b^2\right)=\left(a+b\right)^2$, then

(a) $a + b = 0$ (b) $a = b$ (c) $2a = b$ (d) $ab = 0$

13. If $x^3 + 3x^2 + 3x + 1$ is divided by $(x + 1)$, then the remainder is

(a) –8 (b) 0 (c) 8 (d) $\frac{1}{8}$

14. The value of $(525)^2 - (475)^2$ is

(a) 100 (b) 1000 (c) 100000 (d) –100

15. If $a + b = -1$, then the value of $a^3 + b^3 - 3ab$ is

(a) –1 (b) 1 (c) 26 (d) –26

16. The value of $(2-a)^3 + (2-b)^3 + (2-c)^3 - 3(2-a)(2-b)(2-c)$ when $a + b + c = 6$ is

(a) –3 (b) 3 (c) 0 (d) –1

17. If $\frac{a}{b} + \frac{b}{a} = 1, (a \neq 0, b \neq 0)$, then the value of $a^3 - b^3$ is

(a) –1 (b) 0 (c) 1 (d) $\frac{1}{2}$

18. If $x = \frac{1}{2-\sqrt{3}}$, then the value of $(x^2 - 4x + 1)$ is

(a) –1 (b) 0 (c) 1 (d) 3

19. The number of zeroes of the polynomial $x^3 + x - 3 - 3x^2$ is

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

20. If $(x + 2)$ and $(x - 2)$ are factors of $ax^4 + 2x - 3x^2 + bx - 4$, then the value of $a + b$ is

(a) –7 (b) 7 (c) 14 (d) –8

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1. Factorize the following: $9x^2 + 6x + 1 - 25y^2$.

2. Factorize the following: $a^2 + b^2 + 2ab + 2bc + 2ca$

3. Show that $p(x) = x^3 - 3x^2 + 2x - 6$ has only one real zero.

4. Find the value of a if $x + 6$ is a factor of $x^3 + 3x^2 + 4x + a$.

5. If polynomials $ax^3 + 3x^2 - 3$ and $2x^3 - 5x + a$ leaves the same remainder when each is divided by $x - 4$, find the value of a..

6. The polynomial $f(x)= x^4 - 2x^3 + 3x^2 - ax + b$ when divided by $(x - 1)$ and $(x + 1)$ leaves the remainders 5 and 19 respectively. Find the values of a and b. Hence, find the remainder when $f(x)$ is divided by $(x - 2)$.

7. If the polynomials $2x^3 + ax^2 + 3x - 5$ and $x^3 + x^2 - 2x + a$ leave the same remainder when divided by $(x - 2)$, find the value of a. Also, find the remainder in each case.

8. If the polynomials $az^3 + 4z^2 + 3z - 4$ and $z^3 - 4z + a$ leave the same remainder when divided by $z - 3$, find the value of a.

9. The polynomial $p(x) = x^4 - 2x^3 + 3x^2 - ax + 3a - 7$ when divided by $x + 1$ leaves the remainder 19. Find the values of a. Also find the remainder when $p(x)$ is divided by $x + 2$.

10. If both $x - 2$ and $x - \frac{1}{2}$ are factors of $px^2 + 5x + r$, show that $p = r$.

11. Without actual division, prove that $2x^4 - 5x^3 + 2x^2 - x + 2$ is divisible by $x^2 - 3x + 2$.

12. Simplify $(2x - 5y)^3 - (2x + 5y)^3$.

13. Multiply $x^2 + 4y^2 + z^2 + 2xy + xz - 2yz$ by $(-z + x - 2y)$.

14. If a, b, c are all non-zero and $a + b + c = 0$, prove that $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = 3$

15. If $a + b + c = 5$ and $ab + bc + ca = 10$, then prove that $a^3 + b^3 + c^3 - 3abc = -25$.

16. Without actual division, prove that $2x^4 - 6x^3 + 3x^2 + 3x - 2$ is exactly divisible by $x^2 - 3x + 2$.

17. Without actual division, prove that $x^3 - 3x^2 - 13x + 15$ is exactly divisible by $x^2 + 2x - 3$.

18. Find the values of a and b so that the polynomial $x^3 - 10x^2 + ax + b$ is exactly divisible by $(x - 1)$ as well as $(x - 2)$.

19. Find the integral zeroes of the polynomial $2x^3 + 5x^2 - 5x - 2$.

20. If $(x - 3)$ and $\left(x - \frac{1}{3}\right)$ are both factors of $ax^2 + 5x + b$, then show that $a = b$.

21. Find the values of a and b so that the polynomial $x^4 + ax^3 - 7x^2 + 8x + b$ is exactly divisible by $(x + 2)$ as well as $(x + 3)$.

