

## Factorization

## MCQ Test, Set 03

Time: 30 minutes

Maximum marks: 25

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

- There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
- Each correct answer carries 1 mark. There is no negative marking.
- The key sheet and worked solutions are at the end of this test.

1. The factors of  $16 - 81m^4$  are

A.  $(2 + 3m)(2 - 3m)(4 + 9m^2)$

B.  $(-3m + 2)(-9m^2 + 4)(3m + 2)$

C.  $(3m + 2)^2(9m^2 + 4)$

D.  $(-3m + 2)^2(9m^2 + 4)$

2. Factorize  $25m^2 + 70mp + 49p^2$ .

A.  $(5m - 7p)^2$

B.  $(7m + 5p)^2$

C.  $(5m + 7p)^2$

D.  $(5m + 7p)(5m - 7p)$

3. The factors of  $36p^2 - 12p + 1$  are

A.  $(6p + 1)(6p - 1)$

B.  $(6p + 1)^2$

C.  $(p - 6)^2$

D.  $(6p - 1)^2$

4.  $m^2 - 14mp + 49p^2 =$ 

A.  $(7m - p)^2$

B.  $(m - 7p)^2$

C.  $(m + 7p)(m - 7p)$

D.  $(m + 7p)^2$

5. The factors of  $4m^2 - 20m + 25 - 16n^2$  are

A.  $(2m + 5 - 4n)(2m - 5 + 4n)$

B.  $(2m - 5 + 4n)(2m - 5 - 4n)$

C.  $(2m + 5 + 4n)(2m + 5 - 4n)$

D.  $(2m - 5 - 4n)^2$

6. To factorize  $5p^2 + 14p + 9$  by splitting the middle term, we need two numbers whose product is  $5 \times 9$  and whose sum is 14. They are

