WORKSHEET DA Y 5

Questions based on Imaginary Numbers

Q.1 $i^{57} + 1/i^{125}$ is equal to –
(A) 0 (B) –2i
(C) 2i (D) 2

Q.2 $\{1 + (-i)^{4n+3}\}(1 - i)$ $(n \in N)$ equlas –
(A) 2 (B) – 1
(C) – 2 (D) i

Q.3 $\left(\frac{-1-i}{\sqrt{2}}\right)^{100}$ equals -
(A) 1 (B) – i
(C) i (D) – 1

Q.4 The value of $(-i)^{-117}$ is -
(A) – 1 (B) i
(C) 1 (D) – i

Q.5 $(i^{10} + 1)(i^9 + 1)(i^8 + 1).....(i + 1)$ equals-
(A) – 1 (B) 1
(C) i (D) 0

Q.6 i^{243} equals -
(A) – 1 (B) 1
(C) i (D) – i

Q.7 $\frac{1+i^2+i^3+i^4+i^5}{1+i}$ equals -
(A) 1 – i (B) (1 + i)/2
(C) (1 – i)/2 (D) 1 + i

Q.8 If $k \in N$, then $\frac{i^{4k+1}-i^{4k-1}}{2}$ is equal to -
(A) – 1 (B) i
(C) 1 (D) – i

Q.9 The value of $(1 + i)^{2n} + (1 - i)^{2n}$ $(n \in N)$ is zero, if -
(A) n is odd (B) n is multiple of 4
(C) n is even (D) $\frac{n}{2}$ is odd

Q.10 The value of the expression $\frac{i^{592}+i^{590}+i^{588}+i^{586}+i^{584}}{i^{582}+i^{580}+i^{578}+i^{576}+i^{574}}$ is -
(A) 0 (B) 1
(C) – 1 (D) –2

Questions based on Complex Number

Q.11 The real and imaginary parts of $\frac{5+3i}{i-2}$ are-
(A) –5 / 2, 3 (B) –1, – 3/ 5
(C) –7 / 5, –11/5 (D) 7 / 5, –11/5

Q.12 The value of $\frac{1}{1-i} - \frac{1}{1+i}$ is -
(A) purely rational (B) purely imaginary
(C) purely real (D) None of these

Q.13 The conjugate of $\frac{(2+i)^2}{3+4i}$ is -
(A) 1 (B) purely imaginary
(C) – 1 (D) None of these

Q.14 $(x, y)^2$ is equal to-
(A) $(x^2 - y^2, 0)$ (B) $(x^2 - y^2, 2xy)$
(C) (x^2, y^2) (D) (2x, 2y)

Q.15 The conjugate of $\frac{3+2i}{5-3i}$ is equal to-
(A) $-\frac{1}{34}(9 + 19i)$ (B) $\frac{1}{34}(9 - 19i)$
(C) $\frac{1}{34}(19i - 9)$ (D) $\frac{1}{34}(9 + 19i)$

Q.16 If $z^2 = (\bar{z})^2$, then which statement is true -
(A) z is imaginary
(B) z is real
(C) $z = -\bar{z}$
(D) z is real or imaginary

Q.17 If $z = \cos\theta + i\sin\theta$, then $\frac{1+z}{1-z}$ is equal to
(A) $i\tan\theta$ (B) $i\cot\theta/2$
(C) $i\cot\theta$ (D) $i\tan\theta/2$

Q.18 If $I\left(\frac{2z+1}{iz+1}\right) = -2$, then the locus of z is -
(A) a parabola (B) a straight line
(C) a circle (D) a coordinate axis

Q.19 Which of the following is a complex number
(A) $\left(\tan\pi, \tan\frac{\pi}{2}\right)$ (B) $\left(\sqrt{e}, i^8\right)$
(C) $\left(0, \sqrt{-1}\right)$ (D) None of these

Q.20 Which one is a complex number ?
(A) (i^4, i^5) (B) (i^8, i^{12})
(C) $(\sqrt{-4}, 4)$ (D) {log 2, log (–1)}

