

MATHEMATICS · JEE MAIN

Complex Numbers

Chapter-wise previous year questions, with answer key

105

PYQS

2020–2025

PAPERS

6

TOPICS

Algebra of Complex Numbers

Geometry in Argand Plane

De Moivre's Theorem

Cube Roots of Unity

Modulus and Argument

Polar and Euler Form

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Algebra of Complex Numbers · 29 PYQs

Q1 JEE Main 2025 · 8 Apr · Shift 2

Let $A = \{\theta \in [0, 2\pi] : 1 + 10 \operatorname{Re} \left(\frac{2 \cos \theta + i \sin \theta}{\cos \theta - 3i \sin \theta} \right) = 0\}$. Then $\sum_{\theta \in A} \theta^2$ is equal to

- (A) $\frac{21}{4}\pi^2$
- (B) $6\pi^2$
- (C) $\frac{27}{4}\pi^2$
- (D) $8\pi^2$

[Step-by-step solution ► prepwisar.in/questions/wael_9fo24](https://www.prepwisar.in/questions/wael_9fo24)

Q2 JEE Main 2025 · 4 Apr · Shift 2

Let the product of $\omega_1 = (8 + i) \sin \theta + (7 + 4i) \cos \theta$ and $\omega_2 = (1 + 8i) \sin \theta + (4 + 7i) \cos \theta$ be $\alpha + i\beta$, $i = \sqrt{-1}$. Let p and q be the maximum and the minimum values of $\alpha + \beta$ respectively. Then p + q is equal to :

- (A) 130
- (B) 150
- (C) 160
- (D) 140

[Step-by-step solution ► prepwisar.in/questions/cPyETT0qxq](https://www.prepwisar.in/questions/cPyETT0qxq)

Q3 JEE Main 2025 · 3 Apr · Shift 1

Let $z \in \mathbb{C}$ be such that $\frac{z^2 + 3i}{z - 2 + i} = 2 + 3i$. Then the sum of all possible values of z^2 is :

- (A) $-19 + 2i$
- (B) $-19 - 2i$
- (C) $19 - 2i$
- (D) $19 + 2i$

[Step-by-step solution ► prepwisar.in/questions/IZwpTFu_7G](https://www.prepwisar.in/questions/IZwpTFu_7G)

Q4 JEE Main 2025 · 28 Jan · Shift 2

If $\alpha + i\beta$ and $\gamma + i\delta$ are the roots of $x^2 - (3 - 2i)x - (2i - 2) = 0$, $i = \sqrt{-1}$, then $\alpha\gamma + \beta\delta$ is equal to:

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

[Step-by-step solution ► prepwisar.in/questions/Cilvfftol1](https://www.prepwisar.in/questions/Cilvfftol1)

Q5 JEE Main 2025 · 24 Jan · Shift 1

If α and β are the roots of the equation $2z^2 - 3z - 2i = 0$, where $i = \sqrt{-1}$, then $16 \cdot \operatorname{Re} \left(\frac{\alpha^{19} + \beta^{19} + \alpha^{11} + \beta^{11}}{\alpha^{15} + \beta^{15}} \right) \cdot \operatorname{Im} \left(\frac{\alpha^{19} + \beta^{19} + \alpha^{11} + \beta^{11}}{\alpha^{15} + \beta^{15}} \right)$ is equal to

- (A) 441
- (B) 312
- (C) 409
- (D) 398

[Step-by-step solution ► prepwisar.in/questions/a2N0sucdV2](https://www.prepwisar.in/questions/a2N0sucdV2)

Q6 JEE Main 2024 · 8 Apr · Shift 2

The sum of all possible values of $\theta \in [-\pi, 2\pi]$, for which $\frac{1+i\cos\theta}{1-2i\cos\theta}$ is purely imaginary, is equal to :

- (A) 4π (B) 3π
(C) 2π (D) 5π

[Step-by-step solution ► prepwisser.in/questions/kmPOezbUBB](https://www.prepwisser.in/questions/kmPOezbUBB)

Q7 JEE Main 2024 · 4 Apr · Shift 1

Let α and β be the sum and the product of all the non-zero solutions of the equation $(\bar{z})^2 + |z| = 0, z \in C$. Then $4(\alpha^2 + \beta^2)$ is equal to :

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

[Step-by-step solution ► prepwisser.in/questions/Jp9AS1Et1C](https://www.prepwisser.in/questions/Jp9AS1Et1C)

Q8 JEE Main 2024 · 31 Jan · Shift 2

Let z_1 and z_2 be two complex numbers such that $z_1 + z_2 = 5$ and $z_1^3 + z_2^3 = 20 + 15i$. Then, $|z_1^4 + z_2^4|$ equals -

- (A) $15\sqrt{15}$ (B) $30\sqrt{3}$
(C) $25\sqrt{3}$ (D) 75

[Step-by-step solution ► prepwisser.in/questions/oc9fiEkX0H](https://www.prepwisser.in/questions/oc9fiEkX0H)

Q9 JEE Main 2024 · 30 Jan · Shift 1

If $z = x + iy, xy \neq 0$, satisfies the equation $z^2 + i\bar{z} = 0$, then $|z^2|$ is equal to :

- (A) 9 (B) $\frac{1}{4}$
(C) 4 (D) 1

[Step-by-step solution ► prepwisser.in/questions/uH6WF1wPyj](https://www.prepwisser.in/questions/uH6WF1wPyj)

Q10 JEE Main 2024 · 29 Jan · Shift 1

If $z = \frac{1}{2} - 2i$ is such that $|z + 1| = \alpha z + \beta(1 + i), i = \sqrt{-1}$ and $\alpha, \beta \in \mathbb{R}$, then $\alpha + \beta$ is equal to

- (A) 2 (B) -4
(C) 3 (D) -1

[Step-by-step solution ► prepwisser.in/questions/4WJty-E9aI](https://www.prepwisser.in/questions/4WJty-E9aI)

Q11 JEE Main 2024 · 29 Jan · Shift 1

Let α, β be the roots of the equation $x^2 - x + 2 = 0$ with $\text{Im}(\alpha) > \text{Im}(\beta)$. Then $\alpha^6 + \alpha^4 + \beta^4 - 5\alpha^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/iZgR7CILB4](https://www.prepwisser.in/questions/iZgR7CILB4)

Q12 JEE Main 2023 · 15 Apr · Shift 1

If the set $\left\{ \operatorname{Re} \left(\frac{z - \bar{z} + z\bar{z}}{2 - 3z + 5\bar{z}} \right) : z \in \mathbb{C}, \operatorname{Re}(z) = 3 \right\}$ is equal to

the interval $(\alpha, \beta]$, then $24(\beta - \alpha)$ is equal to :

- (A) 36 (B) 27
(C) 42 (D) 30

[Step-by-step solution ► prepwise.in/questions/-5w9MejXy](https://www.prepwise.in/questions/-5w9MejXy)

Q13 JEE Main 2023 · 13 Apr · Shift 2

Let

$$S = \{z \in \mathbb{C} : \bar{z} = i(z^2 + \operatorname{Re}(\bar{z}))\}$$

. Then $\sum_{z \in S} |z|^2$ is equal to :

- (A) $\frac{7}{2}$ (B) 4
(C) 3 (D) $\frac{5}{2}$

[Step-by-step solution ► prepwise.in/questions/nbZjDgh_Eo](https://www.prepwise.in/questions/nbZjDgh_Eo)

Q14 JEE Main 2023 · 11 Apr · Shift 2

Let

$$S = \left\{ z \in \mathbb{C} - \{i, 2i\} : \frac{z^2 + 8iz - 15}{z^2 - 3iz - 2} \in \mathbb{R} \right\}$$

