

# Tarun Classes of Mathematics

IIT-JEE Mains | CBSE | PU-CET | NDA

Talwara Township, Hoshiarpur | +91 9463672753 | tarunclasses.in

## Complex Numbers

Subjects : Maths

Practice Questions and Pyqs

### Maths - Section A ( MCQ.)

- What is  $(1+i)^4 + (1-i)^4$  equal to, where  $i = \sqrt{-1}$ ?  
A) 4                      B) 0                      C) -4                      D) -8
- If  $\omega \neq 1$  is a cube root of unity, then what is  $(1 + \omega - \omega^2)^{100} + (1 - \omega + \omega^2)^{100}$  equal to?  
A)  $2^{100}\omega^2$                       B)  $2^{100}\omega$                       C)  $2^{100}$                       D)  $-2^{100}$
- If  $x, y$  and  $z$  are the cube roots of unity, then what is the value of  $xy + yz + zx$ ?  
A) 0                      B) 1                      C) 2                      D) 3
- If  $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$  then what is  $\begin{vmatrix} 1+\omega & 1+\omega^2 & \omega+\omega^2 \\ 1 & \omega & \omega^2 \\ \frac{1}{\omega} & \frac{1}{\omega^2} & 1 \end{vmatrix}$  equal to?  
A) 0                      B)  $\omega$                       C)  $\omega^2$                       D)  $1 - \omega^2$
- If  $\omega \neq 1$  is a cube root of unity, then what are the solution of  $(z - 100)^3 + 1000 = 0$ ?  
A)  $10(1 - \omega), 10(10 - \omega^2), 100$                       B)  $10(10 - \omega), 10(10 - \omega^2), 90$   
C)  $10(1 - \omega), 10(10 - \omega^2), 1000$                       D)  $(1 + \omega), (10 + \omega^2), -1$
- If  $z$  is any complex number and  $iz^3 + z^2 - z + i = 0$ , where  $i = \sqrt{-1}$ , then what is the value of  $(|z| + 1)^2$ ?  
A) 1                      B) 4                      C) 81                      D) 121
- Let  $z_1$  and  $z_2$  be two complex numbers such that  $\left| \frac{z_1 + z_2}{z_1 - z_2} \right| = 1$ , then what is  $\operatorname{Re}\left(\frac{z_1}{z_2}\right) + 1$  equal to?  
A) -1                      B) 0                      C) 1                      D) 5
- What is the value of the sum  $\sum_{n=1}^{20} (i^{n-1} + i^n + i^{n+1})$  where  $i = \sqrt{-1}$ ?  
A)  $-2i$                       B) 0                      C) 1                      D)  $2i$
- Consider equation-I:  $z^3 + 2z^2 + 2z + 1 = 0$  and equation -II:  $z^{1985} + z^{100} + 1 = 0$   
What is the number of common roots of equation-I and equation-II?  
A) 0                      B) 1                      C) 2                      D) 3
- If  $z\bar{z} = |z + \bar{z}|$ , where  $z = x + iy, i = \sqrt{-1}$  then the locus of  $z$  is a pair of:  
A) Straight lines                      B) rectangular hyperbolas                      C) parabolas                      D) circles