22. If $x^3 + ax^2 + bx + 6$ has $(x - 2)$ as a factor and leaves a remainder 3 when divided by $(x - 3)$, find the values of a and b.

23. Find the value of $x^3 + y^3 + 15xy - 125$ if $x + y = 5$.

24. Without actually calculating, find the value of $(25)^3 - (75)^3 + (50)^3$.

25. Factorise each of the following cubic expressions:

(i) $8x^3 - y^3 - 12x^2y + 6xy^2$

(ii) $27q^3 - 125p^3 - 135q^2p + 225qp^2$

(iii) $8x^3 + 729 + 108x^2 + 486x$

(iv) $27x^3 - \frac{1}{216} - \frac{9}{2}x^2 + \frac{1}{4}x$

26. Factorise:

(i) $x^3 + 216y^3 + 8z^3 - 36xyz$

(ii) $a^3 - 64b^3 - 27c^3 - 36abc$

27. Factorise: $\left(\frac{1}{2}x - 3y\right)^3 + \left(3y - \sqrt{3}z\right)^3 + \left(\sqrt{3}z - \frac{1}{2}x\right)^3$

28. Give one example each of a binomial of degree 35, and of a monomial of degree 100.

29. Find a zero of the polynomial $p(x) = 2x + 1$.

30. Verify whether 2 and 0 are zeroes of the polynomial $x^2 - 2x$.

31. Find the zero of the polynomial in each of the following cases:

(i) $p(x) = x + 5$ (ii) $p(x) = x - 5$ (iii) $p(x) = 2x + 5$

(iv) $p(x) = 3x - 2$ (v) $p(x) = 3x$ (vi) $p(x) = ax$, $a \neq 0$

32. Find the value of each of the following polynomials at the indicated value of variables:

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

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

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

33. Divide $p(x)$ by $g(x)$, where $p(x) = x + 3x^2 - 1$ and $g(x) = 1 + x$.

34. Divide the polynomial $3x^4 - 4x^3 - 3x - 1$ by $x - 1$.

35. Find the remainder obtained on dividing $p(x) = x^3 + 1$ by $x + 1$.

36. Find the remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by $x - 1$.

37. Check whether the polynomial $q(t) = 4t^3 + 4t^2 - t - 1$ is a multiple of $2t + 1$.

38. Check whether p(x) is a multiple of g(x) or not, where $p(x) = x^3 - x + 1$, $g(x) = 2 - 3x$.

39. Check whether g(x) is a factor of p(x) or not, where $p(x) = 8x^3 - 6x^2 - 4x + 3$, $g(x) = \frac{x}{3} - \frac{1}{4}$.

40. Find the remainder when $x^3 - ax^2 + 6x - a$ is divided by $x - a$.

41. Examine whether $x + 2$ is a factor of $x^3 + 3x^2 + 5x + 6$ and of $2x + 4$.

42. Find the value of k, if $x - 1$ is a factor of $4x^3 + 3x^2 - 4x + k$.

43. Find the value of a, if $x - a$ is a factor of $x^3 - ax^2 + 2x + a - 1$.

44. Factorise $6x^2 + 17x + 5$

45. Factorise $y^2 - 5y + 6$

46. Factorise $x^3 - 23x^2 + 142x - 120$.

47. Factorise :

(i) $x^3 - 2x^2 - x + 2$ (ii) $x^3 - 3x^2 - 9x - 5$

(iii) $x^3 + 13x^2 + 32x + 20$ (iv) $2y^3 + y^2 - 2y - 1$

48. Factorise : $4x^2 + 9y^2 + 16z^2 + 12xy - 24yz - 16xz$

49. Expand $(4a - 2b - 3c)^2$.

50. Factorise $4x^2 + y^2 + z^2 - 4xy - 2yz + 4xz$.

51. If $x + 1$ is a factor of $ax3 + x2 - 2x + 4a - 9$, find the value of a.

52. By actual division, find the quotient and the remainder when the first polynomial is divided by the second polynomial : $x^4 + 1; x - 1$

53. Find the zeroes of the polynomial : $p(x) = (x - 2)^2 - (x + 2)^2$

54. Factorise :

(i) $x^2 + 9x + 18$ (ii) $6x^2 + 7x - 3$

(iii) $2x^2 - 7x - 15$ (iv) $84 - 2r - 2r^2$

55. Factorise :

(i) $2x^3 - 3x^2 - 17x + 30$ (ii) $x^3 - 6x^2 + 11x - 6$

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

56. Using suitable identity, evaluate the following:

(i) 103^3 (ii) 101×102 (iii) 999^2

57. Factorise the following:

(i) $4x^2 + 20x + 25$

(ii) $9y^2 - 66yz + 121z^2$

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

58. Factorise the following :

(i) $9x^2 - 12x + 3$ (ii) $9x^2 - 12x + 4$

59. If $a + b + c = 9$ and $ab + bc + ca = 26$, find $a^2 + b^2 + c^2$.

60. Expand the following :

(i) $(4a - b + 2c)^2$

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

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

61. Find the value of

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

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

62. Factorise the following :

(i) $9x^2+4y^2+16z^2+12xy-16yz-24xz$

(ii) $25x^2+16y^2+4z^2-40xy+16yz-20xz$

(iii) $16x^2+4y^2+9z^2-16xy-12yz+24\,xz$

63. Expand the following :

(i) $(3a-2b)^3$ (ii) $\left(\frac{1}{x}+\frac{y}{3}\right)^3$ (iii) $\left(4-\frac{1}{3x}\right)^3$

