

Sparta classes

STD 9 Maths [Manjari] Exploring Algebraic Identities

* Choose the right answer from the given options. [1 Marks Each]

[25]

1. What is the value of $(a + b)^2$?
(A) $(a^2 + b^2)$ (B) $(a^2 + 2ab + b^2)$ (C) $(a^2 - 2ab + b^2)$ (D) $(a^2 - ab + b^2)$
2. Which identity represents $(a - b)^2$?
(A) $(a^2 - 2ab + b^2)$ (B) $(a^2 + b^2)$ (C) $(a^2 + 2ab + b^2)$ (D) $(a^2 - ab - b^2)$
3. The product of $(a + b)(a - b)$ is
(A) $(a^2 + b^2)$ (B) $(a^2 - b^2)$ (C) $(a^2 + 2ab + b^2)$ (D) $(a^2 - 2ab + b^2)$
4. Expand $(x + 5)^2$.
(A) $x^2 + 10x + 25$ (B) $x^2 + 25$ (C) $x^2 - 10x + 25$ (D) $x^2 + 5x + 25$
5. What is the expansion of $(y - 3)^2$?
(A) $(y^2 + 6y + 9)$ (B) $(y^2 - 9)$ (C) $(y^2 - 6y + 9)$ (D) $(y^2 + 3y + 9)$
6. Which identity is used for $(a + b + c)^2$?
(A) $(a^2 + b^2 + c^2)$
(B) $(a^2 + b^2 + c^2 + 2ab + 2bc + 2ca)$
(C) $(a^2 - b^2 - c^2)$
(D) $(a^2 + b^2 - c^2)$
7. Find the product of $(2x + 3)(2x - 3)$.
(A) $(4x^2 - 9)$ (B) $(4x^2 + 9)$ (C) $(2x^2 - 9)$ (D) $(4x^2 + 6x - 9)$
8. What is $(m + n)^2 - (m - n)^2$?
(A) $(2mn)$ (B) $(4mn)$ (C) $(m^2 + n^2)$ (D) $(m^2 - n^2)$
9. Expand $(2a + b)^2$.
(A) $(4a^2 + b^2)$ (B) $(4a^2 + 4ab + b^2)$ (C) $(2a^2 + b^2)$ (D) $(4a^2 + 2ab + b^2)$
10. Which expression is equal to $(a^2 - b^2)$?
(A) $(a + b)^2$ (B) $(a - b)^2$ (C) $(a + b)(a - b)$ (D) $(a - b)(a - b)$
11. simplify
(A) $(x^2 + 16)$ (B) $(x^2 - 16)$ (C) $(x^2 - 8x + 16)$ (D) $(x^2 + 8x + 16)$
12. Expand $(3p - q)^2$.
(A) $(9p^2 - q^2)$ (B) $(9p^2 - 6pq + q^2)$ (C) $(3p^2 - q^2)$ (D) $(9p^2 + 6pq + q^2)$
13. Which of the following is a standard algebraic identity?

- (A) $(a + b = a^2 + b^2)$
 (B) $((a + b)^2 = a^2 + 2ab + b^2)$
 (C) $(a - b = a^2 - b^2)$
 (D) $(ab = a + b)$
14. Expand $(x + y + z)^2$.
 (A) $(x^2 + y^2 + z^2)$
 (B) $(x^2 + y^2 + z^2 + 2xy + 2yz + 2zx)$
 (C) $(x^2 - y^2 - z^2)$
 (D) $(x + y + z)$
15. What is the square of $(5a)$?
 (A) $(10a)$ (B) $(25a)$ (C) $(25a^2)$ (D) $(5a^2)$
16. Expand $(a + 2b)^2$.
 (A) $(a^2 + 2ab + 4b^2)$ (B) $(a^2 + 4ab + 4b^2)$ (C) $(a^2 - 4ab + 4b^2)$ (D) $(a^2 + 4b^2)$
17. The expression $(p - q)(p + q)$ simplifies to:
 (A) $(p^2 + q^2)$ (B) $(p^2 - q^2)$ (C) $(p^2 + 2pq + q^2)$ (D) $(p^2 - 2pq + q^2)$
18. Expand $(4x + 1)^2$.
 (A) $(16x^2 + 8x + 1)$ (B) $(16x^2 + 1)$ (C) $(8x^2 + 1)$ (D) $(16x^2 - 8x + 1)$
19. Which identity is used to find the square of a binomial?
 (A) $(a + b)^2$ (B) $(a - b)$ (C) $(a + b)$ (D) (ab)
20. Simplify $(7m - 2n)^2$.
 (A) $49m^2 - 28mn + 4n^2$ (B) $49m^2 + 4n^2$
 (C) $14m^2 - 4n^2$ (D) $49m^2 + 28mn + 4n^2$
21. What is the result of $(x + 2)(x + 2)$?
 (A) $(x^2 + 2x + 4)$ (B) $(x^2 + 4x + 4)$ (C) $(x^2 - 4)$ (D) $(x^2 + 4)$
22. Which expression gives the difference of squares?
 (A) $(a + b)^2$ (B) $(a - b)^2$ (C) $(a + b)(a - b)$ (D) (ab)
23. Expand $(2x - 5)^2$.
 (A) $(4x^2 - 20x + 25)$ (B) $(4x^2 + 25)$ (C) $(2x^2 - 25)$ (D) $(4x^2 + 20x + 25)$
24. Which of the following is the correct expansion of $(a - b + c)^2$?
 (A) $(a^2 + b^2 + c^2 - 2ab + 2ac - 2bc)$
 (B) $(a^2 - b^2 + c^2)$
 (C) $(a + b + c)$
 (D) $(a^2 + 2ab + b^2)$

