Unit-1 MCQs

Multiple Choice Questions (MCQs)

Exercise 1.1

1. If $z = x + iy$ is a complex number then, y is called ----- of z.
   (A) Re(z) (B) Im(z) (C) complex part (D) all of these
2. Conjugate of complex number $-2+3i$ is -----
   (A) $2-3i$ (B) $2+3i$ (C) $-2-3i$ (D) $-2+3i$
3. The modulus of a complex number $x+iy$ is equal -----
   (A) $\sqrt{x+y}$ (B) $\sqrt{x^2-y^2}$ (C) $\sqrt{x^2+y^2}$ (D) none of these
4. Multiplicative inverse of complex number $(\sqrt{2}, -\sqrt{5})$ is -----
   (A) $\left(\frac{\sqrt{2}}{\sqrt{7}}, \frac{\sqrt{5}}{\sqrt{7}}\right)$ (B) $\left(-\frac{\sqrt{2}}{\sqrt{7}}, -\frac{\sqrt{5}}{\sqrt{7}}\right)$ (C) $\left(\frac{\sqrt{2}}{7}, \frac{\sqrt{5}}{7}\right)$ (D) $\left(-\frac{\sqrt{2}}{7}, -\frac{\sqrt{5}}{7}\right)$
5. $i^2 . i^4 . i^6 . i^8$ equals to:
   (A) 1 (B) 0 (C) -1 (D) i

Exercise 1.2

6. If $(x+iy)^2 = a+ib$, then $x^2-y^2 =$ -----
   (A) a^2-b^2 (B) a^2+b^2 (C) a (D) b
7. If z_1 & z_2 are two complex numbers then $\overline{z_1 z_2} =$
   (A) $\overline{z_1}\,\overline{z_2}$ (B) $z_1 z_2$ (C) $\overline{z_1} . z_2$ (D) none of these
8. If z_1 & z_2 are two complex numbers then $\overline{z_1+z_2} =$
   (A) $\overline{z_1}+\overline{z_2}$ (B) $\overline{z_1}-\overline{z_2}$ (C) z_1+z_2 (D) none of these
9. Square root of a complex number $z = x+iy$, where $x, y \in R$ is -----
   (A) $\pm\left(\sqrt{\frac{|z|+x}{2}} + i\sqrt{\frac{|z|-x}{2}}\right)$ (B) $\pm\left(\sqrt{\frac{|z|+x}{2}} + \frac{i}{|y|}\sqrt{\frac{|z|-x}{2}}\right)$
   (C) $\pm\left(\sqrt{\frac{|z|+x}{2}} + \frac{iy}{|y|}\sqrt{\frac{|z|-x}{2}}\right)$ (D) none of these
10. Square root of complex number $5+12i$ is -----
    (A) $3+2i$ (B) $-3-2i$ (C) $\pm(3+2i)$ (D) $-3+2i$

Exercise 1.3

11. Factors of the complex polynomial $P(z) = z^2 + (i-3)z - 3i$ are:
    (A) $(z-i)(z-3)$ (B) $(z+i)(z+3)$ (C) $(z+i)(z-3)$ (D) $(z-i)(z+3)$
12. If p(z) is a polynomial function, the values of z that satisfy $P(z) = 0$ are called the ----- of the function $P(z)$.
    (A) roots (B) zeros (C) solutions (D) values
13. The complex roots of polynomial $z^2 + 4 = 0$ are -----
    (A) $2i, -3i$ (B) $2i, -2i$ (C) $4, -4$ (D) $\sqrt{2}, -\sqrt{2}$

Exercise 1.4

15. If 'ω' be the cube root of unity, then $\omega^2 =$ -----

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

16. Three cube roots of -27 are -----

(A) $3, \omega, \omega^2$ (B) $-3, -3\omega, -3\omega^2$ (C) $3, 3\omega, 3\omega^2$ (D) $1, \omega, \omega^2$

17. If ω is the imaginary cube roots of unity then $\omega^2 =$ -----

(A) ω (B) ω^{-1} (C) $\frac{1}{\omega^2}$ (D) ω^3

18. For any $n \in Z$, ω^n is equivalent to -----

(A) 1 or ω or ω^2 (B) $2, 2\omega, 2\omega^2$ (C) $3, 3\omega, 3\omega^2$ (D) $\pm i, 2$