. If $\alpha - \frac{13}{11}i \in S, \alpha \in \mathbb{R} - \{0\}$, then $242\alpha^2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwise.in/questions/qAlPoet5A_](https://www.prepwise.in/questions/qAlPoet5A_)

Q15 JEE Main 2023 · 11 Apr · Shift 2

For $a \in \mathbb{C}$, let

$$A = \{z \in \mathbb{C} : \operatorname{Re}(a + \bar{z}) > \operatorname{Im}(\bar{a} + z)\}$$

and

$$B = \{z \in \mathbb{C} : \operatorname{Re}(a + \bar{z}) < \operatorname{Im}(\bar{a} + z)\}$$

. Then among the two statements :

(S1): If $\operatorname{Re}(a), \operatorname{Im}(a) > 0$, then the set A contains all the real numbers

(S2) : If $\operatorname{Re}(a), \operatorname{Im}(a) < 0$, then the set B contains all the real numbers,

- (A) both are false (B) only (S1) is true
(C) only (S2) is true (D) both are true

[Step-by-step solution ► prepwise.in/questions/2ggNaZZTpK](https://www.prepwise.in/questions/2ggNaZZTpK)

Q16 JEE Main 2023 · 8 Apr · Shift 2

Let $A = \{ \theta \in (0, 2\pi) : \frac{1+2i \sin \theta}{1-i \sin \theta} \text{ is purely imaginary} \}$. Then the sum of the elements in A is :

- (A) 3π (B) π
(C) 2π (D) 4π

[Step-by-step solution ► prepwisar.in/questions/2yPo3mtgiM](https://www.prepwisar.in/questions/2yPo3mtgiM)

Q17 JEE Main 2023 · 6 Apr · Shift 2

Let $a \neq b$ be two non-zero real numbers. Then the number of elements in the set $X = \{ z \in \mathbb{C} : \operatorname{Re}(az^2 + bz) = a \text{ and } \operatorname{Re}(bz^2 + az) = b \}$ is equal to :

- (A) 0 (B) 2
(C) 1 (D) Infinite

[Step-by-step solution ► prepwisar.in/questions/LbZfGA5fgB](https://www.prepwisar.in/questions/LbZfGA5fgB)

Q18 JEE Main 2023 · 29 Jan · Shift 1

For two non-zero complex numbers z_1 and z_2 , if $\operatorname{Re}(z_1 z_2) = 0$ and $\operatorname{Re}(z_1 + z_2) = 0$, then which of the following are possible?

- A. $\operatorname{Im}(z_1) > 0$ and $\operatorname{Im}(z_2) > 0$
B. $\operatorname{Im}(z_1) < 0$ and $\operatorname{Im}(z_2) > 0$
C. $\operatorname{Im}(z_1) > 0$ and $\operatorname{Im}(z_2) < 0$
D. $\operatorname{Im}(z_1) < 0$ and $\operatorname{Im}(z_2) < 0$

Choose the correct answer from the options given below :

- (A) A and C (B) A and B
(C) B and D (D) B and C

[Step-by-step solution ► prepwisar.in/questions/sdCY1MsDwM](https://www.prepwisar.in/questions/sdCY1MsDwM)

Q19 JEE Main 2022 · 28 Jul · Shift 2

Let $z = a + ib, b \neq 0$ be complex numbers satisfying $z^2 = \bar{z} \cdot 2^{1-z}$. Then the least value of $n \in \mathbb{N}$, such that $z^n = (z+1)^n$, is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/CXjSmEcjwL](https://www.prepwisar.in/questions/CXjSmEcjwL)

Q20 JEE Main 2022 · 27 Jul · Shift 1

Let $S = \{ z \in \mathbb{C} : z^2 + \bar{z} = 0 \}$. Then $\sum_{z \in S} (\operatorname{Re}(z) + \operatorname{Im}(z))$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/hMH-bH8kVx](https://www.prepwisar.in/questions/hMH-bH8kVx)

Q21 JEE Main 2022 · 30 Jun · Shift 1

The real part of the complex number $\frac{(1+2i)^8 \cdot (1-2i)^2}{(3+2i) \cdot (4-6i)}$ is equal to :

- (A) $\frac{500}{13}$ (B) $\frac{110}{13}$
(C) $\frac{55}{6}$ (D) $\frac{550}{13}$

[Step-by-step solution ► prepwisar.in/questions/HvNUBY0q0b](https://www.prepwisar.in/questions/HvNUBY0q0b)

Q22 JEE Main 2022 · 29 Jun · Shift 1

Let α and β be the roots of the equation $x^2 + (2i - 1) = 0$. Then, the value of $|\alpha^8 + \beta^8|$ is equal to :

- (A) 50 (B) 250
(C) 1250 (D) 1500

[Step-by-step solution](#) ► [prepwisar.in/questions/8nIdXxcnJU](https://www.prepwisar.in/questions/8nIdXxcnJU)

Q23 JEE Main 2022 · 28 Jun · Shift 2

Sum of squares of modulus of all the complex numbers z satisfying $\bar{z} = iz^2 + z^2 - z$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/COK6bNpHzK](https://www.prepwisar.in/questions/COK6bNpHzK)

Q24 JEE Main 2021 · 26 Aug · Shift 2

The least positive integer n such that $\frac{(2i)^n}{(1-i)^{n-2}}$, $i = \sqrt{-1}$ is a positive integer, is _____.

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/yPR08fj5aH](https://www.prepwisar.in/questions/yPR08fj5aH)

Q25 JEE Main 2021 · 27 Jul · Shift 2

If the real part of the complex number

$$z = \frac{3 + 2i \cos \theta}{1 - 3i \cos \theta}, \theta \in \left(0, \frac{\pi}{2}\right)$$

is zero, then the value of $\sin^2 3\theta + \cos^2 \theta$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution](#) ► [prepwisar.in/questions/h6iHdCeBp8](https://www.prepwisar.in/questions/h6iHdCeBp8)

Q26 JEE Main 2021 · 22 Jul · Shift 2

Let n denote the number of solutions of the equation $z^2 + 3\bar{z} = 0$, where z is a complex number. Then the value of $\sum_{k=0}^{\infty} \frac{1}{n^k}$ is equal to :

- (A) 1 (B) $\frac{4}{3}$
(C) $\frac{3}{2}$ (D) 2

[Step-by-step solution](#) ► [prepwisar.in/questions/UE5tN5uYQk](https://www.prepwisar.in/questions/UE5tN5uYQk)

Q27 JEE Main 2021 · 20 Jul · Shift 2

If the real part of the complex number $(1 - \cos \theta + 2i \sin \theta)^{-1}$ is $\frac{1}{5}$ for $\theta \in (0, \pi)$, then the value of the integral $\int_0^\theta \sin x dx$ is equal to:

- (A) 1 (B) 2
(C) -1 (D) 0

[Step-by-step solution](#) ► [prepwisar.in/questions/s0Wr7uhaPA](https://www.prepwisar.in/questions/s0Wr7uhaPA)

Q28 JEE Main 2021 · 25 Feb · Shift 2

If $\alpha, \beta \in \mathbb{R}$ are such that $1 - 2i$ (here $i^2 = -1$) is a root of $z^2 + \alpha z + \beta = 0$, then $(\alpha - \beta)$ is equal to :

- (A) -7 (B) 7
(C) 3 (D) -3

Step-by-step solution ► [prepwiser.in/questions/98rx2T1NIW](https://www.prepwiser.in/questions/98rx2T1NIW)