Q.21 Which of the following is the correct statement ?
(A) $1 - i < 1 + i$ (B) $2i > i$
(C) $2i + 1 > -2i + 1$ (D) None of these

Q.22 $a + ib > c + id$ is meaningful if -
(A) a = 0, d = 0 (B) a = 0, c = 0
(C) b = 0, c = 0 (D) d = 0, b = 0

Q.23 The number $\frac{3+2i}{2-5i} + \frac{3-2i}{2+5i}$ is -
(A) zero (B) purely real
(C) purely imaginary (D) complex

Q.24 If $\sqrt{x}\ (i + \sqrt{y}) - 15 = i\ (8 - \sqrt{y})$. Then x & y equals to-
(A) 25 , 5 (B) 25 , 9
(C) 9 , 5 (D) 5 , 16

Q.25 If $(x + iy)(2 - 3i) = 4 + i$, then -
(A) $x = -\frac{5}{13}, y = \frac{14}{13}$
(B) $x = \frac{5}{13}, y = -\frac{14}{13}$
(C) $x = \frac{14}{13}, y = \frac{5}{13}$
(D) $x = \frac{5}{13}, y = \frac{14}{13}$

Q.26 The value of x and y which satisfies the equation $\frac{(1+i)^2}{(1-i)^2} + \frac{1}{x+iy} = 1 + i$ is -
(A) $x = \frac{2}{5}, y = -\frac{1}{5}$
(B) $x = -\frac{2}{5}, y = -\frac{1}{5}$
(C) $x = -\frac{2}{5}, y = \frac{1}{5}$
(D) $x = \frac{2}{5}, y = \frac{1}{5}$

Q.27 If $z = -3 + 2i$, then $1/z$ is equal to-
(A) $-\frac{1}{13}(3 + 2i)$ (B) $\frac{1}{13}(3 + 2i)$
(C) $\frac{1}{\sqrt{13}}(3 + 2i)$ (D) $-\frac{1}{\sqrt{13}}(3 + 2i)$

Q.28 If $2\sin\theta - 2i\cos\theta = 1 + i\sqrt{3}$, then value of θ is-
(A) $\frac{\pi}{6}$ (B) $\frac{5\pi}{6}$
(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

Q.29 If $z_1, z_2 \in C$, then which statement is true ?
(A) $R(z_1 - z_2) = R(z_1) - R(z_2)$
(B) $R(z_1 / z_2) = R(z_1) / R(z_2)$
(C) $R(z_1 z_2) = R(z_1)\ R(z_2)$
(D) None of these

Q.30 If $z_1, z_2 \in C$, then wrong statement is-
(A) $\overline{z_1 + z_2} = \bar{z}_2 + \bar{z}_1$
(B) $|z_1\ \overline{z_2}| = |z_2|\ |z_1|$
(C) $\overline{z_1 z_2} = \overline{z_2}\ \overline{z_1}$
(D) $|z_1 + \overline{z_2}| = |z_1 - \overline{z_2}|$

Q.31 If $z = x + iy$, then $\frac{z-\bar{z}}{z+\bar{z}}$ is equal to-
(A) i (y/x) (B) y/x
(C) i (x/y) (D) x/y

Q.32 For any complex number z which statement is true -
(A) $z - \bar{z}$ is purely real number
(B) $z + \bar{z}$ is purely imaginary number
(C) $z\bar{z}$ is purely imaginary number
(D) $z\bar{z}$ is non-negaitve real number

Q.33 If z and $\bar{z}$ are equal then locus of the point z in the complex plane is
(A) real axis (B) circle
(C) imaginary axis (D) None of these

Q.34 If $c^2 + s^2 = 1$, then $\frac{1+c+is}{1+c-is} =$
(A) c + i s (B) s + i c
(C) c – i s (D) s – ic

Q.35 For any complex number z, $\bar{z} = (1/z)$, if -
(A) z is purely imaginary
(B) $|z| = 1$
(C) z is purely real
(D) $z = 1$

Q.36 If $z = 1 + i$, then multiplicative inverse of z^2 is -
(A) 2i (B) –i/2
(C) i/2 (D) 1 – i

