

JEE MAIN COMPLEX NUMBERS AND QUADRATIC EQUATIONS — CUBE ROOTS OF UNITY AND DE MOIVRE'S THEOREM (JEE) — PYQS

Max. Marks: 20

Questions: 5

Section A (MCQ) — 3 questions

Q.1 If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) 1 (2) 0 (3) -1 (4) 256

Scan or tap for the
full solution



Q.2 If $x^2 + x + 1 = 0$, then the value of $\left(x + \frac{1}{x}\right)^4 + \left(x^2 + \frac{1}{x^2}\right)^4 + \left(x^3 + \frac{1}{x^3}\right)^4 + \dots + \left(x^{25} + \frac{1}{x^{25}}\right)^4$ is:

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 162 (2) 145 (3) 128 (4) 175

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Q.3 Let α be a solution of $x^2 + x + 1 = 0$, and for some a and b in $\mathbb{R}$,

$$\begin{bmatrix} 4 & a & b \end{bmatrix} \begin{bmatrix} 1 & 16 & 13 \\ -1 & -1 & 2 \\ -2 & -14 & -8 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \end{bmatrix}. \text{ If}$$

$$\frac{4}{\alpha^4} + \frac{m}{\alpha^a} + \frac{n}{\alpha^b} = 3, \text{ then } m + n \text{ is equal to } \underline{\hspace{2cm}}$$

[JEE Main 2025 (Online) 8th April Evening Shift]

- (1) 11 (2) 3 (3) 8 (4) 7

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Section B (Numerical) — 2 questions

Q.4 Let $\alpha = \frac{-1+i\sqrt{3}}{2}$ and $\beta = \frac{-1-i\sqrt{3}}{2}$, $i = \sqrt{-1}$. If $(7 - 7\alpha + 9\beta)^{20} + (9 + 7\alpha - 7\beta)^{20} + (-7 + 9\alpha + 7\beta)^{20} + (14 + 7\alpha + 7\beta)^{20} = m^{10}$, then m is _____

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Q.5 If α is a root of the equation $x^2 + x + 1 = 0$ and

$$\sum_{k=1}^n \left(\alpha^k + \frac{1}{\alpha^k} \right)^2 = 20, \text{ then } n \text{ is equal to } \underline{\hspace{2cm}}.$$

[JEE Main 2025 (Online) 4th April Evening Shift]

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ANSWER KEY

Section A (MCQ) — 3 questions

Ques.	1	2	3								
Ans.	4	2	1								

Section B (Numerical) — 2 questions

Ques.	4	5									
Ans.	49	11									