Q29 JEE Main 2020 · 2 Sep · Shift 2

The imaginary part of

$$(3 + 2\sqrt{-54})^{\frac{1}{2}} - (3 - 2\sqrt{-54})^{\frac{1}{2}}$$

can be :

- (A) $-2\sqrt{6}$ (B) 6
(C) $\sqrt{6}$ (D) $-\sqrt{6}$

Step-by-step solution ► [prepwiser.in/questions/-KuXs_yGoP](https://www.prepwiser.in/questions/-KuXs_yGoP)

Geometry in Argand Plane · 30 PYQs

Q30 JEE Main 2025 · 7 Apr · Shift 2

If the locus of $z \in \mathbb{C}$, such that $\operatorname{Re}\left(\frac{z-1}{2z+i}\right) + \operatorname{Re}\left(\frac{\bar{z}-1}{2\bar{z}-i}\right) = 2$, is a circle of radius r and center (a, b) , then $\frac{15ab}{r^2}$ is equal to :

- (A) 16
(B) 24
(C) 12
(D) 18

Step-by-step solution ► [prepwiser.in/questions/gKKjw_tYYr](https://www.prepwiser.in/questions/gKKjw_tYYr)

Q31 JEE Main 2025 · 4 Apr · Shift 1

Let $A = \{z \in \mathbb{C} : |z - 2 - i| = 3\}$, $B = \{z \in \mathbb{C} : \operatorname{Re}(z - iz) = 2\}$ and $S = A \cap B$. Then $\sum_{z \in S} |z|^2$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/g1koSFek7Z](https://www.prepwiser.in/questions/g1koSFek7Z)

Q32 JEE Main 2025 · 23 Jan · Shift 1

Let $\left|\frac{\bar{z}-i}{2\bar{z}+i}\right| = \frac{1}{3}$, $z \in \mathbb{C}$, be the equation of a circle with center at C . If the area of the triangle, whose vertices are at the points $(0, 0)$, C and $(\alpha, 0)$ is 11 square units, then α^2 equals:

- (A) $\frac{121}{25}$ (B) 100
(C) $\frac{81}{25}$ (D) 50

Step-by-step solution ► [prepwiser.in/questions/a227G-3XWQ](https://www.prepwiser.in/questions/a227G-3XWQ)

Q33 JEE Main 2024 · 9 Apr · Shift 2

Let z be a complex number such that the real part of $\frac{z-2i}{z+2i}$ is zero. Then, the maximum value of $|z - (6 + 8i)|$ is equal to

- (A) 8 (B) 12
(C) 10 (D) ∞

[Step-by-step solution ► prepwiser.in/questions/ZLfz51AXu](https://www.prepwiser.in/questions/ZLfz51AXu)

Q34 JEE Main 2024 · 1 Feb · Shift 1

Let $S = \{z \in \mathbb{C} : |z - 1| = 1 \text{ and } (\sqrt{2} - 1)(z + \bar{z}) - i(z - \bar{z}) = 2\sqrt{2}\}$. Let $z_1, z_2 \in S$ be such that $|z_1| = \max_{z \in S} |z|$ and $|z_2| = \min_{z \in S} |z|$. Then $|\sqrt{2}z_1 - z_2|^2$ equals :

- (A) 1 (B) 4
(C) 3 (D) 2

[Step-by-step solution ► prepwiser.in/questions/Vprk0NEfRy](https://www.prepwiser.in/questions/Vprk0NEfRy)

Q35 JEE Main 2024 · 27 Jan · Shift 2

Let the complex numbers α and $\frac{1}{\alpha}$ lie on the circles $|z - z_0|^2 = 4$ and $|z - z_0|^2 = 16$ respectively, where $z_0 = 1 + i$. Then, the value of $100|\alpha|^2$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/_LA3QTg0o5](https://www.prepwiser.in/questions/_LA3QTg0o5)

Q36 JEE Main 2023 · 13 Apr · Shift 1

Let $w = z\bar{z} + k_1z + k_2iz + \lambda(1 + i)$, $k_1, k_2 \in \mathbb{R}$. Let $\text{Re}(w) = 0$ be the circle C of radius 1 in the first quadrant touching the line $y = 1$ and the y -axis. If the curve $\text{Im}(w) = 0$ intersects C at A and B , then $30(AB)^2$ is equal to _____

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/lnhi9xHYBX](https://www.prepwiser.in/questions/lnhi9xHYBX)

Q37 JEE Main 2023 · 12 Apr · Shift 1

Let C be the circle in the complex plane with centre $z_0 = \frac{1}{2}(1 + 3i)$ and radius $r = 1$. Let $z_1 = 1 + i$ and the complex number z_2 be outside the circle C such that $|z_1 - z_0||z_2 - z_0| = 1$. If z_0, z_1 and z_2 are collinear, then the smaller value of $|z_2|^2$ is equal to :

- (A) $\frac{3}{2}$ (B) $\frac{5}{2}$
(C) $\frac{13}{2}$ (D) $\frac{7}{2}$

[Step-by-step solution ► prepwiser.in/questions/UgILuKReE5](https://www.prepwiser.in/questions/UgILuKReE5)

Q38 JEE Main 2023 · 11 Apr · Shift 1

Let w_1 be the point obtained by the rotation of $z_1 = 5 + 4i$ about the origin through a right angle in the anticlockwise direction, and w_2 be the point obtained by the rotation of $z_2 = 3 + 5i$ about the origin through a right angle in the clockwise direction. Then the principal argument of $w_1 - w_2$ is equal to :

- (A) $-\pi + \tan^{-1} \frac{8}{9}$ (B) $-\pi + \tan^{-1} \frac{33}{5}$
(C) $\pi - \tan^{-1} \frac{8}{9}$ (D) $\pi - \tan^{-1} \frac{33}{5}$

[Step-by-step solution ► prepwiser.in/questions/SrMgcF0xKf](https://www.prepwiser.in/questions/SrMgcF0xKf)

Let

$$S = \left\{ z = x + iy : \frac{2z - 3i}{4z + 2i} \text{ is a real number} \right\}$$

. Then which of the following is NOT correct?

(A) $y + x^2 + y^2 \neq -\frac{1}{4}$

(B) $(x, y) = (0, -\frac{1}{2})$

(C) $x = 0$

(D) $y \in \left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, \infty\right)$

[Step-by-step solution ► prepwiser.in/questions/p5pbpozIzw](https://www.prepwiser.in/questions/p5pbpozIzw)

For $\alpha, \beta, z \in \mathbb{C}$ and $\lambda > 1$, if $\sqrt{\lambda - 1}$ is the radius of the circle $|z - \alpha|^2 + |z - \beta|^2 = 2\lambda$, then $|\alpha - \beta|$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/_e64JxynRr](https://www.prepwiser.in/questions/_e64JxynRr)

If the center and radius of the circle $\left|\frac{z-2}{z-3}\right| = 2$ are respectively (α, β) and γ , then $3(\alpha + \beta + \gamma)$ is equal to :

(A) 12

(B) 10

(C) 11

(D) 9

[Step-by-step solution ► prepwiser.in/questions/cGSpN6T9jb](https://www.prepwiser.in/questions/cGSpN6T9jb)

For all $z \in C$ on the curve $C_1 : |z| = 4$, let the locus of the point $z + \frac{1}{z}$ be the curve C_2 . Then :

(A) the curves C_1 and C_2 intersect at 4 points

(B) the curve C_2 lies inside C_1

(C) the curve C_1 lies inside C_2

(D) the curves C_1 and C_2 intersect at 2 points

[Step-by-step solution ► prepwiser.in/questions/0GrQWaRRL4](https://www.prepwiser.in/questions/0GrQWaRRL4)