A.  $-5$  and  $-9$

B.  $1$  and  $45$

C.  $5$  and  $9$

D.  $3$  and  $15$

7.  $4n^2 - 29n + 30 =$ 

A.  $(4n - 6)(n - 5)$

B.  $(4n - 5)(n - 6)$

C.  $(4n + 5)(n - 6)$

D.  $(4n + 5)(n + 6)$

8.  $10x^2 + 19x - 15 =$ 

A.  $(2x - 5)(5x - 3)$

B.  $(2x - 3)(5x + 5)$

C.  $(2x + 5)(5x - 3)$

D.  $(2x - 5)(5x + 3)$

9.  $11x^2 + 85x + 114 =$ 

A.  $(11x + 19)(x + 6)$

B.  $(11x - 19)(x - 6)$

C.  $(11x - 19)(x + 6)$

D.  $(11x + 6)(x + 19)$

10. On factorizing,  $11n^2 + 73n + 116 =$ 

A.  $(11n + 29)(n + 4)$

B.  $(11n - 29)(n - 4)$

C.  $(11n - 29)(n + 4)$

D.  $(11n + 4)(n + 29)$

11. On factorizing,  $-7n + 72 - 2n^2 =$   
**A.**  $(2n - 9)(n + 8)$       **B.**  $(9 - 2n)(n + 8)$       **C.**  $(8 - n)(9 - 2n)$       **D.**  $(2n + 9)(n - 8)$
- 
12. On factorizing,  $2(x + 3z)^2 - (x + 3z) - 10 =$   
**A.**  $(2x + 6z + 5)(x + 3z - 2)$       **B.**  $(2x + 6z - 5)(x + 3z - 2)$   
**C.**  $(2x + 6z + 5)(x + 3z + 2)$       **D.**  $(2x + 6z - 5)(x + 3z + 2)$
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13. To factorize  $5p^2 - 29pq - 6q^2$  by splitting the middle term, we need two numbers whose product is  $5 \times (-6)$  and whose sum is  $-29$ . They are  
**A.**  $-15$  and  $2$       **B.**  $-10$  and  $3$       **C.**  $1$  and  $-30$       **D.**  $-1$  and  $30$
- 
14. Factorize  $3\sqrt{7}t^2 - 122t - 24\sqrt{7}$ .  
**A.**  $(3\sqrt{7}t + 4)(t - 6\sqrt{7})$       **B.**  $(3\sqrt{7}t - 4)(t - 6\sqrt{7})$   
**C.**  $(3\sqrt{7}t - 4)(t + 6\sqrt{7})$       **D.**  $(3\sqrt{7}t + 4)(t + 6\sqrt{7})$
- 
15. Factorize  $15t^2 + 4t + \frac{4}{15}$ .  
**A.**  $(15t + 2)(t + 2)$       **B.**  $(15t - 2)(t - \frac{2}{15})$   
**C.**  $(15t - 2)(t + \frac{2}{15})$       **D.**  $(15t + 2)(t + \frac{2}{15})$
- 
16.  $6(a + 2)^2 + (a + 2)(c + 1) - (c + 1)^2 =$   
**A.**  $(2a + c - 5)(3a - c + 5)$       **B.**  $(2a + c + 3)(3a - c + 3)$       **C.**  $(2a + c + 5)(3a - c + 5)$       **D.**  $(2a + c + 5)(3a - c - 5)$
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17.  $9a^2 + 16b^2 + 16c^2 - 24ab - 32bc + 24ca =$   
**A.**  $(3a - 4b + 4c)^2$       **B.**  $(3a + 4b + 4c)^2$       **C.**  $(9a - 16b + 16c)^2$       **D.**  $(3a + 4b - 4c)^2$
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18. On factorizing,  $27y^3 - 108y^2z + 144yz^2 - 64z^3 =$   
**A.**  $(3y + 4z)(3y - 4z)^2$       **B.**  $(3y - 4z)^3$   
**C.**  $(3y - 4z)(9y^2 + 12yz + 16z^2)$       **D.**  $(3y + 4z)^3$
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19. On factorizing,  $x^3 + 9x^2z + 27xz^2 - 37z^3 =$   
**A.**  $(x - z)(x^2 + 6xz + 25z^2)$       **B.**  $(x + 7z)(x^2 + 2xz + 13z^2)$   
**C.**  $(x - z)(x^2 + 10xz + 37z^2)$       **D.**  $(x - z)(x^2 + 2xz + 13z^2)$
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20. Factorize  $64m^3 + 27n^3$ .  
**A.**  $(16m^2 - 24mn + 9n^2)(4m + 3n)$       **B.**  $(16m^2 + 12mn + 9n^2)(4m + 3n)$   
**C.**  $(16m^2 + 12mn + 9n^2)(4m - 3n)$       **D.**  $(16m^2 - 12mn + 9n^2)(4m + 3n)$
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21. The factors of  $x^3 - 57x - 56$  are  
**A.**  $(x + 7)(x - 1)(x - 8)$       **B.**  $(x + 1)(x + 8)(x - 7)$       **C.**  $(x + 8)(x - 1)(x - 7)$       **D.**  $(x + 1)(x + 7)(x - 8)$
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22. The factors of  $m^4 + 25m^2 + 625$  are  
**A.**  $(m^2 + 25)^2$       **B.**  $(m^2 + 10m + 25)(m^2 - 10m + 25)$   
**C.**  $(m^2 + 5m + 25)(m^2 - 5m + 25)$       **D.**  $(m^2 + 5m - 25)(m^2 - 5m - 25)$
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**23.** The factors of  $(2p - q)^3 + (q - 3r)^3 + (3r - 2p)^3$  are

**A.**  $3(2p - q)(q - 3r)(3r - 2p)$

**B.**  $-3(2p - q)(q - 3r)(3r - 2p)$

**C.** 0

**D.**  $(2p - q)(q - 3r)(3r - 2p)$

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**24.** The factors of  $81m - m^5$  are

**A.**  $m(3 - m)^2(m + 3)^2$

**B.**  $m(3 - m)^2(m^2 + 9)$

**C.**  $m(m + 3)^2(m^2 + 9)$

**D.**  $m(3 - m)(m + 3)(m^2 + 9)$

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**25.** Factorize  $20y^2 + (4y^2 + 9)y + 45$ .

**A.**  $(4y^2 + 5)(y + 9)$

**B.**  $(4y^2 + 9)(y + 5)$

**C.**  $(4y^2 + 9)(y - 5)$

**D.**  $(4y^2 - 9)(y + 5)$

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## Key sheet

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|              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|
| <b>1. A</b>  | <b>2. C</b>  | <b>3. D</b>  | <b>4. B</b>  | <b>5. B</b>  |
| <b>6. C</b>  | <b>7. B</b>  | <b>8. C</b>  | <b>9. A</b>  | <b>10. A</b> |
| <b>11. B</b> | <b>12. D</b> | <b>13. C</b> | <b>14. A</b> | <b>15. D</b> |
| <b>16. C</b> | <b>17. A</b> | <b>18. B</b> | <b>19. C</b> | <b>20. D</b> |
| <b>21. D</b> | <b>22. C</b> | <b>23. A</b> | <b>24. D</b> | <b>25. B</b> |