25. What is the value of $(3x + 2y)^2$?

(A) $(9x^2 + 12xy + 4y^2)$

(B) $(9x^2 + 4y^2)$

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

(D) $(9x^2 - 12xy + 4y^2)$

*** Answer the following short questions. [2 Marks Each]**

[64]

26. Factor using suitable identities:

$$16y^2 - 24y + 9$$

27. Factor using suitable identities:

$$\frac{9}{4}s^2 + 6st + 4t^2$$

28. Factor using suitable identities:

$$\frac{p^2}{16} - 2 + \frac{16}{p^2}$$

29. Factor the following:

$$9a^2 + b^2 + 4c^2 - 6ab + 12ac - 4bc$$

30. Factor the following:

$$16s^2 + 25t^2 - 40st$$

31. Factor the following:

$$r^2 - r - 42$$

32. Factor the following:

$$49g^2 + 14gh + h^2$$

33. Factor the following:

$$64u^2 + 121v^2 + 4w^2 - 176uv - 32uw + 44vw$$

34. Use suitable identity to find the following product:

$$(-3x + 4)^2$$

35. Use suitable identity to find the following product:

$$(2s + 7)(2s - 7)$$

36. Use suitable identity to find the following product:

$$\left(p^2 + \frac{1}{2}\right)\left(p^2 - \frac{1}{2}\right)$$

37. Use suitable identity to find the following product:

$$(2n + 7)(2n - 7)$$

38. Use suitable identity to find the following product:

$$(s - 2t)(s^2 + 2st + 4t^2)$$

39. Use suitable identity to find the following product:

$$\left(\frac{1}{2r} - 4r\right)^2$$

40. Use suitable identity to find the following product:

$$(-3m + 4k - l)^2$$

41. Use suitable identity to find the following product:

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

42. Find the value using suitable identity:

$$17 \times 21$$

43. Find the value using suitable identity:

$$104 \times 96$$

44. Find the value using suitable identity:

$$24 \times 16$$

45. Find the value using suitable identity:

$$147^3$$

46. Find the value using suitable identity:

$$199^3$$

47. Find the value using suitable identity:

$$127^3$$

48. Factor the following algebraic expression:

$$4y^2 + 1 + \frac{1}{16y^2}$$

49. Factor the following algebraic expression:

$$9m^2 - \frac{1}{25n^2}$$

50. Factor the following algebraic expression:

$$27b^3 - \frac{1}{64b^3}$$

51. Factor the following algebraic expression:

$$x^2 + \frac{5x}{6} + \frac{1}{6}$$

52. Factor the following algebraic expression:

$$27u^3 - \frac{1}{125} - \frac{27u^2}{5} + \frac{9u}{25}$$

53. Factor the following algebraic expression:

$$64y^3 + \frac{1}{125}z^3$$

54. Factor the following algebraic expression:

$$p^3 + 27q^3 + r^3 - 9pqr$$

55. Factor the following algebraic expression:

$$9m^2 - 12m + 4$$

56. Factor the following algebraic expression:

$$4x^2 + 9y^2 + 36z^2 + 12xz + 36yz + 24xy$$

57. Factor the following algebraic expression:

$$27u^3 - \frac{1}{216} - \frac{9u^2}{2} + \frac{u}{4}$$

*** Answer the following questions. [3 Marks Each]**

[96]

58. Using the identity $(a + b)^2 = a^2 + 2ab + b^2$, expand the following:

(i) $(7x + 4y)^2$

(ii) $\left(\frac{7}{5}x + \frac{3}{2}y\right)^2$

(iii) $(2.5p + 1.5q)^2$

59. Using the identity $(a + b)^2 = a^2 + 2ab + b^2$, expand the following:

(i) $\left(\frac{3}{4}s + 8t\right)^2$

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

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

60. Using the same identity, find the values of the following:

(i) $(64)^2$

(ii) $(105)^2$

(iii) $(205)^2$

61. Find the values of the following using the identity $(a - b)^2 = a^2 - 2ab + b^2$.

(i) $(79)^2$

(ii) $(193)^2$

(iii) $(299)^2$

62. Find the following squares using one of the above identities. Determine which of these identities will make these calculations easier.