11. If  $\alpha$  and  $\beta$  are the distinct roots of equation  $x^2 - x + 1 = 0$ , then what is the value of  $\left| \frac{\alpha^{100} + \beta^{100}}{\alpha^{100} - \beta^{100}} \right|$  ?
- A)  $\sqrt{3}$                       B)  $\sqrt{2}$                       C) 1                      D)  $\frac{1}{\sqrt{3}}$
12. If  $\omega$  is a non-real cube root of 1, then what is the value of  $\left| \frac{1-\omega}{\omega+\omega^2} \right|$  ?
- A)  $\sqrt{3}$                       B)  $\sqrt{2}$                       C) 1                      D)  $\frac{4}{\sqrt{3}}$
13. Consider equation-I:  $z^3 + 2z^2 + 2z + 1 = 0$  and equation -II:  $z^{1985} + z^{100} + 1 = 0$   
What are the roots of equation - I?
- A)  $1, \omega, \omega^2$                       B)  $-1, \omega, \omega^2$                       C)  $1, -\omega, \omega^2$                       D)  $-1, -\omega, -\omega^2$
14. If  $z = \frac{1+i\sqrt{3}}{1-i\sqrt{3}}$  where  $i = \sqrt{-1}$ , then what is the argument of  $z$  ?
- A)  $\frac{\pi}{3}$                       B)  $\frac{2\pi}{3}$                       C)  $\frac{4\pi}{3}$                       D)  $\frac{5\pi}{6}$
15. If  $z$  is a complex number such that  $\frac{z-1}{z+1}$  is purely imaginary, then what is  $|z|$  equal to?
- A)  $\frac{1}{2}$                       B)  $\frac{2}{3}$                       C) 1                      D) 2
16. What is the value of  $\sqrt{12+5i} + \sqrt{12-5i}$ , where  $i = \sqrt{-1}$  ?
- A) 24                      B) 25                      C)  $5\sqrt{2}$                       D)  $5(\sqrt{2} - 1)$
17. What is the modulus of  $\left( \frac{\sqrt{3}}{2} - \frac{1}{2} \right)^{200}$  ?
- A)  $\frac{1}{4}$                       B)  $\frac{1}{2}$                       C) 1                      D)  $2^{200}$
18. If  $x^2 + x + 1 = 0$ , then what is the value of  $x^{199} + x^{200} + x^{201}$  ?
- A) -1                      B) 0                      C) 1                      D) 3
19. What is the modulus of the complex number  $\frac{\cos \theta + i \sin \theta}{\cos \theta - i \sin \theta}$ , where  $i = \sqrt{-1}$  ?
- A)  $\frac{1}{2}$                       B) 1                      C)  $\frac{3}{2}$                       D) 2
20. What is the value of  $\left[ \frac{1+\sqrt{3}}{2} \right]^{2019} + \left[ \frac{1-\sqrt{3}}{2} \right]^{2019}$  ?
- A) 1                      B) -1                      C)  $2i$                       D)  $-2i$
21. What is  $i^{1000} + i^{1001} + i^{1002} + i^{1003}$  equal to (where  $i = \sqrt{-1}$ )?
- A) 0                      B)  $i$                       C)  $-i$                       D) 1
22. What is the principal argument of  $(-1 - i)$ , where  $i = \sqrt{-1}$  ?
- A)  $\frac{\pi}{4}$                       B)  $-\frac{\pi}{4}$                       C)  $-\frac{3\pi}{4}$                       D)  $\frac{3\pi}{4}$
23. The number of non-zero integral solutions of the equation  $|1 - 2i|^x = 5^x$  is
- A) Zero (No solution)                      B) One                      C) Two                      D) Three
24. The value of the sum  $\sum_{n=1}^{13} (i^n + i^{n+1})$  where  $i = \sqrt{-1}$  is :
- A)  $i$                       B)  $-i$                       C) 0                      D)  $i - 1$
25. What is  $\frac{(1+i)^{4n+5}}{(1-i)^{4n+3}}$  equal to, where  $n$  is a natural number and  $i = \sqrt{-1}$  ?
- A) 2                      B)  $2i$                       C)  $-2i$                       D)  $i$
26.  $(x^3 - 1)$  can be factorised as  
where  $\omega$  is one of the cube roots of unity.

- A)  $(x-1)(x-\omega)(x+\omega^2)$       B)  $(x-1)(x-\omega)(x-\omega^2)$   
 C)  $(x-1)(x+\omega)(x+\omega^2)$       D)  $(x-1)(x+\omega)(x-\omega^2)$
27. If  $1, \omega, \omega^2$  are the cube roots of unity, then the value of  $(1+\omega)(1+\omega^2)(1+\omega^4)(1+\omega^8)$  is  
 A) -1      B) 0      C) 1      D) 2
28. What is  $\omega^{100} + \omega^{200} + \omega^{300}$  equal to, where  $\omega$  is the cube root of unity?  
 A) 1      B)  $3\omega$       C)  $3\omega^2$       D) 0
29. If  $z = \left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^{107} + \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^{107}$ , then what is the imaginary part of  $z$  equal to?  
 A) 0      B)  $\frac{1}{2}$       C)  $\frac{\sqrt{3}}{2}$       D) 1
30. The smallest positive integer  $n$  for which  $\left(\frac{1+i}{1-i}\right)^n = 1$ , is  
 A) 1      B) 4      C) 8      D) 16
31. If  $1, \omega, \omega^2$  are the cube roots of unity, then  $(1+\omega)(1+\omega^2)(1+\omega^3)(1+\omega+\omega^2)$  is equal to  
 A) -2      B) -1      C) 0      D) 2
32. The smallest positive integral value of  $n$  for which  $\left(\frac{1-i}{1+i}\right)^n$  is purely imaginary with positive imaginary part is  
 A) 1      B) 3      C) 4      D) 5
33. Let  $\alpha$  and  $\beta$  be the roots of the equation  $x^2 + x + 1 = 0$ . The equation whose roots are  $\alpha^{19}$  and  $\beta^7$  is  
 A)  $x^2 - x - 1 = 0$       B)  $x^2 - x + 1 = 0$       C)  $x^2 + x - 1 = 0$       D)  $x^2 + x + 1 = 0$
34. What is the value of  $1 + i^2 + i^4 + i^6 + \dots + i^{100}$  where  $i = \sqrt{-1}$ ?  
 A) 0      B) 1      C) -1      D) None of the above
35. What is the least positive integer  $n$  for which  $\left(\frac{1+i}{1-i}\right)^n = 1$ ?  
 A) 16      B) 12      C) 8      D) 4
36. What is the value of  $\left(\frac{i+\sqrt{3}}{-i+\sqrt{3}}\right)^{200} + \left(\frac{i-\sqrt{3}}{i+\sqrt{3}}\right) + 1$ ?  
 A) -1      B) 0      C) 1      D) 2
37. Consider equation-I:  $z^3 + 2z^2 + 2z + 1 = 0$  and equation -II:  $z^{1985} + z^{100} + 1 = 0$   
 Which of the following is a root of equation-I?  
 A) -1      B)  $-\omega$       C)  $-\omega^2$       D)  $\omega$
38. If  $z_1, z_2$  are complex numbers such that  $\frac{2z_1}{3z_2}$  is a purely imaginary number, then the value of  $\left|\frac{z_1-z_2}{z_1+z_2}\right|$  is  
 A) 1      B) 2      C) 3      D) 4
39. If  $z = x - iy$  and  $z^{1/3} = p + iq$  ( $x, y, p, q \in \mathbb{R}$ ), then  $\frac{\left(\frac{x}{p} + \frac{y}{q}\right)}{(p^2+q^2)}$  is equal to  
 A) 2      B) -1      C) 1      D) -2
40. If  $\theta \in \mathbb{R}$  and  $\frac{1-i\cos\theta}{1+2i\cos\theta}$  is real number, then  $\theta$  will be (when  $I$  : Set of integers)  
 A)  $(2n+1)\frac{\pi}{2}, n \in I$       B)  $\frac{3n\pi}{2}, n \in I$       C)  $n\pi, n \in I$       D)  $2n\pi, n \in I$
41. The expression  $\frac{(1+i)^n}{(1-i)^{n-2}}$  equals  
 A)  $-i^{n+1}$       B)  $i^{n+1}$       C)  $-2i^{n+1}$       D) 1