Q43 JEE Main 2023 · 29 Jan · Shift 2

Let

$$\alpha = 8 - 14i, A = \left\{ z \in \mathbb{C} : \frac{\alpha z - \overline{\alpha z}}{z^2 - (\overline{z})^2 - 112i} = 1 \right\}$$

and $B = \{z \in \mathbb{C} : |z + 3i| = 4\}$. Then

$$\sum_{z \in A \cap B} (\operatorname{Re} z - \operatorname{Im} z)$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/i-f1vdHLwI](https://www.prepwiser.in/questions/i-f1vdHLwI)

Q44 JEE Main 2023 · 25 Jan · Shift 2

Let z be a complex number such that $\left| \frac{z-2i}{z+i} \right| = 2, z \neq -i$. Then z lies on the circle of radius 2 and centre :

(A) $(0, -2)$

(B) $(0, 0)$

(C) $(0, 2)$

(D) $(2, 0)$

[Step-by-step solution ► prepwiser.in/questions/aVyoRTnacP](https://www.prepwiser.in/questions/aVyoRTnacP)

Q45 JEE Main 2023 · 25 Jan · Shift 1

Let $z_1 = 2 + 3i$ and $z_2 = 3 + 4i$. The set

$$S = \left\{ z \in \mathbb{C} : |z - z_1|^2 - |z - z_2|^2 = |z_1 - z_2|^2 \right\}$$

represents a

(A) hyperbola with the length of the transverse axis 7

(B) hyperbola with eccentricity 2

(C) straight line with the sum of its intercepts on the coordinate axes equals -18

(D) straight line with the sum of its intercepts on the coordinate axes equals 14

[Step-by-step solution ► prepwiser.in/questions/8mpku_jYSn](https://www.prepwiser.in/questions/8mpku_jYSn)

Q46 JEE Main 2022 · 27 Jul · Shift 1

Let the minimum value v_0 of $v = |z|^2 + |z - 3|^2 + |z - 6i|^2, z \in \mathbb{C}$ is attained at $z = z_0$. Then $|2z_0^2 - \overline{z_0}^3 + 3|^2 + v_0^2$ is equal to :

(A) 1000

(B) 1024

(C) 1105

(D) 1196

[Step-by-step solution ► prepwiser.in/questions/H-CsuyYOE0](https://www.prepwiser.in/questions/H-CsuyYOE0)

Q47 JEE Main 2022 · 25 Jul · Shift 1

For $n \in \mathbb{N}$, let

$$S_n = \left\{ z \in \mathbb{C} : |z - 3 + 2i| = \frac{n}{4} \right\}$$

and

$$T_n = \left\{ z \in \mathbb{C} : |z - 2 + 3i| = \frac{1}{n} \right\}$$

. Then the number of elements in the set $\{n \in \mathbb{N} : S_n \cap T_n = \emptyset\}$ is :

- (A) 0 (B) 2
(C) 3 (D) 4

[Step-by-step solution ► prepwisser.in/questions/UObPZINn0Q](https://www.prepwisser.in/questions/UObPZINn0Q)

Q48 JEE Main 2022 · 27 Jun · Shift 1

The area of the polygon, whose vertices are the non-real roots of the equation $\bar{z} = iz^2$ is :

- (A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$
(C) $\frac{3}{2}$ (D) $\frac{3}{4}$

[Step-by-step solution ► prepwisser.in/questions/g6D9guiaNE](https://www.prepwisser.in/questions/g6D9guiaNE)

Q49 JEE Main 2022 · 25 Jun · Shift 1

Let a circle C in complex plane pass through the points $z_1 = 3 + 4i$, $z_2 = 4 + 3i$ and $z_3 = 5i$. If $z (\neq z_1)$ is a point on C such that the line through z and z_1 is perpendicular to the line through z_2 and z_3 , then $\arg(z)$ is equal to :

- (A) $\tan^{-1} \left(\frac{2}{\sqrt{5}} \right) - \pi$
(B) $\tan^{-1} \left(\frac{24}{7} \right) - \pi$
(C) $\tan^{-1} (3) - \pi$
(D) $\tan^{-1} \left(\frac{3}{4} \right) - \pi$

[Step-by-step solution ► prepwisser.in/questions/6IjKXQE6xI](https://www.prepwisser.in/questions/6IjKXQE6xI)

Q50 JEE Main 2021 · 27 Aug · Shift 2

Let z_1 and z_2 be two complex numbers such that $\arg(z_1 - z_2) = \frac{\pi}{4}$ and z_1, z_2 satisfy the equation $|z - 3| = \operatorname{Re}(z)$. Then the imaginary part of $z_1 + z_2$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/SkRB1rUryF](https://www.prepwisser.in/questions/SkRB1rUryF)

Q51 JEE Main 2021 · 25 Jul · Shift 2

The equation of a circle is $\operatorname{Re}(z^2) + 2(\operatorname{Im}(z))^2 + 2\operatorname{Re}(z) = 0$, where $z = x + iy$. A line which passes through the center of the given circle and the vertex of the parabola, $x^2 - 6x - y + 13 = 0$, has y-intercept equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/QdnaC_skhs](https://www.prepwisser.in/questions/QdnaC_skhs)

Q52 JEE Main 2021 · 18 Mar · Shift 1

If the equation $a|z|^2 + \overline{\alpha}z + \alpha\overline{z} + d = 0$ represents a circle where a, d are real constants then which of the following condition is correct?

- (A) $|\alpha|^2 - ad \neq 0$
- (B) $|\alpha|^2 - ad > 0$ and $a \in \mathbb{R} - \{0\}$
- (C) $|\alpha|^2 - ad \geq 0$ and $a \in \mathbb{R}$
- (D) $\alpha = 0, a, d \in \mathbb{R}^+$

Step-by-step solution ► [prepwisser.in/questions/zeqIKFzVEU](https://www.prepwisser.in/questions/zeqIKFzVEU)

Q53 JEE Main 2021 · 18 Mar · Shift 1

Let z_1, z_2 be the roots of the equation $z^2 + az + 12 = 0$ and z_1, z_2 form an equilateral triangle with origin. Then, the value of $|a|$ is :

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/Z0wajCTm_p](https://www.prepwisser.in/questions/Z0wajCTm_p)

Q54 JEE Main 2021 · 25 Feb · Shift 1

Let the lines $(2 - i)z = (2 + i)\overline{z}$ and $(2 + i)z + (i - 2)\overline{z} - 4i = 0$, (here $i^2 = -1$) be normal to a circle C . If the line $iz + \overline{z} + 1 + i = 0$ is tangent to this circle C , then its radius is :

- (A) $\frac{3}{2\sqrt{2}}$
- (B) $3\sqrt{2}$
- (C) $\frac{1}{2\sqrt{2}}$
- (D) $\frac{3}{\sqrt{2}}$

Step-by-step solution ► [prepwisser.in/questions/aBqKW9bXID](https://www.prepwisser.in/questions/aBqKW9bXID)

Q55 JEE Main 2020 · 6 Sep · Shift 1

The region represented by $\{z = x + iy \in \mathbb{C} : |z| - \operatorname{Re}(z) \leq 1\}$ is also given by the inequality : $\{z = x + iy \in \mathbb{C} : |z| - \operatorname{Re}(z) \leq 1\}$

- (A) $y^2 \leq 2(x + \frac{1}{2})$
- (B) $y^2 \leq x + \frac{1}{2}$
- (C) $y^2 \geq 2(x + 1)$
- (D) $y^2 \geq x + 1$

Step-by-step solution ► [prepwisser.in/questions/czbjV24cB2](https://www.prepwisser.in/questions/czbjV24cB2)

