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Dept. of Mathematics 2025 – 2026
Class XI – Mathematics
Work Sheet – Complex Numbers

1	$i + i^3 + i^5 + \ldots$ to $(2n + 1)$ terms is $(a)\ i$ $(b)\ 1$ $(c)\ -1$ $(d)\ -i$
2	$\frac{1-2i}{2+3i}$ when expressed in the form $a + ib$ is given by $(a)\ \frac{2}{12}+\frac{9}{12}i$ $(b)\ -\frac{4}{13}-\frac{7}{13}i$ $(c)\ -\frac{4}{13}+\frac{7}{13}i$ $(d)\ -\frac{7}{21}-\frac{1}{21}i$
3	Which of the following is a purely imaginary number? $(a)\ 5i$ $(b)\ 0$ $(c)\ 2$ $(d)\ 3 - 5i$
4	The imaginary part of the complex number $\frac{2+3i}{1-3i}$ = ? $(a)\ \frac{1}{2}$ $(b)\ \frac{9}{10}$ $(c)\ \frac{5}{2}$ $(d)\ -\frac{5}{2}$
5	If $z = 7 - 9i$, then $z\bar{z}$ = ? $(a)\ 63$ $(b)\ -63$ $(c)\ 130$ $(d)\ -130$
6	For any value of t, $(\cos t + i \sin t)(\cos t - i \sin t)$ is given by $(a)\ 1$ $(b)\ -1$ $(c)\ i$ $(d)\ -i$
7	The conjugate of $(5 + 2i)^2$ is $(a)\ 5 - 2i$ $(b)\ 21 - 20i$ $(c)\ 6 - 17i$ $(d)\ 13 + 5i$
8	The imaginary part of $z = \frac{a+ib}{a-ib}$ = ? $(a)\ \frac{2ab}{a^2+b^2}$ $(b)\ \frac{-2ab}{a^2+b^2}$ $(c)\ \frac{a^2-b^2}{a^2+b^2}$ $(d)\ \frac{a^2+b^2}{a^2-b^2}$
9	The value of $i^6 + i^7 + i^8 + i^9 + i^{10}$ = ? $(a)\ 1$ $(b)\ 0$ $(c)\ -1$ $(d)\ i$
10	The value of $5i^5 + 4i^4 - 3i^3 + 2i^2 - i$ is $(a)\ 4 - 10i$ $(b)\ 4 + 10i$ $(c)\ 5 - i$ $(d)\ 2 + 7i$

11	If x is real such that $\frac{1-ix}{1+ix} = a - ib$, then (a) $a^2 + b^2 = 1$ (b) $a^2 - b^2 = 1$ (c) $a + b = 1$ (d) $a^2 + b^2 = 2$
12	The square root of $7 - 24i$ is (a) $3 - 4i$ or $4i - 3$ (b) $\pm(3 + 4i)$ (c) $\pm\left(\sqrt{7} + 2\sqrt{6}i\right)$ (d) $4 - 3i$ or $3i - 4$
13	The conjugate of $\frac{2-i}{2+i} = ?$ (a) $\frac{3+4i}{9}$ (b) $\frac{3+4i}{5}$ (c) $\frac{2+3i}{8}$ (d) $\frac{1+2i}{6}$
14	If $3x + i(4x - 6y) = 2 - i$ then the values of x and y are respectively are (a) $\frac{2}{3}$ and $\frac{11}{18}$ (b) $\frac{1}{3}$ and $\frac{12}{13}$ (c) $\frac{2}{3}$ and $\frac{12}{13}$ (d) $\frac{1}{3}$ and $\frac{11}{18}$
15	If $x + iy = \sqrt{\frac{2+i}{2-i}}$, then $x^2 + y^2$ is (a) $\frac{2}{5}$ (b) 1 (c) $\frac{1}{5}$ (d) 2
16	The modulus of $\frac{(2-i)(3-2i)(1+i)}{1-i}$ is (a) $\sqrt{15}$ (b) $\sqrt{35}$ (c) $\sqrt{65}$ (d) $\sqrt{35}$

For Q17 and Q18, 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.

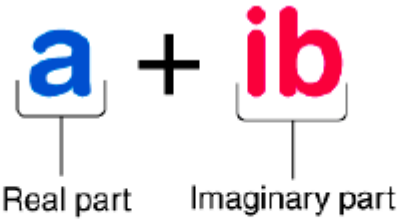
(c) A is true but R is false.

(d) A is false but R is true.