## Solutions

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1. The factors of  $16 - 81m^4$  are

$$\begin{aligned}16 - 81m^4 &= 4^2 - (9m^2)^2 \\&= (4 + 9m^2)(4 - 9m^2) \\&= (4 + 9m^2)[2^2 - (3m)^2] \\&= (4 + 9m^2)(2 + 3m)(2 - 3m)\end{aligned}$$

**Ans: (A)**  $(2 + 3m)(2 - 3m)(4 + 9m^2)$

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2. Factorize  $25m^2 + 70mp + 49p^2$ .

$$\begin{aligned}25m^2 + 70mp + 49p^2 &= (5m)^2 + (7p)^2 + 2(5m)(7p) \\&= (5m + 7p)^2 \\&= (5m + 7p)(5m + 7p) \\&\text{using } a^2 + b^2 + 2ab = (a + b)^2\end{aligned}$$

**Ans: (C)**  $(5m + 7p)^2$

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3. The factors of  $36p^2 - 12p + 1$  are

$$\begin{aligned}36p^2 - 12p + 1 &= (6p)^2 + 1^2 - 2(6p)(1) \\&= (6p - 1)^2 \\&= (6p - 1)(6p - 1) \\&\text{using } a^2 + b^2 - 2ab = (a - b)^2\end{aligned}$$

**Ans: (D)**  $(6p - 1)^2$

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4.  $m^2 - 14mp + 49p^2 =$

$$\begin{aligned}m^2 - 14mp + 49p^2 &= m^2 + (7p)^2 - 2(m)(7p) \\&= (m - 7p)^2 \\&= (m - 7p)(m - 7p) \\&\text{using } a^2 + b^2 - 2ab = (a - b)^2\end{aligned}$$

**Ans: (B)**  $(m - 7p)^2$

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5. The factors of  $4m^2 - 20m + 25 - 16n^2$  are

$$\begin{aligned}4m^2 - 20m + 25 - 16n^2 &= (2m - 5)^2 - (4n)^2 \\&= (2m - 5 + 4n)(2m - 5 - 4n) \\&\text{using } a^2 - 2ab + b^2 = (a - b)^2 \text{ and } a^2 - b^2 = (a + b)(a - b)\end{aligned}$$

**Ans: (B)**  $(2m - 5 + 4n)(2m - 5 - 4n)$

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6. To factorize  $5p^2 + 14p + 9$  by splitting the middle term, we need two numbers whose product is  $5 \times 9$  and whose sum is 14. They are

$$\begin{aligned}5 \times 9 &= 45 \\5 \times 9 &= 45 \text{ and } 5 + 9 = 14 \\&\text{So the numbers are 5 and 9.}\end{aligned}$$

**Ans: (C)** 5 and 9

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7.  $4n^2 - 29n + 30 =$

$$\begin{aligned} 4 \times 30 &= 120: (-5) \times (-24) = 120 \text{ and } -5 - 24 = -29 \\ &= 4n^2 - 5n - 24n + 30 \\ &= n(4n - 5) - 6(4n - 5) \\ &= (4n - 5)(n - 6) \end{aligned}$$

**Ans: (B)**  $(4n - 5)(n - 6)$

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8.  $10x^2 + 19x - 15 =$

$$\begin{aligned} 10 \times (-15) &= -150: (-6) \times 25 = -150 \text{ and } -6 + 25 = 19 \\ &= 10x^2 - 6x + 25x - 15 \\ &= 2x(5x - 3) + 5(5x - 3) \\ &= (5x - 3)(2x + 5) \end{aligned}$$

**Ans: (C)**  $(2x + 5)(5x - 3)$

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9.  $11x^2 + 85x + 114 =$

$$\begin{aligned} 11 \times 114 &= 1254 \\ 1254 &= 2 \times 3 \times 11 \times 19 = 19 \times 66, \text{ and } 19 + 66 = 85 \\ &= 11x^2 + 19x + 66x + 114 \\ &= x(11x + 19) + 6(11x + 19) \\ &= (11x + 19)(x + 6) \end{aligned}$$

**Ans: (A)**  $(11x + 19)(x + 6)$

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10. On factorizing,  $11n^2 + 73n + 116 =$

$$\begin{aligned} 11 \times 116 &= 1276 \\ 1276 &= 2 \times 2 \times 11 \times 29 = 29 \times 44, \text{ and } 29 + 44 = 73 \\ &= 11n^2 + 29n + 44n + 116 \\ &= n(11n + 29) + 4(11n + 29) \\ &= (11n + 29)(n + 4) \end{aligned}$$