42. If  $z_1, z_2, z_3$  are imaginary numbers such that  $|z_1| = |z_2| = |z_3| = \left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right| = 1$ , then  $|z_1 + z_2 + z_3|$  is
- A) equal to 1      B) less than 1      C) greater than 1      D) equal to 3
43. The value of  $\left( \frac{1+\sqrt{3}i}{1-\sqrt{3}i} \right)^{64} + \left( \frac{1-\sqrt{3}i}{1+\sqrt{3}i} \right)^{64}$  is
- A) 0      B) -1      C) 1      D)  $i$
44. If  $\alpha$  and  $\beta$  are roots of  $x^2 - x + 1 = 0$ , then the value of  $\alpha^{2013} + \beta^{2013}$  is
- A) 2      B) -2      C) -1      D) 1
45. If  $\frac{z-1}{z+1}$  is purely imaginary, then
- A)  $|z| = \frac{1}{2}$       B)  $|z| = 1$       C)  $|z| = 2$       D)  $|z| = 3$
46. If  $\left( \frac{3}{2} + i\frac{\sqrt{3}}{2} \right)^{50} = 3^{25}(x + iy)$  where  $x$  and  $y$  are real, then the ordered pair  $(x, y)$  is
- A) (-3,0)      B) (0,3)      C) (0,-3)      D)  $\left( \frac{1}{2}, \frac{\sqrt{3}}{2} \right)$
47. If  $i = \sqrt{-1}$  and  $n$  is a positive integer, then  $i^n + i^{n+1} + i^{n+2} + i^{n+3}$  is equal to
- A) 1      B)  $i$       C)  $i^n$       D) 0
48. The argument of the complex number  $\sin\left(\frac{6\pi}{5}\right) + i\left(1 + \cos\frac{6\pi}{5}\right)$  is
- A)  $\frac{\pi}{10}$       B)  $\frac{5\pi}{6}$       C)  $\frac{-\pi}{10}$       D)  $\frac{2\pi}{5}$
49. The modulus of  $[1 - \cos \theta + i \sin \theta]^{-1}$  is
- A)  $\frac{1}{2} \operatorname{cosec} \frac{\theta}{2}$       B)  $\operatorname{cosec} \frac{\theta}{2}$   
C)  $\frac{1}{2} \left| \operatorname{cosec} \frac{\theta}{2} \right|$       D)  $\left| \operatorname{cosec} \frac{\theta}{2} \right|$
50. The value of  $\frac{i^{1004} + i^{1006} + i^{1008} + i^{1010} + i^{1012}}{i^{510} + i^{508} + i^{506} + i^{504} + i^{502}}$  is
- A) 1      B)  $-i$       C)  $i$       D)  $-1$

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## Complex Numbers

Subjects : Maths

Practice Questions and Pyqs

### Maths - Section A ( MCQ.)

|        |        |        |        |        |        |        |        |        |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 - D  | 2 - D  | 3 - A  | 4 - A  | 5 - B  | 6 - B  | 7 - C  | 8 - B  | 9 - C  | 10 - D |
| 11 - D | 12 - A | 13 - B | 14 - B | 15 - C | 16 - C | 17 - C | 18 - B | 19 - B | 20 - C |
| 21 - A | 22 - C | 23 - A | 24 - D | 25 - A | 26 - B | 27 - C | 28 - D | 29 - A | 30 - B |
| 31 - C | 32 - B | 33 - D | 34 - B | 35 - D | 36 - A | 37 - D | 38 - A | 39 - D | 40 - A |
| 41 - C | 42 - A | 43 - B | 44 - B | 45 - B | 46 - D | 47 - D | 48 - C | 49 - C | 50 - D |