Questions based on Modulus of a Complex Number

Q.37 The modulus of complex number $z = -2i(1-i)^2(1+i\sqrt{3})^3$ is –
(A) 32 (B) 0
(C) – 32 (D) 1

Q.38 The modulus of sum of complex numbers $-4 + 3i$ and $-8 + 6i$ is-
(A) equal to sum of moduli
(B) greater than or equal to sum of moduli
(C) less than or equal to sum of moduli
(D) none of these

Q.39 If $z_1 = 2 + i$, $z_2 = 3 - 2i$, then value of $\left|\frac{2z_2 + z_1 - 5 - i}{2z_1 - z_2 + 3 - i}\right|^2$ is -
(A) 2
(B) 1
(C) 0
(D) None of these

Q.40 Modulus of $\frac{\cos\theta - i\sin\theta}{\sin\theta - i\cos\theta}$ is -
(A) 0 (B) 2θ
(C) $\pi - 2\theta$ (D) None of these

Q.41 If $z = x + iy$ and $|z - 3| = R(z)$, then locus of z is-
(A) $y^2 = -3(2x + 3)$
(B) $y^2 = 3(2x + 3)$
(C) $y^2 = -3(2x - 3)$
(D) $y^2 = 3(2x - 3)$

Q.42 If z_1 and z_2 are any two complex numbers, then $\frac{|z_2 + z_1|}{||z_2| - |z_1||}$ is -
(A) ≤ 1 (B) ≥ 1
(C) ≥ -1 (D) None of these

Q.43 If $|z| + 2 = I(z)$, then $z = (x, y)$ lies on -
(A) $y^2 = -4(x - 1)$ (B) $y^2 = 4(x - 1)$
(C) $x^2 = -4(y - 1)$ (D) No locus

Q.44 The complex number z which satisfy the condition $|z| + z = 0$ always lie on-
(A) y-axis (B) x-axis
(C) x-axis and $x \leq 0$ (D) $x = y$

Q.45 If $(-7 - 24i)^{1/2} = x - iy$, then $x^2 + y^2$ is equal to-
(A) $\sqrt{25}$ (B) 25
(C) 15 (D) None of these

Q.46 If z_1 and z_2 be two complex numbers, then which statement is true -
(A) $|z_1 + z_2| \leq |z_1| + |z_2|$
(B) $|z_1 - z_2| = |z_1| + |z_2|$
(C) $|z_1 + z_2| \geq |z_1 - z_2|$
(D) $|z_1 + z_2| \geq |z_1| + |z_2|$

Q.47 If $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, then $a^2 + b^2$ is equal to -
(A) 2 (B) 1
(C) 3 (D) 4

Questions based on Amplitude of a Complex Number

Q.48 If amp $(z_i) = \theta_i$, i = 1, 2, 3; then amp $\left(\frac{z_1}{z_2\,\bar{z}_3}\right)$ is equal to-
(A) $\frac{\theta_1}{\theta_2\theta_3}$ (B) $\frac{\theta_1\theta_2}{\theta_3}$
(C) $\theta_1 - \theta_2 - \theta_3$ (D) $\theta_1 - \theta_2 + \theta_3$

Q.49 The amplitude of $-1 - i\sqrt{3}$ is-
(A) $-\pi/3$ (B) $\pi/3$
(C) $2\pi/3$ (D) $-2\pi/3$

Q.50 The amplitude of $\sin\frac{6\pi}{5} + i\left(1+\cos\frac{6\pi}{5}\right)$ is-

(A) $3\pi / 5$ (B) $9\pi / 10$
(C) $3\pi / 10$ (D) None of these

Q.51 The amplitude of $3 - \sqrt{8}$ is -

(A) 0 (B) $\pi/2$
(C) π (D) $-\pi/2$

Q.52 The amplitude of 1/i is equal to-

(A) π (B) $\pi/2$
(C) $-\pi/2$ (D) 0

Q.53 If amp (z) = θ, then amp (1/z) is equal to-

(A) θ (B) $-\theta$
(C) $\pi - \theta$ (D) $\pi + \theta$

Q.54 The amplitude of $1 - \cos\theta - i\sin\theta$ is-

(A) $\pi + (\theta/2)$ (B) $(\pi - \theta)/2$
(C) $(\theta - \pi)/2$ (D) $\theta/2$