**Ans: (A)**  $(11n + 29)(n + 4)$

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11. On factorizing,  $-7n + 72 - 2n^2 =$

$$\begin{aligned} \text{Writing the terms in order: } &-2n^2 - 7n + 72 \\ (-2) \times 72 &= -144: (-16) \times 9 = -144 \text{ and } -16 + 9 = -7 \\ &= -2n^2 - 16n + 9n + 72 \\ &= -2n(n + 8) + 9(n + 8) \\ &= (n + 8)(9 - 2n) \end{aligned}$$

**Ans: (B)**  $(9 - 2n)(n + 8)$

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12. On factorizing,  $2(x + 3z)^2 - (x + 3z) - 10 =$

Let  $x + 3z = p$

$$2(x + 3z)^2 - (x + 3z) - 10 = 2p^2 - p - 10$$

$$2 \times (-10) = -20; 4 \times (-5) = -20 \text{ and } 4 - 5 = -1$$

$$= 2p^2 + 4p - 5p - 10$$

$$= 2p(p + 2) - 5(p + 2)$$

$$= (p + 2)(2p - 5)$$

$$= [(x + 3z) + 2][2(x + 3z) - 5]$$

$$= (x + 3z + 2)(2x + 6z - 5)$$

Ans: (D)  $(2x + 6z - 5)(x + 3z + 2)$

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13. To factorize  $5p^2 - 29pq - 6q^2$  by splitting the middle term, we need two numbers whose product is  $5 \times (-6)$  and whose sum is  $-29$ . They are

$$5 \times (-6) = -30$$

$$1 \times (-30) = -30 \text{ and } 1 - 30 = -29$$

So the numbers are 1 and  $-30$ .

Ans: (C) 1 and  $-30$

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14. Factorize  $3\sqrt{7}t^2 - 122t - 24\sqrt{7}$ .

$$3\sqrt{7} \times (-24\sqrt{7}) = 3 \times (-24) \times 7 = -504; 4 \times (-126) = -504 \text{ and } 4 - 126 = -122$$

$$= 3\sqrt{7}t^2 + 4t - 126t - 24\sqrt{7}$$

$$= t(3\sqrt{7}t + 4) - 6\sqrt{7}(3\sqrt{7}t + 4)$$

$$= (3\sqrt{7}t + 4)(t - 6\sqrt{7})$$

Ans: (A)  $(3\sqrt{7}t + 4)(t - 6\sqrt{7})$

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15. Factorize  $15t^2 + 4t + \frac{4}{15}$ .

$$15t^2 + 4t + \frac{4}{15} = \frac{225t^2 + 60t + 4}{15}$$

$$= \frac{1}{15}(225t^2 + 60t + 4)$$

$$= \frac{1}{15}[(15t)^2 + 2^2 + 2(15t)(2)]$$

$$= \frac{1}{15}(15t + 2)^2$$

$$= \left(t + \frac{2}{15}\right)(15t + 2)$$

Ans: (D)  $(15t + 2)\left(t + \frac{2}{15}\right)$

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16.  $6(a+2)^2 + (a+2)(c+1) - (c+1)^2 =$

Let  $a+2 = x$  and  $c+1 = y$

$$6(a+2)^2 + (a+2)(c+1) - (c+1)^2 = 6x^2 + xy - y^2$$

$$6 \times (-1) = -6; (-2) \times 3 = -6 \text{ and } -2 + 3 = 1$$

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

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

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

$$= [3(a+2) - (c+1)][2(a+2) + (c+1)]$$

$$= (3a + 6 - c - 1)(2a + 4 + c + 1)$$

$$= (3a - c + 5)(2a + c + 5)$$

Ans: (C)  $(2a + c + 5)(3a - c + 5)$

17.  $9a^2 + 16b^2 + 16c^2 - 24ab - 32bc + 24ca =$

$$9a^2 + 16b^2 + 16c^2 - 24ab - 32bc + 24ca = (3a)^2 + (4b)^2 + (4c)^2 - 2(3a)(4b) - 2(4b)(4c) + 2(4c)(3a)$$

$$= (3a - 4b + 4c)^2$$

$$\text{using } a^2 + b^2 + c^2 - 2ab - 2bc + 2ca = (a - b + c)^2$$

Ans: (A)  $(3a - 4b + 4c)^2$

18. On factorizing,  $27y^3 - 108y^2z + 144yz^2 - 64z^3 =$

$$27y^3 - 108y^2z + 144yz^2 - 64z^3 = (3y)^3 - (4z)^3 - 3(3y)^2(4z) + 3(3y)(4z)^2$$