Q56 JEE Main 2020 · 6 Sep · Shift 2

Let $z = x + iy$ be a non-zero complex number such that $z^2 = i|z|^2$, where $i = \sqrt{-1}$, then z lies on the :

- (A) line, $y = -x$
- (B) real axis
- (C) line, $y = x$
- (D) imaginary axis

Step-by-step solution ► [prepwisser.in/questions/zxHFIPkoDd](https://www.prepwisser.in/questions/zxHFIPkoDd)

Q57 JEE Main 2020 · 4 Sep · Shift 1

Let $u = \frac{2z+i}{z-ki}$, $z = x + iy$ and $k > 0$. If the curve represented by $\text{Re}(u) + \text{Im}(u) = 1$ intersects the y-axis at the points P and Q where $PQ = 5$, then the value of k is :

- (A) 2 (B) 4
(C) 1/2 (D) 3/2

[Step-by-step solution ► prepwiser.in/questions/mE7Gw91KzA](https://www.prepwiser.in/questions/mE7Gw91KzA)

Q58 JEE Main 2020 · 3 Sep · Shift 2

If z_1, z_2 are complex numbers such that $\text{Re}(z_1) = |z_1 - 1|$, $\text{Re}(z_2) = |z_2 - 1|$, and $\arg(z_1 - z_2) = \frac{\pi}{6}$, then $\text{Im}(z_1 + z_2)$ is equal to :

- (A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{\sqrt{3}}$
(C) $\frac{2}{\sqrt{3}}$ (D) $2\sqrt{3}$

[Step-by-step solution ► prepwiser.in/questions/oigXp75Hh3](https://www.prepwiser.in/questions/oigXp75Hh3)

Q59 JEE Main 2020 · 7 Jan · Shift 1

If $\text{Re}\left(\frac{z-1}{2z+i}\right) = 1$, where $z = x + iy$, then the point (x, y) lies on a :

- (A) straight line whose slope is $\frac{3}{2}$
(B) straight line whose slope is $-\frac{2}{3}$
(C) circle whose diameter is $\frac{\sqrt{5}}{2}$
(D) circle whose centre is at $(-\frac{1}{2}, -\frac{3}{2})$

[Step-by-step solution ► prepwiser.in/questions/FyRo8pcCbW](https://www.prepwiser.in/questions/FyRo8pcCbW)

De Moivre's Theorem · 9 PYQs

Q60 JEE Main 2023 · 13 Apr · Shift 2

Let α, β be the roots of the equation $x^2 - \sqrt{2}x + 2 = 0$. Then $\alpha^{14} + \beta^{14}$ is equal to

- (A) -64 (B) $-64\sqrt{2}$
(C) $-128\sqrt{2}$ (D) -128

[Step-by-step solution ► prepwiser.in/questions/k5NhEKN6zy](https://www.prepwiser.in/questions/k5NhEKN6zy)

Q61 JEE Main 2023 · 24 Jan · Shift 2

The value of

$$\left(\frac{1 + \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}}{1 + \sin \frac{2\pi}{9} - i \cos \frac{2\pi}{9}} \right)^3$$

is

- (A) $-\frac{1}{2}(1 - i\sqrt{3})$
(B) $-\frac{1}{2}(\sqrt{3} - i)$
(C) $\frac{1}{2}(1 - i\sqrt{3})$
(D) $\frac{1}{2}(\sqrt{3} + i)$

[Step-by-step solution ► prepwiser.in/questions/qg4WMCh0IU](https://www.prepwiser.in/questions/qg4WMCh0IU)

Q62 JEE Main 2023 · 24 Jan · Shift 1

Let $p, q \in \mathbb{R}$ and $(1 - \sqrt{3}i)^{200} = 2^{199}(p + iq)$, $i = \sqrt{-1}$ then $p + q + q^2$ and $p - q + q^2$ are roots of the equation.

(A) $x^2 + 4x - 1 = 0$

(B) $x^2 - 4x + 1 = 0$

(C) $x^2 + 4x + 1 = 0$

(D) $x^2 - 4x - 1 = 0$

[Step-by-step solution ► prepwiser.in/questions/SIKH11pM1r](https://www.prepwiser.in/questions/SIKH11pM1r)

Q63 JEE Main 2022 · 29 Jul · Shift 1

If $z = 2 + 3i$, then $z^5 + (\bar{z})^5$ is equal to :

(A) 244

(B) 224

(C) 245

(D) 265

[Step-by-step solution ► prepwiser.in/questions/hsU65Y7cyh](https://www.prepwiser.in/questions/hsU65Y7cyh)

Q64 JEE Main 2021 · 26 Aug · Shift 2

If $(\sqrt{3} + i)^{100} = 2^{99}(p + iq)$, then p and q are roots of the equation :

(A) $x^2 - (\sqrt{3} - 1)x - \sqrt{3} = 0$

(B) $x^2 + (\sqrt{3} + 1)x + \sqrt{3} = 0$

(C) $x^2 + (\sqrt{3} - 1)x - \sqrt{3} = 0$

(D) $x^2 - (\sqrt{3} + 1)x + \sqrt{3} = 0$

[Step-by-step solution ► prepwiser.in/questions/KyJh1R1wp0](https://www.prepwiser.in/questions/KyJh1R1wp0)

Q65 JEE Main 2021 · 26 Feb · Shift 1

The sum of 162^{th} power of the roots of the equation $x^3 - 2x^2 + 2x - 1 = 0$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/kjZb_Ed6uG](https://www.prepwiser.in/questions/kjZb_Ed6uG)

Q66 JEE Main 2021 · 24 Feb · Shift 2

Let $i = \sqrt{-1}$. If

$$\frac{(-1 + i\sqrt{3})^{21}}{(1 - i)^{24}} + \frac{(1 + i\sqrt{3})^{21}}{(1 + i)^{24}} = k$$

, and $n = [|k|]$ be the greatest integral part of $|k|$. Then

$$\sum_{j=0}^{n+5} (j+5)^2 - \sum_{j=0}^{n+5} (j+5)$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/BV-dMwbGvC](https://www.prepwiser.in/questions/BV-dMwbGvC)

Q67 JEE Main 2020 · 5 Sep · Shift 2

The value of $\left(\frac{-1+i\sqrt{3}}{1-i}\right)^{30}$ is :

- (A) $-2^{15}i$
- (B) -2^{15}
- (C) $2^{15}i$
- (D) 6^5

[Step-by-step solution](https://www.prepwisar.in/questions/6GZ2uzByKx) ► [prepwisar.in/questions/6GZ2uzByKx](https://www.prepwisar.in/questions/6GZ2uzByKx)

Q68 JEE Main 2020 · 3 Sep · Shift 1

If

$$\left(\frac{1+i}{1-i}\right)^{\frac{m}{2}} = \left(\frac{1+i}{1-i}\right)^{\frac{n}{3}} = 1$$

, ($m, n \in \mathbb{N}$) then the greatest common divisor of the least values of m and n is _____ .