(i) 117^2

(ii) 78^2

63. Find the following squares using one of the above identities. Determine which of these identities will make these calculations easier.

(i) 198^2

(ii) 214^2

64. Find the following squares using one of the above identities. Determine which of these identities will make these calculations easier.

(i) 1104^2

(ii) 1120^2

65. Factor using suitable identities:

$$9a^2 + 4b^2 + c^2 - 12ab + 6ac - 4bc$$

66. Fill in the blanks to complete the following identities:

(i) $10x^2 - 11x - 6 = (2x - \underline{\hspace{1cm}})(\underline{\hspace{1cm}} + 2)$

(ii) $6x^2 + 7x + 2 = (\underline{\hspace{2cm}})(\underline{\hspace{2cm}})$

67. Select and use the identity that will help you to find the following products without multiplying directly:

(i) $(41)^2$

(ii) $(27)^2$

68. Select and use the identity that will help you to find the following products without multiplying directly:

(i) (23×17)

(ii) $(135)^2$

69. Select and use the identity that will help you to find the following products without multiplying directly:

(i) $(97)^2$

(ii) (18×29)

70. Select and use the identity that will help you to find the following products without multiplying directly:

(i) (34×43)

(ii) $(205)^2$

71. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{3p^2 - 3pq - 18q^2}{p^2 + 3pq - 10q^2}$$

72. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{n^3 - 3n^2m + 3nm^2 - m^3}{5m^2 - 10mn + 5n^2}$$

73. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{4y^2 - 20yz + 25z^2}{(25z^2 - 4y^2)}$$

74. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{(x^2 + x - 6)(x^2 - 7x + 12)}{(x^2 - 6x + 8)(x^2 - 9)}$$

75. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{p^4 - 16}{p^2 - 4p + 4}$$

76. Use suitable identity to find the following product:

$$\left(\frac{7}{2}k - \frac{2}{3}m\right)^3$$

77. Find the value using suitable identity:

$$(-107)^3$$

78. Find the value using suitable identity:

$$(-299)^3$$

79. Factor the following algebraic expression:

$$9x^3 - \frac{8}{3}y^3 + \frac{z^3}{3} + 6xyz$$

80. Simplify the following:

$$\frac{4x^2+4x+1}{4x^2-1}$$

81. Simplify the following:

$$\frac{9(3a^3-24b^3)}{9a^2-36b^2}$$

82. Simplify the following:

$$\frac{s^3+125t^3}{s^2-2st-35t^2}$$

83. Find possible expressions for the length and breadth of each of the following rectangles whose areas are given by the following expressions in square units.

(i) $25a^2 - 30ab + 9b^2$

(ii) $36s^2 - 49t^2$

84. Find possible expressions for the length, breadth, and heights of each of the following cuboids whose volumes are given by the following expressions in cubic units.

(i) $6a^2 - 24b^2$

(ii) $3ps^2 - 15ps + 12p$

85. The village playground is shaped as a square of side 40 metres. A path of width s metres is created around the playground for people to walk. Find an expression for the area of the path in terms of s .

86. If a number plus its reciprocal equals $\frac{10}{3}$, find the number.

87. A rectangular pool has area $2x^2 + 7x + 3$ square hastas. If its width is $2x + 1$ hastas, find its length. Hasta was a unit used to measure length.

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

89. Find the value of

$$x^3 + y^3 - 12xy + 64, \text{ when } x + y = -4$$

*** Questions with calculation. [4 Marks Each]**

[36]

90. Factor completely:

(i) $9x^2 + 24xy + 16y^2$

(ii) $4s^2 + 20st + 25t^2$

91. Factor completely:

(i) $49x^2 + 28xy + 4y^2$

(ii) $64p^2 + \frac{32}{3}pq + \frac{4}{9}q^2$

92. Factor completely:

(i) $3a^2 + 4ab + \frac{4}{3}b^2$

(ii) $\frac{9}{5}s^2 + 6sv + 5v^2$

93. Factor using suitable identities:

$$\frac{m^2}{9} + \frac{mk}{3} + \frac{k^2}{4} + 3nk + 2mn + 9n^2$$

94. Expand the following using the identity $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$:

(i) $(p + 3q + 7r)^2$

(ii) $(3x - 2y + 4z)^2$

95. Fill in the blanks to complete the following identities:

(i) $s^2 - 11s + 24 = 0$ () ()

(ii) () $(x + 1) = (3x^2 - 4x - 7)$

96. Simplify the following rational expression assuming that the expression in the denominator are not equal to zero:

$$\frac{w^3 - v^3 + x^3 + 3wvx}{w^2 + v^2 + x^2 - 2wv - 2vx + 2wx}$$

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

98. By factoring the expression, check that $n^3 - n$ is always divisible by 6 for all natural numbers n . Give reasons.

*** Answer the following questions. [5 Marks Each]**

[10]

99. Is this an identity?

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

100. Find the value of

$$x^3 - 8y^3 - 36xy - 216, \text{ when } x = 2y + 6$$
