Conceptual Multiple Choice Questions: Roots of Unity and Polynomials (Exercise 4.4)

Class 11 Mathematics (Chapter 4)

Prepared by ExpertGuy

MCQs

1. The cube roots of unity are:

(a) $1, \omega, \omega^2$

(b) $1, -1, i$

(c) $1, i, -i$

(d) $0, \omega, \omega^2$

2. The sum of cube roots of unity is:

(a) 0

(b) 1

(c) -1

(d) ω

3. The product of cube roots of unity is:

(a) 1

(b) -1

(c) 0

(d) ω

4. If ω is a cube root of unity, then $\omega^4 =$:

(a) ω

(b) ω^2

(c) 1

(d) -1

5. The cube roots of 8 are:

(a) $2, 2\omega, 2\omega^2$

(b) $2, -2, 2i$

(c) $1, \omega, \omega^2$

(d) $2, 2i, -2i$

6. The cube roots of -27 are:

(a) $-3, -3\omega, -3\omega^2$

(b) $-3, 3\omega, 3\omega^2$

(c) $-1, \omega, \omega^2$

(d) $-3, 3i, -3i$

7. The value of $\omega^{28} + \omega^{29} + 1$ is:

(a) 0

(b) 1

(c) ω

(d) -1

8. The value of $(1 + \omega - \omega^2)^8$ is:

(a) 256ω

(b) 256

(c) -256

(d) $256\omega^2$

9. The fourth roots of unity are:

(a) $1, -1, i, -i$

(b) $1, \omega, \omega^2, \omega^3$

(c) $1, -1, \omega, \omega^2$

(d) $0, 1, i, -i$

10. The product of fourth roots of unity is:

(a) -1

(b) 1

(c) 0

(d) i

11. The fourth roots of 16 are:

(a) $2, -2, 2i, -2i$

(b) $2, -2, \omega, \omega^2$

(c) $1, -1, i, -i$

(d) $2, 2\omega, 2\omega^2, 2\omega^3$

12. The fourth roots of 81 are:

(a) $3, -3, 3i, -3i$

(b) $3, -3, \omega, \omega^2$

(c) $1, -1, i, -i$

(d) $3, 3\omega, 3\omega^2, 3\omega^3$

13. The solution set of $2x^4 - 32 = 0$ is:

(a) $\{\pm 2, \pm 2i\}$
(b) $\{\pm 4, \pm 4i\}$
(c) $\{\pm 2, \pm i\}$
(d) $\{0, \pm 2\}$

14. The solution set of $3y^5 - 243y = 0$ is:

(a) $\{0, \pm 3, \pm 3i\}$
(b) $\{0, \pm 3, \pm i\}$
(c) $\{\pm 3, \pm 3i\}$
(d) $\{0, \pm 9, \pm 9i\}$

15. The solution set of $x^3 + x^2 + x + 1 = 0$ is:

(a) $\{-1, \pm i\}$
(b) $\{1, \pm i\}$
(c) $\{-1, \omega, \omega^2\}$
(d) $\{0, \pm i\}$

16. If ω is a cube root of unity, the equation with roots $2\omega, 2\omega^2$ is:

(a) $x^2 + 2x + 4 = 0$
(b) $x^2 - 2x + 4 = 0$
(c) $x^2 + x + 1 = 0$
(d) $x^2 - x + 1 = 0$

17. The complex cube roots of -1 are:

(a) $\frac{1 \pm i\sqrt{3}}{2}$
(b) $\frac{-1 \pm i\sqrt{3}}{2}$
(c) $\pm i$
(d) ω, ω^2

18. The value of $\left(\frac{1+i\sqrt{3}}{2}\right)^9 + \left(\frac{1-i\sqrt{3}}{2}\right)^9$ is:

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

19. According to the Remainder Theorem, the remainder when $f(x)$ is divided by $x - a$ is:

(a) $f(a)$

(b) $f(-a)$

(c) a

(d) 0

20. According to the Factor Theorem, $x - a$ is a factor of $f(x)$ if:

(a) $f(a) = 0$

(b) $f(-a) = 0$

(c) $f(a) = 1$

(d) $f(a) = a$

Answers and Explanations

1. **Answer: a**
   Cube roots of unity are $1, \omega, \omega^2$, where $\omega = \frac{-1+i\sqrt{3}}{2}$ (p.258).

2. **Answer: a**
   Sum: $1 + \omega + \omega^2 = 0$ (p.258).

3. **Answer: a**
   Product: $\omega^3 = 1$ (p.258).

4. **Answer: a**
   $\omega^4 = \omega^3 \cdot \omega = 1 \cdot \omega = \omega$ (p.258).

5. **Answer: a**
   Cube roots of 8: $2, 2\omega, 2\omega^2$ (p.259).

6. **Answer: a**
   Cube roots of -27: $-3, -3\omega, -3\omega^2$ (p.261).

7. **Answer: a**
   $\omega^{28} + \omega^{29} + 1 = \omega + \omega^2 + 1 = 0$ (p.262).

8. **Answer: a**
   $(1 + \omega - \omega^2)^8 = 256\omega$ (p.262).

9. **Answer: a**
   Fourth roots of unity: $1, -1, i, -i$ (p.259).

10. **Answer: a**
    Product: $1 \cdot (-1) \cdot i \cdot (-i) = -1$ (p.259).

11. **Answer: a**
    Fourth roots of 16: $2, -2, 2i, -2i$ (p.267).

12. **Answer: a**
    Fourth roots of 81: $3, -3, 3i, -3i$ (p.267).

13. **Answer: a**
    Solution set: $\{\pm 2, \pm 2i\}$ (p.268).

14. **Answer: a**
    Solution set: $\{0, \pm 3, \pm 3i\}$ (p.268).

15. **Answer: a**
    Solution set: $\{-1, \pm i\}$ (p.269).

16. **Answer: a**
    Equation: $x^2 + 2x + 4 = 0$ (p.266).

17. **Answer: a**
    Complex cube roots of -1: $\frac{1 \pm i\sqrt{3}}{2}$ (p.265).

18. **Answer: a**
    Value: -2 (p.266).

19. **Answer: a**
    Remainder Theorem: Remainder is $f(a)$ (p.269).

20. **Answer: a**
    Factor Theorem: $f(a) = 0$ (p.269).