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwisar.in/questions/mVz-pYGB78) ► [prepwisar.in/questions/mVz-pYGB78](https://www.prepwisar.in/questions/mVz-pYGB78)

Cube Roots of Unity · 12 PYQs

Q69 JEE Main 2025 · 8 Apr · Shift 2

Let α be a solution of $x^2 + x + 1 = 0$, and for some a and b in

$$R, \begin{bmatrix} 4 & a & b \end{bmatrix} \begin{bmatrix} 1 & 16 & 13 \\ -1 & -1 & 2 \\ -2 & -14 & -8 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \end{bmatrix}. \text{ If } \frac{4}{\alpha^4} + \frac{m}{\alpha^a} + \frac{n}{\alpha^b} = 3, \text{ then } m + n \text{ is equal to } \underline{\hspace{2cm}}$$

- (A) 11
- (B) 3
- (C) 8
- (D) 7

[Step-by-step solution](https://www.prepwisar.in/questions/aUZ8tYC3lt) ► [prepwisar.in/questions/aUZ8tYC3lt](https://www.prepwisar.in/questions/aUZ8tYC3lt)

Q70 JEE Main 2025 · 4 Apr · Shift 2

If α is a root of the equation $x^2 + x + 1 = 0$ and $\sum_{k=1}^n \left(\alpha^k + \frac{1}{\alpha^k}\right)^2 = 20$, then n is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwisar.in/questions/qlaUIRZleG) ► [prepwisar.in/questions/qlaUIRZleG](https://www.prepwisar.in/questions/qlaUIRZleG)

Q71 JEE Main 2025 · 29 Jan · Shift 2

Let integers $a, b \in [-3, 3]$ be such that $a + b \neq 0$. Then the number of all possible ordered pairs (a, b) , for which $\left|\frac{z-a}{z+b}\right| = 1$ and $\begin{vmatrix} z+1 & \omega & \omega^2 \\ \omega & z+\omega^2 & 1 \\ \omega^2 & 1 & z+\omega \end{vmatrix} = 1, z \in \mathbb{C}$, where ω and ω^2 are the roots of $x^2 + x + 1 = 0$, is equal to _____ .

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwisar.in/questions/ZPuA0UtpAN) ► [prepwisar.in/questions/ZPuA0UtpAN](https://www.prepwisar.in/questions/ZPuA0UtpAN)

Q72 JEE Main 2024 · 30 Jan · Shift 2

If z is a complex number, then the number of common roots of the equations $z^{1985} + z^{100} + 1 = 0$ and $z^3 + 2z^2 + 2z + 1 = 0$, is equal to

- (A) 0 (B) 2
(C) 1 (D) 3

[Step-by-step solution ► prepwiser.in/questions/bcnz4XBIqe](https://www.prepwiser.in/questions/bcnz4XBIqe)

Q73 JEE Main 2024 · 27 Jan · Shift 1

If α satisfies the equation $x^2 + x + 1 = 0$ and $(1 + \alpha)^7 = A + B\alpha + C\alpha^2$, $A, B, C \geq 0$, then $5(3A - 2B - C)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/TXz_KUhOfo](https://www.prepwiser.in/questions/TXz_KUhOfo)

Q74 JEE Main 2022 · 25 Jul · Shift 1

If $\alpha, \beta, \gamma, \delta$ are the roots of the equation $x^4 + x^3 + x^2 + x + 1 = 0$, then $\alpha^{2021} + \beta^{2021} + \gamma^{2021} + \delta^{2021}$ is equal to :

- (A) -4 (B) -1
(C) 1 (D) 4

[Step-by-step solution ► prepwiser.in/questions/88W13YNeFv](https://www.prepwiser.in/questions/88W13YNeFv)

Q75 JEE Main 2022 · 29 Jun · Shift 2

Let α be a root of the equation $1 + x^2 + x^4 = 0$. Then, the value of $\alpha^{1011} + \alpha^{2022} - \alpha^{3033}$ is equal to :

- (A) 1 (B) α
(C) $1 + \alpha$ (D) $1 + 2\alpha$

[Step-by-step solution ► prepwiser.in/questions/KVhrdC-Pj3](https://www.prepwiser.in/questions/KVhrdC-Pj3)

Q76 JEE Main 2022 · 26 Jun · Shift 2

If $z^2 + z + 1 = 0$, $z \in C$, then

$$\left| \sum_{n=1}^{15} \left(z^n + (-1)^n \frac{1}{z^n} \right)^2 \right|$$

is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/WSFnTXYa5R](https://www.prepwiser.in/questions/WSFnTXYa5R)

Q77 JEE Main 2021 · 26 Aug · Shift 1

Let $z = \frac{1-i\sqrt{3}}{2}$, $i = \sqrt{-1}$. Then the value of

$$21 + \left(z + \frac{1}{z} \right)^3 + \left(z^2 + \frac{1}{z^2} \right)^3 + \left(z^3 + \frac{1}{z^3} \right)^3 + \dots + \left(z^{21} + \frac{1}{z^{21}} \right)^3$$

is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/IXavMAZSM4](https://www.prepwiser.in/questions/IXavMAZSM4)

Q78 JEE Main 2021 · 18 Mar · Shift 2

If $f(x)$ and $g(x)$ are two polynomials such that the polynomial $P(x) = f(x^3) + x g(x^3)$ is divisible by $x^2 + x + 1$, then $P(1)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/qzZ4fk0ttX](https://www.prepwiser.in/questions/qzZ4fk0ttX)

Q79 JEE Main 2020 · 4 Sep · Shift 2

If a and b are real numbers such that

$$(2 + \alpha)^4 = a + b\alpha$$

where $\alpha = \frac{-1+i\sqrt{3}}{2}$ then $a + b$ is equal to :

(A) 33

(B) 9

(C) 24

(D) 57

[Step-by-step solution ► prepwiser.in/questions/AjQtwnSOEb](https://www.prepwiser.in/questions/AjQtwnSOEb)

Q80 JEE Main 2020 · 8 Jan · Shift 2

$$\text{Let } \alpha = \frac{-1+i\sqrt{3}}{2}.$$

$$\text{If } a = (1 + \alpha) \sum_{k=0}^{100} \alpha^{2k} \text{ and}$$

$$b = \sum_{k=0}^{100} \alpha^{3k}, \text{ then } a \text{ and } b \text{ are the roots of the quadratic equation :}$$

(A) $x^2 + 101x + 100 = 0$

(B) $x^2 + 102x + 101 = 0$

(C) $x^2 - 102x + 101 = 0$

(D) $x^2 - 101x + 100 = 0$

[Step-by-step solution ► prepwiser.in/questions/nmY5pn6Ako](https://www.prepwiser.in/questions/nmY5pn6Ako)

Modulus and Argument · 23 PYQs

Q81 JEE Main 2025 · 7 Apr · Shift 1

Among the statements

(S1) : The set $\{z \in \mathbb{C} - \{-i\} : |z| = 1 \text{ and } \frac{z-i}{z+i} \text{ is purely real}\}$ contains exactly two elements, and

(S2) : The set $\{z \in \mathbb{C} - \{-1\} : |z| = 1 \text{ and } \frac{z-1}{z+1} \text{ is purely imaginary}\}$ contains infinitely many elements.