64. Find the following products:

(i) $\left(\frac{x}{2}+2y\right)\left(\frac{x^2}{4}-xy+4y^2\right)$ (ii) $(x^2-1)(x^4+x^2+1)$

65. Factorise the following :

(i) $8p^3+\frac{12}{5}p^2+\frac{6}{25}p+\frac{1}{125}$

(ii) $1-64a^3-12a+48a^2$

66. Without finding the cubes, factorise $(x-2y)^3+(2y-3z)^3+(3z-x)^3$

67. Give possible expressions for the length and breadth of the rectangle whose area is given by $4a^2+4a-3$.

68. Factorise: (i) $1+64x^3$ (ii) $a^3-2\sqrt{2}b^3$

69. Evaluate each of the following using suitable identities:

(i) $(104)^3$ (ii) $(999)^3$

70. Factorise : $8x^3+27y^3+36x^2y+54xy^2$

71. Factorise : $8x^3+y^3+27z^3-18xyz$

72. Verify : (i) $x^3+y^3=(x+y)(x^2-xy+y^2)$ (ii) $x^3-y^3=(x-y)(x^2+xy+y^2)$

73. Factorise each of the following:

(i) $27y^3+125z^3$ (ii) $64m^3-343n^3$

74. Factorise : $27x^3+y^3+z^3-9xyz$

75. Without actually calculating the cubes, find the value of each of the following:

(i) $(-12)^3+(7)^3+(5)^3$

(ii) $(28)^3+(-15)^3+(-13)^3$

76. Find the following product :$(2x-y+3z)(4x^2+y^2+9z^2+2xy+3yz-6xz)$

77. Factorise :

(i) $a^3-8b^3-64c^3-24abc$ (ii) $2\sqrt{2}\,a^3+8b^3-27c^3+18\,\sqrt{2}\,abc$.

78. Give possible expressions for the length and breadth of rectangles, in which its areas is given by $35y^2 + 13y - 12$

79. Without actually calculating the cubes, find the value of :

$(i)\left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 - \left(\frac{5}{6}\right)^3$ $(ii)(0.2)^3 - (0.3)^3 + (0.1)^3$

80. By Remainder Theorem find the remainder, when $p(x)$ is divided by $g(x)$, where

(i) $p(x) = x^3 - 2x^2 - 4x - 1$, $g(x) = x + 1$

(ii) $p(x) = x^3 - 3x^2 + 4x + 50$, $g(x) = x - 3$

(iii) $p(x) = 4x^3 - 12x^2 + 14x - 3$, $g(x) = 2x - 1$

(iv) $p(x) = x^3 - 6x^2 + 2x - 4$, $g(x) = 1 - \frac{3}{2}x$

81. Check whether $p(x)$ is a multiple of $g(x)$ or not :

(i) $p(x) = x^3 - 5x^2 + 4x - 3$, $g(x) = x - 2$

(ii) $p(x) = 2x^3 - 11x^2 - 4x + 5$, $g(x) = 2x + 1$

82. Show that $p - 1$ is a factor of $p^{10} - 1$ and also of $p^{11} - 1$.

83. For what value of m is $x^3 - 2mx^2 + 16$ divisible by $x + 2$?

84. If $x + 2a$ is a factor of $x^5 - 4a^2x^3 + 2x + 2a + 3$, find a.

85. Find the value of m so that $2x - 1$ be a factor of $8x^4 + 4x^3 - 16x^2 + 10x + m$.

86. Show that :

(i) $x + 3$ is a factor of $69 + 11x - x^2 + x^3$.

(ii) $2x - 3$ is a factor of $x + 2x^3 - 9x^2 + 12$.

87. If $x + y = 12$ and $xy = 27$, find the value of $x^3 + y^3$.

88. Without actually calculating the cubes, find the value of $48^3 - 30^3 - 18^3$.

89. Without finding the cubes, factorise $(2x - 5y)^3 + (5y - 3z)^3 + (3z - 2x)^3$.

90. Without finding the cubes, factorise $(x - y)^3 + (y - z)^3 + (z - x)^3$.