

Factorization

QUESTIONS

1. The factors of $(1 - 6z + 9z^2)$ are
(a) $(1 + 3z)(1 - 3z)$ (b) $(z + 3)^2$ (c) $(3z - 1)^2$ (d) $(z - 3)^2$
2. Factorize $a^3 - 2\sqrt{2}b^3$ is
(a) $(a + \sqrt{2}b)(a^2 - \sqrt{2}ab + 2b^2)$ (b) $(a - \sqrt{2}b)(a^2 + \sqrt{2}ab + 2b^2)$
(c) $(a - \sqrt{2}b)(a^2 - \sqrt{2}ab + 2b^2)$ (d) $(a - \sqrt{2}b)(a^2 + \sqrt{2}ab + b^2)$
3. Factorize $16x^2 - 25y^2$
(a) $(4x - 5y)^2$ (b) $(4x + 5y)^2$
(c) $\frac{4x + 5y}{4x - 5y}$ (d) $(4x + 5y)(4x - 5y)$
4. Factorize $36x^3y - 60x^2yz$
(a) $12x^2y(3x - 5z)$ (b) $12x^2y(3x + 5z)$
(c) $12x^2(5z - 3x)$ (d) $6x^2y(6x - 2z)$
5. Solve $(a + b)^2 - (a - b)^2$
(a) $2ab$ (b) $a^2 + b^2$
(c) $2a^2 + 2b^2$ (d) $4ab$
6. Which of the following is equal to $x^3(a - 2b) + x^2(a - 2b)$.
(a) $x^2(a - 2b)(x + 1)$ (b) $(x^2 - 1)(a - 2b)$
(c) $(x^2 + 1)(a - 2b)(x + 1)$ (d) $x(a - 2b)(x - 1)$
7. The factors of $x^2 + 2xy - 15y^2$ are
(a) $(x - 5y)(x - 3y)$ (b) $(x + 5y)(x + 3y)$
(c) $(x - 5y)(x + 3y)$ (d) $(x + 5y)(x - 3y)$
8. Factorization: $x^2 - 3x - 54$
(a) $(x - 9)(x - 6)$ (b) $(x - 9)(x + 6)$
(c) $(x + 9)(x + 6)$ (d) $(x - 4)(x + 3)$
9. Factorization: $6x^2 + 11x - 10$
(a) $(2x + 5)(3x - 2)$ (b) $(2x + 5)(2x + 2)$
(c) $(2x + 5)$ (d) $(2x + 2)(x - 2)$