(A) both are incorrect

(B) both are correct

(C) only (S2) is correct

(D) only (S1) is correct

[Step-by-step solution ► prepwiser.in/questions/MZajj49IYc](https://www.prepwiser.in/questions/MZajj49IYc)

Q82 JEE Main 2025 · 28 Jan · Shift 1

Let O be the origin, the point A be $z_1 = \sqrt{3} + 2\sqrt{2}i$, the point $B (z_2)$ be such that $\sqrt{3}|z_2| = |z_1|$ and $\arg(z_2) = \arg(z_1) + \frac{\pi}{6}$. Then

- (A) area of triangle ABO is $\frac{11}{4}$
- (B) area of triangle ABO is $\frac{11}{\sqrt{3}}$
- (C) ABO is a scalene triangle
- (D) ABO is an obtuse angled isosceles triangle

[Step-by-step solution ► prepwiser.in/questions/kY7pdaveya](https://www.prepwiser.in/questions/kY7pdaveya)

Q83 JEE Main 2025 · 22 Jan · Shift 1

Let z_1, z_2 and z_3 be three complex numbers on the circle $|z| = 1$ with $\arg(z_1) = \frac{-\pi}{4}, \arg(z_2) = 0$ and $\arg(z_3) = \frac{\pi}{4}$. If $|z_1\bar{z}_2 + z_2\bar{z}_3 + z_3\bar{z}_1|^2 = \alpha + \beta\sqrt{2}, \alpha, \beta \in \mathbb{Z}$, then the value of $\alpha^2 + \beta^2$ is :

- (A) 41
- (B) 29
- (C) 24
- (D) 31

[Step-by-step solution ► prepwiser.in/questions/QZp4p0FOZI](https://www.prepwiser.in/questions/QZp4p0FOZI)

Q84 JEE Main 2024 · 8 Apr · Shift 1

Let z be a complex number such that $|z + 2| = 1$ and $\operatorname{Im}\left(\frac{z+1}{z+2}\right) = \frac{1}{5}$. Then the value of $|\operatorname{Re}(\overline{z+2})|$ is

- (A) $\frac{2\sqrt{6}}{5}$
- (B) $\frac{24}{5}$
- (C) $\frac{\sqrt{6}}{5}$
- (D) $\frac{1+\sqrt{6}}{5}$

[Step-by-step solution ► prepwiser.in/questions/nTQyatp9uM](https://www.prepwiser.in/questions/nTQyatp9uM)

Q85 JEE Main 2024 · 6 Apr · Shift 2

If z_1, z_2 are two distinct complex number such that $\left|\frac{z_1 - 2z_2}{\frac{1}{2} - z_1\bar{z}_2}\right| = 2$, then

- (A) either z_1 lies on a circle of radius $\frac{1}{2}$ or z_2 lies on a circle of radius 1.
- (B) z_1 lies on a circle of radius $\frac{1}{2}$ and z_2 lies on a circle of radius 1.
- (C) either z_1 lies on a circle of radius 1 or z_2 lies on a circle of radius $\frac{1}{2}$.
- (D) both z_1 and z_2 lie on the same circle.

[Step-by-step solution ► prepwiser.in/questions/kjfQ6SiEoM](https://www.prepwiser.in/questions/kjfQ6SiEoM)

Q86 JEE Main 2024 · 5 Apr · Shift 1

Consider the following two statements :

Statement I: For any two non-zero complex numbers

$$z_1, z_2, (|z_1| + |z_2|) \left| \frac{z_1}{|z_1|} + \frac{z_2}{|z_2|} \right| \leq 2(|z_1| + |z_2|), \text{ and}$$

Statement II : If x, y, z are three distinct complex numbers and a, b, c are three positive real numbers such that $\frac{a}{|y-z|} = \frac{b}{|z-x|} = \frac{c}{|x-y|}$, then $\frac{a^2}{y-z} + \frac{b^2}{z-x} + \frac{c^2}{x-y} = 1$.

Between the above two statements,

- (A) both Statement I and Statement II are incorrect.
- (B) Statement I is correct but Statement II is incorrect.
- (C) Statement I is incorrect but Statement II is correct.
- (D) both Statement I and Statement II are correct.

[Step-by-step solution ► prepwiset.in/questions/KPuS-pnKK](https://www.prepwiset.in/questions/KPuS-pnKK)

Q87 JEE Main 2024 · 1 Feb · Shift 2

If z is a complex number such that $|z| \leq 1$, then the minimum value of $|z + \frac{1}{2}(3 + 4i)|$ is :

- (A) 2
- (B) $\frac{5}{2}$
- (C) $\frac{3}{2}$
- (D) 3

[Step-by-step solution ► prepwiset.in/questions/9HJEDvV_av](https://www.prepwiset.in/questions/9HJEDvV_av)

Q88 JEE Main 2024 · 31 Jan · Shift 1

If α denotes the number of solutions of $|1 - i|^x = 2^x$ and $\beta = \left(\frac{|z|}{\arg(z)} \right)$, where

$$z = \frac{\pi}{4}(1+i)^4 \left[\frac{1-\sqrt{\pi}i}{\sqrt{\pi}+i} + \frac{\sqrt{\pi}-i}{1+\sqrt{\pi}i} \right], i = \sqrt{-1}$$

, then the distance of the point (α, β) from the line $4x - 3y = 7$ is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiset.in/questions/EVrMQ_qsu0](https://www.prepwiset.in/questions/EVrMQ_qsu0)

Q89 JEE Main 2024 · 29 Jan · Shift 2

Let r and θ respectively be the modulus and amplitude of the complex number $z = 2 - i \left(2 \tan \frac{5\pi}{8} \right)$, then (r, θ) is equal to

- (A) $(2 \sec \frac{11\pi}{8}, \frac{11\pi}{8})$
- (B) $(2 \sec \frac{3\pi}{8}, \frac{3\pi}{8})$
- (C) $(2 \sec \frac{5\pi}{8}, \frac{3\pi}{8})$
- (D) $(2 \sec \frac{3\pi}{8}, \frac{5\pi}{8})$

[Step-by-step solution ► prepwiset.in/questions/LCHbFbSBYR](https://www.prepwiset.in/questions/LCHbFbSBYR)

Q90 JEE Main 2023 · 10 Apr · Shift 1

Let the complex number $z = x + iy$ be such that $\frac{2z-3i}{2z+i}$ is purely imaginary. If $x + y^2 = 0$, then $y^4 + y^2 - y$ is equal to :

- (A) $\frac{4}{3}$ (B) $\frac{3}{2}$
(C) $\frac{3}{4}$ (D) $\frac{2}{3}$

Step-by-step solution ► [prepwisser.in/questions/27AFKLVYuh](https://www.prepwisser.in/questions/27AFKLVYuh)

Q91 JEE Main 2023 · 8 Apr · Shift 1

If for $z = \alpha + i\beta$, $|z + 2| = z + 4(1 + i)$, then $\alpha + \beta$ and $\alpha\beta$ are the roots of the equation :

- (A) $x^2 + 2x - 3 = 0$ (B) $x^2 + 3x - 4 = 0$
(C) $x^2 + x - 12 = 0$ (D) $x^2 + 7x + 12 = 0$

Step-by-step solution ► [prepwisser.in/questions/OpduaBzVwv](https://www.prepwisser.in/questions/OpduaBzVwv)

Q92 JEE Main 2023 · 30 Jan · Shift 1

Let $z = 1 + i$ and $z_1 = \frac{1+i\bar{z}}{\bar{z}(1-z)+\frac{1}{z}}$. Then $\frac{12}{\pi} \arg(z_1)$ is equal to _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/i2nM_IuPSU](https://www.prepwisser.in/questions/i2nM_IuPSU)

Q93 JEE Main 2022 · 29 Jul · Shift 2

If $z \neq 0$ be a complex number such that $|z - \frac{1}{z}| = 2$, then the maximum value of $|z|$ is :

- (A) $\sqrt{2}$ (B) 1
(C) $\sqrt{2} - 1$ (D) $\sqrt{2} + 1$

Step-by-step solution ► [prepwisser.in/questions/9rMqVFnpCr](https://www.prepwisser.in/questions/9rMqVFnpCr)

Q94 JEE Main 2022 · 26 Jul · Shift 2

If $z = x + iy$ satisfies $|z| - 2 = 0$ and $|z - i| - |z + 5i| = 0$, then :

- (A) $x + 2y - 4 = 0$ (B) $x^2 + y - 4 = 0$
(C) $x + 2y + 4 = 0$ (D) $x^2 - y + 3 = 0$

Step-by-step solution ► [prepwisser.in/questions/-6cvNVrLM7](https://www.prepwisser.in/questions/-6cvNVrLM7)