Q.55 The amplitude of complex number $z = \frac{(1+i\sqrt{3})^2}{4i(1-i\sqrt{3})}$ is -

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

Q.56 If $z = \frac{(1+i)\sqrt{3}-(1-i)}{2\sqrt{2}}$, then -

(A) $|z| = 1$, amp $(z) = -\pi/4$
(B) $|z| = 1$, amp$(z) = \pi/4$
(C) $|z| = 1$, amp$(z) = 5\pi/12$
(D) $|z| = 1$, amp $(z) = \pi/12$

Q.57 The amplitude of $\frac{(1+i)(2+i)}{3-i}$ is -

(A) $-\pi/3$ (B) $\pi/2$
(C) $\pi/3$ (D) $-\pi/2$

Q.58 If z_1, z_2 are two complex numbers such that $|z_1 + z_2| = |z_1 - z_2|$ then amp(z_1) –amp(z_2) is equal to-

(A) $\pi/3$
(B) $\pi/2$
(C) $\pi/4$
(D) 0

Q.59 If amp(z) = α, then amp(iz) is equal to -

(A) $\pi - \alpha$ (B) $(\pi/2) + \alpha$
(C) $(\pi/2) - \alpha$ (D) $-\alpha$

Q.60 The amplitude of complex number $(1 + i\sqrt{3})$ $(1 + i)$ $(\cos\theta + i\sin\theta)$ is -

(A) $\frac{\pi}{12} - \theta$ (B) $\frac{7\pi}{12} + \theta$
(C) $\frac{7\pi}{12} - \theta$ (D) $\frac{\pi}{12} + \theta$

Q.61 If z_1 and z_2 are two conjugate complex numbers and amp$(z_1) = \theta$, then amp (z_1) + amp (z_2) and amp (z_1/z_2) are equal to -

(A) $2\theta, -2\theta$ (B) $0, 2\theta$
(C) $2\theta, 0$ (D) None of these

Q.62 The amplitude of $\left|\frac{x+iy}{x-iy}\right|$ is -

(A) $\tan^{-1}(y/x)$ (B) $2\tan^{-1}(y/x)$
(C) 0 (D) $\pi/2$

Q.63 amp (cot α – i) equals -

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

Q.64 The arg of $\frac{1}{4}(1 - i\sqrt{3})^2$ is -

(A) $2\pi/3$ (B) $-2\pi/3$
(C) 2π (D) π

Q.65 If $\sqrt{3} + i = (a + ib)(c + id)$, then

$\tan^{-1}\left(\frac{b}{a}\right) + \tan^{-1}\left(\frac{d}{c}\right) =$

(A) $n\pi - \frac{\pi}{3}$ (B) $n\pi + \frac{\pi}{6}$

(C) $\frac{\pi}{3} + 2n\pi$ (D) $2n\pi - \frac{\pi}{3}$

Q.66 If amplitude of $\frac{2+i}{i-1}$ is θ, then -

(A) $0 < \theta < \pi/2$
(B) $-\pi/2 < \theta < 0$
(C) $\pi/2 < \theta < \pi$
(D) $-\pi < \theta < -\pi/2$

Questions based on Polar form of Complex Number

Q.67 The polar form of $-5(\cos 40^\circ - i \sin 40^\circ)$ is -

(A) $5(\cos 140^\circ + i \sin 140^\circ)$

(B) $5 (\cos 140^\circ - i \sin 140^\circ)$

(C) $5(\cos 40^\circ - i \sin 40^\circ)$

(D) $5(\cos 40^\circ + i \sin 40^\circ)$

Q.68 The polar form of $\frac{1+7i}{(2-i)^2}$ is -

(A) $\sqrt{2}\left(\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}\right)$