$$= (3y - 4z)^3$$

$$\text{using } (a - b)^3 = a^3 - b^3 - 3ab(a - b)$$

Ans: (B)  $(3y - 4z)^3$

19. On factorizing,  $x^3 + 9x^2z + 27xz^2 - 37z^3 =$

$$x^3 + 9x^2z + 27xz^2 - 37z^3 = x^3 + 3(x)^2(3z) + 3(x)(3z)^2 + (3z)^3 - 64z^3$$

$$= (x + 3z)^3 - (4z)^3$$

$$= (x + 3z - 4z)[(x + 3z)^2 + (x + 3z)(4z) + (4z)^2]$$

$$= (x - z)[x^2 + 6xz + 9z^2 + 4xz + 12z^2 + 16z^2]$$

$$= (x - z)(x^2 + 10xz + 37z^2)$$

$$\text{using } a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Ans: (C)  $(x - z)(x^2 + 10xz + 37z^2)$

20. Factorize  $64m^3 + 27n^3$ .

$$64m^3 + 27n^3 = (4m)^3 + (3n)^3$$

$$= (4m + 3n)[(4m)^2 - (4m)(3n) + (3n)^2]$$

$$= (4m + 3n)(16m^2 - 12mn + 9n^2)$$

$$\text{using } a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

Ans: (D)  $(16m^2 - 12mn + 9n^2)(4m + 3n)$

**21.** The factors of  $x^3 - 57x - 56$  are

$$\begin{aligned}x^3 - 57x - 56 &= x^3 - x - 56x - 56 \\&= x(x^2 - 1) - 56(x + 1) \\&= x(x + 1)(x - 1) - 56(x + 1) \\&= (x + 1)[x(x - 1) - 56] \\&= (x + 1)(x^2 - x - 56)\end{aligned}$$

Now  $x^2 - x - 56$ :  $7 \times (-8) = -56$  and  $7 - 8 = -1$

$$\begin{aligned}x^2 - x - 56 &= x^2 + 7x - 8x - 56 \\&= x(x + 7) - 8(x + 7) \\&= (x + 7)(x - 8)\end{aligned}$$

So  $x^3 - 57x - 56 = (x + 1)(x + 7)(x - 8)$

**Ans: (D)**  $(x + 1)(x + 7)(x - 8)$

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**22.** The factors of  $m^4 + 25m^2 + 625$  are

$$\begin{aligned}m^4 + 25m^2 + 625 &= (m^2)^2 + 2(m^2)(25) + 25^2 - 25m^2 \\&= (m^2 + 25)^2 - (5m)^2 \\&= (m^2 + 25 + 5m)(m^2 + 25 - 5m) \\&= (m^2 + 5m + 25)(m^2 - 5m + 25)\end{aligned}$$

**Ans: (C)**  $(m^2 + 5m + 25)(m^2 - 5m + 25)$

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**23.** The factors of  $(2p - q)^3 + (q - 3r)^3 + (3r - 2p)^3$  are

Here  $(2p - q) + (q - 3r) + (3r - 2p) = 0$

If  $a + b + c = 0$ , then  $a^3 + b^3 + c^3 = 3abc$

$$\therefore (2p - q)^3 + (q - 3r)^3 + (3r - 2p)^3 = 3(2p - q)(q - 3r)(3r - 2p)$$

**Ans: (A)**  $3(2p - q)(q - 3r)(3r - 2p)$

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**24.** The factors of  $81m - m^5$  are

$$\begin{aligned}81m - m^5 &= m(81 - m^4) \\&= m[9^2 - (m^2)^2] \\&= m(m^2 + 9)(9 - m^2) \\&= m(m^2 + 9)[3^2 - m^2] \\&= m(m^2 + 9)(m + 3)(3 - m)\end{aligned}$$

**Ans: (D)**  $m(3 - m)(m + 3)(m^2 + 9)$

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**25.** Factorize  $20y^2 + (4y^2 + 9)y + 45$ .

$$\begin{aligned}20y^2 + (4y^2 + 9)y + 45 &= 20y^2 + 4y^3 + 9y + 45 \\&= 4y^3 + 20y^2 + 9y + 45 \\&= 4y^2(y + 5) + 9(y + 5) \\&= (y + 5)(4y^2 + 9)\end{aligned}$$

**Ans: (B)**  $(4y^2 + 9)(y + 5)$

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