Q95 JEE Main 2022 · 25 Jun · Shift 2

Let z_1 and z_2 be two complex numbers such that $\bar{z}_1 = i\bar{z}_2$ and $\arg\left(\frac{z_1}{z_2}\right) = \pi$. Then :

- (A) $\arg z_2 = \frac{\pi}{4}$ (B) $\arg z_2 = -\frac{3\pi}{4}$
(C) $\arg z_1 = \frac{\pi}{4}$ (D) $\arg z_1 = -\frac{3\pi}{4}$

Step-by-step solution ► [prepwisser.in/questions/qK0sihemr5](https://www.prepwisser.in/questions/qK0sihemr5)

Q96 JEE Main 2021 · 20 Jul · Shift 1

If z and ω are two complex numbers such that $|z\omega| = 1$ and $\arg(z) - \arg(\omega) = \frac{3\pi}{2}$, then

$$\arg\left(\frac{1 - 2\bar{z}\omega}{1 + 3\bar{z}\omega}\right)$$

is :

(Here $\arg(z)$ denotes the principal argument of complex number z)

(A) $\frac{\pi}{4}$

(B) $-\frac{3\pi}{4}$

(C) $-\frac{\pi}{4}$

(D) $\frac{3\pi}{4}$

[Step-by-step solution ► prepwisser.in/questions/9Q6HtGHN73](https://www.prepwisser.in/questions/9Q6HtGHN73)

Q97 JEE Main 2021 · 16 Mar · Shift 2

The least value of $|z|$ where z is complex number which satisfies the inequality

$$\exp\left(\frac{(|z| + 3)(|z| - 1)}{||z| + 1|} \log_e 2\right) \geq \log_{\sqrt{2}} |5\sqrt{7} + 9i|, i = \sqrt{-1}$$

, is equal to :

(A) 8

(B) 3

(C) 2

(D) $\sqrt{5}$

[Step-by-step solution ► prepwisser.in/questions/MikTs6Cc1Z](https://www.prepwisser.in/questions/MikTs6Cc1Z)

Q98 JEE Main 2021 · 16 Mar · Shift 1

Let z and ω be two complex numbers such that $\omega = z\bar{z} - 2z + 2$, $\left|\frac{z+i}{z-3i}\right| = 1$ and $\operatorname{Re}(\omega)$ has minimum value. Then, the minimum value of $n \in \mathbb{N}$ for which ω^n is real, is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/HfDmCGHU8I](https://www.prepwisser.in/questions/HfDmCGHU8I)

Q99 JEE Main 2021 · 16 Mar · Shift 1

Let a complex number z , $|z| \neq 1$,

satisfy

$$\log_{\frac{1}{\sqrt{2}}}\left(\frac{|z| + 11}{(|z| - 1)^2}\right) \leq 2$$

. Then, the largest value of $|z|$ is equal to _____.

(A) 5

(B) 8

(C) 6

(D) 7

[Step-by-step solution ► prepwisser.in/questions/gEzYmVty3D](https://www.prepwisser.in/questions/gEzYmVty3D)

Q100 JEE Main 2021 · 24 Feb · Shift 1

If the least and the largest real values of a , for which the equation $z + a|z - 1| + 2i = 0$ ($z \in \mathbb{C}$ and $i = \sqrt{-1}$) has a solution, are p and q respectively; then $4(p^2 + q^2)$ is equal to _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/MxyHsekAYE](https://www.prepwiser.in/questions/MxyHsekAYE)

Q101 JEE Main 2020 · 9 Jan · Shift 1

Let z be complex number such that

$$\left| \frac{z-i}{z+2i} \right| = 1 \text{ and } |z| = \frac{5}{2}.$$

Then the value of $|z + 3i|$ is :

- (A) $2\sqrt{3}$ (B) $\sqrt{10}$
(C) $\frac{15}{4}$ (D) $\frac{7}{2}$

[Step-by-step solution ► prepwiser.in/questions/Vjo3emo2-C](https://www.prepwiser.in/questions/Vjo3emo2-C)

Q102 JEE Main 2020 · 8 Jan · Shift 1

If the equation, $x^2 + bx + 45 = 0$ ($b \in \mathbb{R}$) has conjugate complex roots and they satisfy $|z + 1| = 2\sqrt{10}$, then :

- (A) $b^2 - b = 42$
(B) $b^2 + b = 12$
(C) $b^2 + b = 72$
(D) $b^2 - b = 30$

[Step-by-step solution ► prepwiser.in/questions/1_nZhar7T0](https://www.prepwiser.in/questions/1_nZhar7T0)

Q103 JEE Main 2020 · 7 Jan · Shift 2

If $\frac{3+i \sin \theta}{4-i \cos \theta}$, $\theta \in [0, 2\theta]$, is a real number, then an argument of $\sin \theta + i \cos \theta$ is :

- (A) $\pi - \tan^{-1} \left(\frac{3}{4} \right)$
(B) $-\tan^{-1} \left(\frac{3}{4} \right)$
(C) $\tan^{-1} \left(\frac{4}{3} \right)$
(D) $\pi - \tan^{-1} \left(\frac{4}{3} \right)$

[Step-by-step solution ► prepwiser.in/questions/wTsyn4-nbG](https://www.prepwiser.in/questions/wTsyn4-nbG)

Polar and Euler Form · 2 PYQs

Q104 JEE Main 2023 · 31 Jan · Shift 2

The complex number $z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$ is equal to :

- (A) $\cos \frac{\pi}{12} - i \sin \frac{\pi}{12}$
(B) $\sqrt{2} \left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12} \right)$
(C) $\sqrt{2}i \left(\cos \frac{5\pi}{12} - i \sin \frac{5\pi}{12} \right)$
(D) $\sqrt{2} \left(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12} \right)$

[Step-by-step solution ► prepwiser.in/questions/vGvLGtdpgS](https://www.prepwiser.in/questions/vGvLGtdpgS)

The value of

$$\left(\frac{1 + \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}}{1 + \sin \frac{2\pi}{9} - i \cos \frac{2\pi}{9}} \right)^3$$

is :

- (A) $\frac{1}{2} (\sqrt{3} - i)$
- (B) $-\frac{1}{2} (\sqrt{3} - i)$
- (C) $-\frac{1}{2} (1 - i\sqrt{3})$
- (D) $\frac{1}{2} (1 - i\sqrt{3})$

Step-by-step solution ► prepwisar.in/questions/OeYf8wwlyk

Answer key — Complex Numbers

Numbers match the question numbers above. For full working, open the solution link under each question.

1	A	2	A	3	B	4	A	5	A	6	B	7	A	8	D
9	D	10	C	11	13	12	D	13	B	14	1680	15	A	16	D
17	D	18	D	19	6	20	0	21	D	22	A	23	2	24	6
25	1	26	B	27	A	28	A	29	A	30	D	31	22	32	B
33	B	34	D	35	20	36	24	37	B	38	C	39	B	40	2
41	A	42	A	43	14	44	A	45	D	46	A	47	D	48	A
49	B	50	6	51	1	52	B	53	6	54	A	55	A	56	C
57	A	58	D	59	C	60	D	61	B	62	B	63	A	64	A
65	3	66	310	67	A	68	4	69	A	70	11	71	10	72	B
73	5	74	B	75	A	76	2	77	13	78	0	79	B	80	C
81	C	82	D	83	B	84	A	85	C	86	B	87	C	88	3
89	B	90	C	91	D	92	9	93	D	94	C	95	C	96	B
97	B	98	4	99	D	100	10	101	D	102	D	103	D	104	D
105	B														

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