

Maxprap. Chapter wise Series Class 11th - Complex Number

Class : 11th

Subject: Mathematics

Max. Marks : 60

Duration : 2 Hrs

Sections: A (MCQs), B (Short Answer-I), C (Short Answer-II), D (Long Answer), E (Case-Based).

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 23 questions divided into five Sections A, B, C, D and E. (iii). Section A comprises of 10 MCQs of 1 mark each. Section B comprises of 5 questions of 2 marks each. Section C comprises of 4 questions of 3 marks each. Section D comprises of 4 question of 5 marks each and Section E comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted.

Section A

Questions 1 to 10 carry 1 mark each

1. The value of $\frac{(i^5+i^6+i^7+i^8+i^9)}{(1+i)}$ is
a) $\frac{1}{2}$ b) $\frac{1}{2}(1+i)$ c) $\frac{1}{2}(1-i)$ d) 1
2. If $z = (2 + \sqrt{-5})$ then $|z| = ?$
a) 7 b) 6 c) 3 d) 9
3. The least value of n for which $\left(\frac{1+i}{1-i}\right)^n$ is a positive integer is
a) 1 b) 4 c) 8 d) 2
4. If $z = \frac{1+2i}{1-(1-i)^2}$, then $\arg(z)$ equals
a) $\frac{\pi}{4}$ b) 0 c) π d) $\frac{\pi}{2}$
5. If $x + iy = \frac{3+5i}{7-6i}$, then $y =$
a) $\frac{-9}{85}$ b) $\frac{53}{85}$ c) $\frac{43}{85}$ d) $\frac{9}{85}$
6. If $(x + iy)^{1/3} = a + ib$, then $\frac{x}{a} + \frac{y}{b} =$
a) None of these b) 0 c) 1 d) - 1
7. The value of $(1+i)(1+i^2)(1+i^3)(1+i^4)$ is
a) 1 b) 2 c) 0 d) i
8. If $z = \frac{(1-i\sqrt{3})}{2(1-i)}$ then $|z| = ?$

a) $\frac{1}{\sqrt{2}}$

b) $\frac{1}{\sqrt{3}}$

c) $\frac{1}{2\sqrt{3}}$

d) $\frac{1}{2\sqrt{2}}$

Assertion(A)/Reason(R) Based (9-10): In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

9. Assertion (A): The value of $\frac{i^{592} + i^{590} + i^{588} + i^{586} + i^{584}}{i^{582} + i^{580} + i^{578} + i^{576} + i^{574}}$ is -1 .

Reason (R): The value of $i^n + i^{n+1} + i^{n+2} + \dots + i^{n+7}$ is 0.

10. Assertion (A): The multiplicative inverse of z is denoted by z^{-1} or $\frac{1}{z} = \frac{\bar{z}}{|z|^2}$.

Reason (R): if $z_1 = 2 + 3i$ and $z_2 = 1 + 2i$, then $\frac{z_1}{z_2} = \frac{8}{5} - \frac{1}{5}i$.

SECTION – B

Questions 11 to 15 carry 2 marks each

11. Evaluate: $(i^{77} + i^{70} + i^{87} + i^{414})^3$

12. Find $\frac{z_1}{z_2}$ where, $z_1 = 1 + 3i$, $z_2 = 2 + 5i$

13. Find the conjugates the complex numbers: $\frac{(1+i)(2+i)}{3+i}$.

14. Evaluate: $2x^3 + 2x^2 - 7x + 72$, when $x = \frac{3-5i}{2}$.

15. If $\frac{(1+i)^2}{2-i} = x + iy$, then find the value of $x + y$.

SECTION – C

Questions 16 to 19 carry 3 marks each

16. Convert the complex number $(2\sqrt{3} - 2i)$ into polar form.

17. Find the square root of $-2 + 2\sqrt{3}i$

18. If $(x + iy)^{1/3} = a + ib$, where $x, y, a, b \in \mathbb{R}$, then show that $\frac{x}{a} - \frac{y}{b} = -2(a^2 + b^2)$.

19. If $x - iy = \sqrt{\frac{a-ib}{c-id}}$ prove that $(x^2 + y^2)^2 = \frac{a^2 + b^2}{c^2 + d^2}$

SECTION – D

Questions 20 to 23 carry 5 marks each

20. Find the modulus and argument of $z = \frac{(1+i)^{13}}{(1-i)^7}$.

21. If $x - iy = \sqrt{\frac{a-ib}{c-id}}$, then prove that $x^2 + y^2 = \sqrt{\frac{a^2+b^2}{c^2+d^2}}$.

22. Change the complex number $2 - 2i$ into polar form.

23. Find the real values of θ for which $\left(\frac{1+i\cos\theta}{1-2i\cos\theta}\right)$ is purely real.

SECTION – E (Case Study Based Questions)

Questions 24 & 25 carry 4 marks each

24. Read the following text carefully and answer the questions that follow:

Two complex numbers $Z_1 = a + ib$ and $Z_2 = c + id$ are said to be equal, if $a = c$ and $b = d$.

a) If $(x + iy)(2 - 3i) = 4 + i$ then find the value of (x, y) . (1)

b) If $\frac{(1+i)^2}{2-i} = x + iy$, then find the value of $x + y$. (1)

c) If $\left(\frac{1-i}{1+i}\right)^{100} = a + ib$, then find the values of a and b . (2)

OR

If $(a - 2, 2b + 1) = (b - 1, a + 2)$, then find the real values of a and b . (2)

25. Read the following text carefully and answer the questions that follow:

The conjugate of a complex number z , is the complex number, obtained by changing the sign of imaginary part of z . It is denoted by $\bar{z}$.

The modulus (or absolute value) of a complex number, $z = a + ib$ is defined as the non-negative real number $\sqrt{a^2 + b^2}$. It is denoted by $|z|$. i.e.

$$|z| = \sqrt{a^2 + b^2}$$

Multiplicative inverse of z is $\frac{\bar{z}}{|z|^2}$. It is also called reciprocal of z . $z\bar{z} = |z|^2$

d) If $f(z) = \frac{7-z}{1-z^2}$, where $z = 1 + 2i$, then find $|f(z)|$. (1)

e) Find the value of $(z + 3)(\bar{z} + 3)$. (1)

f) If $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$, then find the value of $x + y$. (2)

OR

If $z = 3 + 4i$, then find $\bar{z}$. (2)

Objective Questions		
MCQ	1 marks x 8 question = 8	
Assertion Reason	1 marks x 2 question = 2	
Subjective		
Short type I	2 marks x 5 question = 10	
Short type II	3 marks x 4 question = 12	
Long Type	5 marks x 4 question = 20	
Case Studies Based		
Case 1	4 marks	
Case 2	4 marks	

Total = 60 marks Your Score =