(B) $\sqrt{2}\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

(C) $\sqrt{2}\left(\sin\frac{\pi}{4} + i\cos\frac{\pi}{4}\right)$

(D) $\sqrt{2}\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$

Q.69 r $(\cos\theta + i \sin\theta)$ form of $\frac{1-i}{1+i}$ is -

(A) $\sin\frac{\pi}{2} + i\cos\frac{\pi}{2}$ (B) $\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$

(C) $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$ (D) None of these

Q.70 $-3 - 4i$ equals -

(A) $5e^{i\{\pi - \tan^{-1}(3/4)\}}$ (B) $5e^{-i\{\pi - \tan^{-1}(4/3)\}}$

(C) $5e^{i\{\pi - \tan^{-1}(4/3)\}}$ (D) $5e^{i\{\pi - \tan^{-1}(3/4)\}}$

Q.71 If modulus and amplitude of a complex number are 2 and $2\pi/3$ respectively, then the number is-

(A) $1 - i\sqrt{3}$ (B) $1 + i\sqrt{3}$

(C) $-1 + i\sqrt{3}$ (D) $-1 - i\sqrt{3}$

Questions based on Square root of a Complex Number

Q.72 The square root of $-5 - 12i$ is -

(A) $\pm(3 - 2i)$ (B) $\pm(2 - 3i)$

(C) $\pm(3 + 2i)$ (D) $\pm(2 - i)$

Q.73 The square root of $8 - 6i$ is -

(A) $\pm(1 + 3i)$ (B) $\pm(3 - i)$

(C) $\pm(1 - 3i)$ (D) $\pm(3 + i)$

Q.74 The square root of i is -

(A) $\pm\frac{1}{\sqrt{2}}(1 + i)$ (B) $\pm\frac{1}{\sqrt{2}}(1 - i)$

(C) $\pm\sqrt{2}(1 - i)$ (D) $\pm\sqrt{2}(1 + i)$

Q.75 The square root of $-7 + 24i$ is -

(A) $\pm(3 + 4i)$ (B) $\pm(-3 + 4i)$

(C) $\pm(-4 + 3i)$ (D) $\pm(4 + 3i)$

Questions based on Cube roots of unity

Q.76 If ω is cube root of unity, then the value of $\frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2} + \frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2}$ is-

(A) 1 (B) 0

(C) – 1 (D) 2

Q.77 The value of $\left(\sqrt{3}+i\right)^n + \left(\sqrt{3}-i\right)^n$ is-

(A) $2^n \sin n\pi/6$ (B) $2^n \cos n\pi/6$

(C) $2^{n+1} \cos n\pi/6$ (D) $2^{n+1} \sin n\pi/6$

Q.78 If ω is cube root of unity and if $n = 3k + 2$ then the value of $\omega^n + \omega^{2n}$ is-

(A) 0 (B) –1

(C) 2 (D) 1

Q.79 If ω is cube root of unity then the value of $(1 + \omega)(1 + \omega^2)(1 + \omega^4)(1 + \omega^8)$ ..... 2n is-

(A) 0 (B) n

(C) –1 (D) 1

Q.80 $\left[\frac{-1+i\sqrt{3}}{2}\right]^6 + \left[\frac{-1-i\sqrt{3}}{2}\right]^6 + \left[\frac{-1+i\sqrt{3}}{2}\right]^5 + \left[\frac{-1-i\sqrt{3}}{2}\right]^5 =$

(A) 1 (B) –1

(C) 2 (D) None of these

Q.81 If ω is cube root of unity, then the value of $(1 + \omega) - (1 - \omega^2) - 3(1 + \omega^2)^3$ is-

(A) 0 (B) 1
(C) –1 (D) 2

Q.82 If ω is one imaginary n^{th} root of unity, then the value of $1 + \omega + \omega^2 + ... + \omega^{n-1}$ is-

(A) – 1 (B) 1
(C) 0 (D) 2

Q.83 If roots of $x^n - 1 = 0$ are $\omega_1, \omega_2, ..., \omega_n$, then- ${\omega_1}^{n-1} + {\omega_2}^{n-1} + ... + {\omega_n}^{n-1}$ equals-

