

PART 1 - MATHEMATICS

Topic : Complex numbers and quadratic equations

SECTION-A : (Maximum Marks : 16)

This section contains **FOUR** questions.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. Match each entry in **List-I** to the correct entry in **List-II** and choose the correct option.

[JEE Advanced 2026 Paper 1]

List-I		List-II	
P.	If α and β are the distinct roots of the equation $x^2 + x + 1 = 0$, then the quadratic equation with roots $\frac{1}{(\alpha + 1)^{2026}}$ and $\frac{1}{(\beta + 1)^{2026}}$ is	1.	$x^2 + x + 1 = 0$
Q.	If α and β are the distinct roots of the equation $x^2 + x + 1 = 0$, then the quadratic equation with roots $\frac{1}{(\alpha + 1)^{2027}}$ and $\frac{1}{(\beta + 1)^{2027}}$ is	2.	$x^2 - x + 1 = 0$
R.	If γ and δ are the distinct roots of the equation $x^2 - x + 1 = 0$, then the value of $\frac{1}{(\gamma - 1)^{2026}} + \frac{1}{(\delta - 1)^{2026}}$ is	3.	$x^2 + x - 1 = 0$

Space for Rough Work

List-I		List-II	
S.	If p and r are the distinct roots of the equation $x^2 + x - 1 = 0$, then the value of $\frac{1}{(p+1)^3} + \frac{1}{(r+1)^3}$ is	4.	-1
		5.	-4

- (A) (P) $\rightarrow$ (1), (Q) $\rightarrow$ (2), (R) $\rightarrow$ (5), (S) $\rightarrow$ (4) (B) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (1), (R) $\rightarrow$ (4), (S) $\rightarrow$ (5)
 (C) (P) $\rightarrow$ (1), (Q) $\rightarrow$ (2), (R) $\rightarrow$ (4), (S) $\rightarrow$ (5) (D) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (3), (R) $\rightarrow$ (5), (S) $\rightarrow$ (4)

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2. Let a, b, c be positive integers in arithmetic progression such that the equation $ax^2 + bx + c = 0$ has only integer solutions.

Then which of the following statements is (are) TRUE ?

[JEE Advanced 2026 Paper 2]

- (A) $c - b$ is an integer multiple of a
 (B) Both the roots of the equation $ax^2 + bx + c = 0$ are odd integers
 (C) If $c = 15$, then $ab = 8$
 (D) If $b = 8$, then $x = 3$ is a root of the equation $ax^2 + bx + c = 0$

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3. Let R denote the set of all real numbers. Let $a_i, b_i \in \mathbb{R}$ for $i \in \{1, 2, 3\}$.

Define the functions $f: \mathbb{R} \rightarrow \mathbb{R}$, $g: \mathbb{R} \rightarrow \mathbb{R}$, and $h: \mathbb{R} \rightarrow \mathbb{R}$ by

$$f(x) = a_1 + 10x + a_2x^2 + a_3x^3 + x^4,$$

$$g(x) = b_1 + 3x + b_2x^2 + b_3x^3 + x^4,$$

$$h(x) = f(x+1) - g(x+2).$$

If $f(x) \neq g(x)$ for every $x \in \mathbb{R}$, then the coefficient of x^3 in $h(x)$ is

[JEE Advanced 2025 Paper 1]

- (A) 8 (B) 2 (C) -4 (D) -6

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4. Let R denote the set of all real numbers. Let $z_1 = 1 + 2i$ and $z_2 = 3i$ be two complex numbers, where $i = \sqrt{-1}$. Let

$$S = \{(x, y) \in \mathbb{R} \times \mathbb{R} : |x + iy - z_1| = 2|x + iy - z_2|\}.$$

Then which of the following statements is (are) TRUE?

[JEE Advanced 2025 Paper 1]

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(A) S is a circle with centre $\left(-\frac{1}{3}, \frac{10}{3}\right)$

(B) S is a circle with centre $\left(\frac{1}{3}, \frac{8}{3}\right)$

(C) S is a circle with radius $\frac{\sqrt{2}}{3}$

(D) S is a circle with radius $\frac{2\sqrt{2}}{3}$

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full solution



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SECTION-B : (Maximum Marks : 8)

This section contains **TWO** questions.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

5. For a non-zero complex number z , let $\arg(z)$ denote the principal argument of z , with $-\pi < \arg(z) \leq \pi$. Let ω be the cube root of unity for which $0 < \arg(\omega) < \pi$. Let

$$\alpha = \arg\left(\sum_{n=1}^{2025} (-\omega)^n\right).$$

Then the value of $\frac{3\alpha}{\pi}$ is _____.

[JEE Advanced 2025 Paper 2]

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6. Let $f(x) = x^4 + ax^3 + bx^2 + c$ be a polynomial with real coefficients such that $f(1) = -9$. Suppose that $i\sqrt{3}$ is a root of the equation $4x^3 + 3ax^2 + 2bx = 0$, where $i = \sqrt{-1}$. If $\alpha_1, \alpha_2, \alpha_3$, and α_4 are all the roots of the equation $f(x) = 0$, then $|\alpha_1|^2 + |\alpha_2|^2 + |\alpha_3|^2 + |\alpha_4|^2$ is equal to _____.

[JEE Advanced 2024 Paper 1]

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Space for Rough Work

JEE ADVANCED COMPLEX NUMBERS AND QUADRATIC EQUATIONS — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																
Ques.	1	2	3	4												
Ans.	C	A, B, C	C	A, D												

SECTION-B																
Ques.	5	6														
Ans.	-2	20														