10. Factorization: $2x^2 + 5x - 3$

(a) $(x + 3)(2x + 1)$

(b) $(x - 3)(2x - 1)$

(c) $(x + 2)(x - 1)$

(d) $(x + 3)(2x - 1)$

11. Factorization: $7 - 12x - 4x^2$

(a) $(1 - 2x)(7 + 2x)$

(b) $(1 - 2x)(7 - 2x)$

(c) $(1 - x)(7 + x)$

(d) $(1 + 2x)(4 + x)$

12. Factorization: $1 - 18z - 63z^2$

(a) $(3 - 21z)(1 + 3z)$

(b) $(1 - 21z)(1 + 3z)$

(c) $(2 + 21z)(1 + 3z)$

(d) $(1 - 7z)(1 + 2z)$

13. Factorization: $x^2 - 17x - 84$

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

(b) $(x - 21)(x + 4)$

(c) $(x - 21)(x - 4)$

(d) $(x + 21)(x + 4)$

14. Factorization: $3x^2 - 4x - 7$

(a) $(3x + 7)(x + 1)$

(b) $(3x - 7)(x - 1)$

(c) $(3x - 7)(x + 1)$

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

15. Factorization: $2x^2 - 7x - 30$

(a) $(2x + 5)(x - 6)$

(b) $(2x + 5)(x + 6)$

(c) $(2x - 5)(x - 6)$

(d) $(2x + 2)(x - 3)$

16. Factorization: $10 + 3x - x^2$

(a) $(2 + x)(5 - x)$

(b) $(2 + x)(5 + x)$

(c) $(2 + x)(3 - x)$

(d) $(2 + 3x)(2 - x)$

17. Factorization: $x^2 - 3ax - 88a^2$

(a) $(x - 11a)(x - 8a)$

(b) $(x - 11a)(x + 8a)$

(c) $(x + 11a)(x + 8a)$

(d) $(x - 9a)(x + 4a)$

18. Factorization: $2x^3 + 5x - 12xy^2$

(a) $x(x + 2y)(2x + 3y)$

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

(c) $x(x - 4y)(2x - 3y)$

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

19. Factorization: $x^2y^2 - 12xy - 45$

(a) $(xy - 15)(xy + 3)$

(b) $(xy + 15)(xy + 3)$

(c) $(xy - 15)(xy - 3)$

(d) $(x - 15)(y + 3)$

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

(a) 1

(b) 2

(c) 3

(d) 4

21. The zero of $x + 2$ is

(a) 0

(b) 2

(c) -2

(d) 1

22. The expanded form of $(x + y)(x - y)$ is a

(a) monomial

(b) binomial

(c) trinomial

(d) none of these

23. Find the degree of $(x^2 - x)^2$

(a) 3

(b) 4

(c) 5

(d) 6

24. If $a = 2, b = 1$ then $a^2 + b^2 + 2ab =$

(a) 9

(b) 4

(c) 2

(d) 1

25. $(x + a)(x - b)$ is given by

(a) $x^2 - (a + b)x + ab$

(b) $x^2 - (a - b)x + ab$

(c) $x^2 - (a - b)x + ab$

(d) $x^2 + (a - b)x - ab$

26. Factorize $x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x}$

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

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

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

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

27. Factorize the expression given by $18x^3y^3 - 27x^2y^3 + 36x^3y^2$

(a) $9x^2y^2(2xy - 3y + 4x)$

(b) $9x^2y^2(2xy + 3y + 4x)$

(c) $9x^2y^2(2xy + 3y - 4x)$

(d) $9x^2y^2(2xy - 3y - 4x)$

28. Factorize the given expression $mn(u^2 + v^2) - uv(m^2 + n^2)$

(a) $(un + vm)(um - vn)$

(b) $(un + vm)(um + vn)$

(c) $(un - vm)(um - vn)$

(d) $(un - vm)(um + vn)$

29. Factorize $(p + q)(2p + 5) - (p + q)(p + 3)$

(a) $(p - q)(p + 2)$

(b) $(p - q)(p - 2)$

(c) $(p - q)(p + 2)$

(d) $(p + q)(p + 2)$

30. The value of $(x - y)(x + y)\left(x^2 + y^2\right)\left\{\left(x^2 + y^2\right)^2 - 2x^2y^2\right\}$ is

(a) $x^8 - y^8$

(b) $x^8 + y^8$

(c) $x^6 - y^6$

(d) $x^6 + y^6$

ANSWER - KEY

1. (c)	2. (b)	3. (d)	4. (a)	5. (d)	6. (a)	7. (d)	8. (b)	9. (a)	10. (d)
11. (a)	12. (b)	13. (b)	14. (c)	15. (a)	16. (a)	17. (b)	18. (b)	19. (a)	20. (c)
21. (c)	22. (b)	23. (b)	24. (a)	25. (d)	26. (a)	27. (a)	28. (c)	29. (d)	30. (a)

Answers and Solutions

1. (c): $1 - 6z + 9z^2$ or $9z^2 - 6z + 1$

$$\text{or } (3z)^2 - 2 \times 3z \times 1 + (1)^2$$

$$\text{or } (3z - 1)^2.$$

2. (b): $a^3 - 3\sqrt{2}b^3$

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

Then use formula,

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

3. (d): $16x^2 - 25y^2$

$$= (4x)^2 - (5y)^2 = (4x + 5y)(4x - 5y).$$

4. (a): $36x^3y - 60x^2yz$

$$= 12x^2y[3x - 5z].$$

5. (d): $(a + b)^2 - (a - b)^2 = (a + b + a - b)(a + b - a + b) = 2a \times 2b = 4ab.$

6. (a): $x^3(a - 2b) + x^2(a - 2b) = x^2(a - 2b)[x + 1]$

7. (d): $x^2 + 2xy - 5y^2$

Considered it as a quadratic in x,

$$\text{Then roots} = \frac{-2y \pm \sqrt{4y^2 - 4 \times 1 \times (-15y^2)}}{2}$$

$$= \frac{-2y \pm \sqrt{64y^2}}{2}$$

$$= \frac{-2y \pm 8y}{2} = -5y \text{ or } 3y$$

$$\Rightarrow (x - 3y)(x + 5y).$$

8. (b): $x^2 - 3x - 54$

$$\begin{aligned}\text{Roots} &= \frac{3 \pm \sqrt{9 - 4 \times -54}}{2} \\ &= \frac{3 \pm \sqrt{225}}{2} \\ &= \frac{3 \pm 15}{2} = 9 \text{ or } -6\end{aligned}$$