(A) 0 (B) n – 1
(C) 1 (D) n

Q.84 If ω is a non real cube root of unity and n is a positive integer which is not a multiple of 3; then $1 + \omega^n + \omega^{2n}$ is equal to-

(A) 3ω (B) 0
(C) 3 (D) None of these

Q.85 The sum of squares of cube roots of unity is-

(A) 0 (B) – 1
(C) 1 (D) 3

Q.86 The product of n, n^{th} roots of unity is-

(A) – 1 (B) 1
(C) $(-1)^n$ (D) $(-1)^{n-1}$

Q.87 If ω is an imaginary cube root of unity, then for positive integral value of n, the product of $\omega . \omega^2 . \omega^3 .....\omega^n$ will be-

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

Questions based on Geometry of complex number

Q.88 If $z = (k + 3) + i\sqrt{5-k^2}$, then locus of z is a -

(A) circle
(B) parabola
(C) straight line
(D) None of these

Q.89 If $\bar{z} = 2 - z$, then locus of z is a

(A) line passing through origin
(B) line parallel to y–axis
(C) line parallel to x–axis
(D) circle

Q.90 The value of z for which $|z + i| = |z - i|$ is-

(A) any real number
(B) any natural number
(C) any complex number
(D) None of these

Q.91 If $|z| = 2$, then locus of $-1 + 5z$ is a circle whose centre is -

(A) (–1, 0) (B) (1, 0)
(C) (0, –1) (D) (0, 0)

Q.92 If centre of any circle is at point z_1 and its radius is a, then its equation is -

(A) $|z + z_1| = a$
(B) $|z| = a$
(C) $|z - z_1| < a$
(D) $|z - z_1| = a$

Q.93 If 0, 3 + 4i, 7 + 7i, 4 + 3i are vertices of a quadrilateral, then its is -

(A) square (B) rectangle
(C) parallelogram (D) rhombus

Q.94 If complex numbers z_1, z_2, z_3 represent the vertices A, B, C of a parallelogram ABCD respectively, then the vertex D is -

(A) $\frac{1}{2}(z_1 + z_2 - z_3)$

(B) $\frac{1}{2}(z_1 + z_2 + z_3)$

(C) $z_1 + z_3 - z_2$
(D) $2(z_1 + z_2 - z_3)$

Q.95 If complex numbers 2i, 5 + i and 4 represent points A, B and C respectively, then centroid of ΔABC is-

(A) 2 + i
(B) 1 + 3i
(C) 3 + i
(D) 3 – i

Q.96 If complex numbers 1, –1 and $\sqrt{3}$ i are represented by points A, B and C respectively on a compex plane, then they are -
(A) vertices of an isosceles triangle
(B) vertices of right-angled triangle
(C) collinear
(D) vertices of an equilateral triangle

Q.97 If 1 + 2i, – 2 + 3i, – 3 – 4i are vertices of a triangle, then its area is-
(A) 11 (B) 22
(C) 16 (D) 30

Q.98 The length of a straight line segment joining complex numbers 2 and –3i is -
(A) $\sqrt{3}$ (B) $\sqrt{2}$
(C) $\sqrt{13}$ (D) 13

Q.99 If z = x + iy, then $I(z) > 0$ represents a region -
(A) above real axis
(B) below real axis
(C) right of imaginary axis
(D) None of these

Q.100 If $|z| = 3$, then point represented by $2 - z$ lie on the circle -
(A) centre (2, 0), radius = 3
(B) centre (0, 2), radius = 3
(C) centre (2, 0), radius = 1
(D) None of these

Q.101 $z\bar{z} + a\bar{z} + \bar{a}z + b = 0$ is the equation of a circle, if -
(A) $|a|^2 < b$ (B) $|a|^2 \geq b$
(C) $|a|^2 \leq b$ (D) None of these

Q.102 If z is a complex number, then radius of the circle $z\bar{z} - 2(1 + i)z - 2(1 - i)\bar{z} - 1 = 0$ is-
(A) 2 (B) 1
(C) 3 (D) 4