19. Product of all the four 4th roots of unity is -----

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

Exercise 1.5

20. Polar form of a complex number $1+i\sqrt{3}$ is -----

(A) $2\cos30^\circ + i2\sin30^\circ$ (B) $2\sin60^\circ + i2\cos60^\circ$ (C) $2\cos60^\circ + i2\sin60^\circ$ (D) $2\cos60^\circ - i2\sin60^\circ$

21. The range for principal argument θ of a complex number $z = a+bi$ is -----

(A) $[-\pi, \pi]$ (B) $(-\pi, \pi]$ (C) $[-\pi, \pi)$ (D) $(-\pi, \pi)$

22. If $\arg(z_1) = \theta_1$ and $\arg(z_2) = \theta_2$, then $\arg(z_1 \cdot z_2) =$ -----

(A) $\theta_1 - \theta_2$ (B) $\theta_1 + \theta_2$ (C) $\theta_1 . \theta_2$ (D) $\frac{\theta_1}{\theta_2}$

23. If $z_1 = 5\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$ and $z_2 = 4\left(\cos\frac{3\pi}{2} + i\sin\frac{3\pi}{2}\right)$ then $\arg(z_1 \cdot z_2) =$ -----

(A) $\frac{5\pi}{6}$ (B) $\frac{3\pi}{2}$ (C) $\frac{5\pi}{3}$ (D) $\frac{10\pi}{3}$

24. The encrypted form of letter T from word MATH by using encryption key $k = 2+3i$ is -----

(A) $13+0i$ (B) $20+0i$ (C) $8+0i$ (D) $1+0i$

ANSWER KEY

1.	B	2.	C	3.	C	4.	C	5.	A	6.	C	7.	A	8.	A	9.	C	10.	C
11.	C	12.	B	13.	B	14.	B	15.	A	16.	B	17.	B	18.	A	19.	A	20.	C
21.	B	22.	B	23.	C	24.	B												

Formula Sheet

1. Addition: $(a+ib)+(c+id)=(a+c)+i(b+d)$
2. Subtraction: $(a+ib)-(c+id) = (a-c)+i(b-d)$
3. Multiplication: $(a+ib)(c+id) = (ac-bd)+i(ad+bc)$
4. If k is any real number, then $k(a+ib)=ka+ikb$
5. $a+bi=c+di \Leftrightarrow a=c$ and $b=d$.
6. $|x+iy|=\sqrt{x^2+y^2}$
7. $\sqrt{x+iy} = \pm\left(\sqrt{\frac{|z|+x}{2}}+\frac{iy}{|y|}\sqrt{\frac{|z|-x}{2}}\right)$, where $|z| = \sqrt{x^2+y^2} \geq 0$ is modulus of z.
8. If $\frac{-1+\sqrt{3}i}{2}=\omega$, then $\frac{-1-\sqrt{3}i}{2}=\omega^2$ Or If $\frac{-1-\sqrt{3}i}{2}=\omega$, then $\frac{-1+\sqrt{3}i}{2}=\omega^2$
9. If $1, \omega, \omega^2$ are the cube roots of unity, then $1+\omega+\omega^2=0$ and $\omega^3 = 1$.
10. Polar form of $x+iy=r\cos\theta+ir\sin\theta$
11. If $z=a+bi$, then $\arg z=\theta=\tan^{-1}\left(\frac{b}{a}\right)$, $(a \neq 0)$ and for principal argument θ : $-\pi<\theta\leq\pi$
12. If $z_1=r_1(\cos\theta_1+i\sin\theta_1)$ and $z_2=r_2(\cos\theta_2+i\sin\theta_2)$ be two complex number in polar form, then
    - i) Addition: $z_1+z_2=r_1(\cos\theta_1+i\sin\theta_1)+r_2(\cos\theta_2+i\sin\theta_2)$
    - ii) Subtraction: $z_1-z_2=r_1(\cos\theta_1+i\sin\theta_1)-r_2(\cos\theta_2+i\sin\theta_2)$
    - iii) Multiplication: $z_1\cdot z_2=r_1\cdot r_2[\cos(\theta_1+\theta_2)+i\sin(\theta_1+\theta_2)]$
        - $\arg(z_1\cdot z_2)=\arg(z_1)+\arg(z_2)$