9. (a): $6x^2 + 11x - 10$

$$\begin{aligned}&= \frac{-11 \pm \sqrt{121 - 4 \times 6 \times (-10)}}{2 \times 6} \\ &= \frac{-11 \pm \sqrt{121 + 240}}{12} \\ &= \frac{-11 \pm 19}{12} = \frac{8}{12} \text{ or } \frac{-30}{12} \\ &= 2/3 \text{ or } -\frac{5}{2} \\ \therefore \left(x - \frac{2}{3}\right)\left(x + \frac{5}{2}\right) &= 0 \\ \text{Or } (3x - 2)(2x + 5) &= 0\end{aligned}$$

10. (d): $2x^2 - 5x + 3$

Using same process as in Q9,

$$\begin{aligned}\text{Roots} &= -3 \text{ and } \frac{1}{2}, \\ \therefore (x + 3)\left(x - \frac{1}{2}\right) &= 0 \\ \text{or } (x + 3)(2x - 1) &= 0.\end{aligned}$$

- 11.** (a): Use same process as in Q9.
- 12.** (b): Use same process as in Q9.
- 13.** (b): Use same process as in Q9.
- 14.** (c): Use same process as in Q9.
- 15.** (a): Use same process as in Q9.
- 16.** (a): Use same process as in Q9.
- 17.** (b): Use same process as in Q9.
- 18.** (b): Here x has to be taken as common factor

$$= x[2x^2 + 5xy - 12y^2]$$

$$= 2 \times x^2 + (5y) \times x - 12y^2 \text{ is of the form}$$

$$ax^2 + bx + c$$

Now, use same techniques as in Q9.

19. (a): $x^2y^2 - 12xy + 45$

Here xy is a combined entity which we can call $m = xy$.

$$\Rightarrow m^2 - 12m + 45$$

$$= (m - 15)(m + 3)$$

Now, put back $m = xy$.

20. (c): Degree of a polynomial is degree of highest term

$$\text{Highest term} = -3x^3.$$

Power of 'x' variable in highest term is 3 (as it is x^3).

21. (c): zero means root

$$x + 2 = 0$$

$$\Rightarrow x = -2.$$

22. (b): $(x + y)(x - y)$

$$x^2 - y^2 = A \text{ binomial.}$$

23. (b): $(x^2 - x)^2$

By physical inspection and mental calculation, we can see that highest term will be

$$= x^4 = 4 \Rightarrow \text{degree} = 4,$$

ALITER, by actual calculation

$$(x^2 - x)^2 = [x(x - 1)]^2$$

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

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

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

So we get, $\rightarrow x^4$ as highest term $\Rightarrow \text{Degree} = 4$.

- 24.** (a): Just put the value of 'a' & 'b'

Or

$$\text{Write } a^2 + b^2 + 2ab = (a + b)^2$$

Now put $a = 2, b = 1$

$$= (2 + 1)^2 = 9.$$

- 25.** (d): Multiply $(x + a)(x - b)$ term by term

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

$$= x^2 + ax - bx - ab$$

$$= x^2 + (a - b)x - ab.$$

- 26.** (a): $x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x}$ (identify the square term.)

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

$$= \left[x + \frac{1}{x}\right] \left[x + \frac{1}{x} - 2\right]$$

- 27.** (a): Inspection shows that $9x^2y^2$ is common factor:

$$9x^2y^2 \{2xy - 3y + 4x\}$$

Further factors are not possible.

- 28.** (c): $mn(u^2 - v^2) - uv(m^2 + n^2)$

$$= u^2mn + v^2mn$$

$$= -uvm^2 - uvn^2$$

$$= un(um - vn) + vm(vn - um)$$

$$= un(um - vn) - vm(um - un)$$

$$= (un - vm)(um - vn).$$

- 29.** (d): Taking $(p + q)$ factors as common,

$$(p + q)\{2p + 5 - (p + 3)\}$$

$$= (p + q)\{p + 2\}.$$

30. **(a):** $(x-y)(x+y)(x^2+y^2)\{(x^2+y^2)-2x^2y^2\}$ Combining from left in bunches of two factors each,

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

$$\text{Then } (x^2 - y^2)(x^2 + y^2) = x^4 - y^4$$

$$\text{Then, } (x^4 - y^4)(x^4 + y^4) = x^8 - y^8$$

$$\left[\text{since } \{(x^2 + y^2)^2 - 2x^2y^2\} = x^4 + y^4 \right].$$