17	**Assertion (A):** If z is a complex number, then $(\bar{z})^{-1}(\bar{z})$ is equal to 4. **Reason (R):** The region of the complex plane for which $\left\|\frac{z-a}{z+a}\right\| = 1$ [Re(a) ≠ 0] is Y-axis
18	**Assertion (A):** If $\sqrt{a+ib} = x + iy$, then $\sqrt{a-ib} = x - iy$. **Reason (R):** A complex number z is said to be purely imaginary, if Re(z) = 0.

19	Express $i^9 + i^{10} + i^{11} + i^{12}$ in the form $a + ib$
20	Find the multiplicative inverse of $2 - 3i$.
21	Find the modulus of $\frac{1+i}{1-i}$.
22	Express i^{-35} in the form $a + ib$.
23	Find the multiplicative inverse of $4 - 3i$.
24	If $4x + i(3x - y) = 3 + i(-6)$, where x and y are real numbers, find the value of x and y
25	What are the real values of x and y if $(x - iy)(3 + 5i)$ is the conjugate of $(-1, -3i)$?
26	Find real θ such that $\frac{3 + 2i\sin\theta}{1 - 2i\sin\theta}$ is purely real
27	If $x + iy = \sqrt{\frac{a+ib}{c+id}}$, prove that $(x^2 + y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$
28	Find the magnitude and conjugate of the number $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$
29	Express $\frac{5+\sqrt{2}i}{1-\sqrt{2}i}$ in the form $a + ib$
30	If z_1, z_2, are $1 - i$ and $-2 + 4i$, respectively then find $\text{Im}\left(\frac{z_1 \cdot z_2}{\bar{z}_1}\right)$
31	Find the value of x and y : if $\frac{(1+i)x - 2i}{3+i} + \frac{(2-3i)y + i}{3-i} = i$
32	Find the value of $1 + i^{14} + i^{18} + i^{22}$
33	Find the conjugate of $-1 - 2i$.

34	Find the value of $(1+i)^4\left(1+\frac{1}{i}\right)^4$.
35	Find the modulus of the complex number $\cos\theta + i\sin\theta$.
36	What is the value of $(\sqrt{2}+3i)(\sqrt{2}-3i)$?
37	Find the conjugate of $1+i+i^2+i^4+i^6$.
38	If $z_1 = -3+2i$ and $z_2 = 1-i$ what is the real part of $z_1 z_2$.
39	If $(a+ib)(c+id)(e+if) = x+iy$, what is the value of $x^2 + y^2$.
40	Find the multiplicative inverse of $5 - 3i$.
41	Write $\left(\sqrt{3}+i\right)\left(1+\sqrt{3}i\right)$ in the form $a + ib$.
42	Express $\frac{2-\sqrt{-25}}{1-\sqrt{-16}}$ in the form $a + ib$. Also, find its conjugate.
43	Find the value of x and y if $(x+iy)(2-3i) = 4+i$
44	If $(x+iy)^{\frac{1}{3}} = a+ib$, $x, y, a, b \in \mathrm{R}$, show that $\frac{x}{a}+\frac{y}{b} = 4(a^2-b^2)$
45	Express $\frac{\sqrt{5+12i}+\sqrt{5-12i}}{\sqrt{5+12i}-\sqrt{5-12i}}$ in the form $a + ib$.
46	Find the multiplicative inverse of $\frac{(i+1)(i+2)}{(i-1)(i-2)}$
47	Evaluate $\left[i^{18}+\left(\frac{1}{i}\right)^{25}\right]^3$
48	Find the modulus of $\frac{1+i}{1-i}-\frac{1-i}{1+i}$
49	Find the values of x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.

50	Find the value of $i^{10}+i^{11}+i^{12}+i^{13}+i^{14}$
51	If $x-iy=\sqrt{\frac{a-ib}{a+ib}}$, prove that $\left(x^2+y^2\right)^2=\frac{a^2+b^2}{a^2-b^2}$
52	If $(x+iy)^3=a+ib$, then show that $\frac{a}{x}+\frac{b}{y}=4(x^2-y^2)$
53	Find the multiplicative inverse of $\frac{(i+1)(i+2)}{(i-1)(i-2)}$
54	Find the value of x and y if $(x+iy)(2-3i)=4+i$
55	Find the multiplicative inverse of $4-3i$
	Case Study
56	Complex numbers are the numbers that are expressed in the form of a+ib where, a, b are real numbers and 'i' is an imaginary number called "iota". The value of i = (√-1). For example, 2 + 3i is a complex number, where 2 is a real number (Re) and 3i is an imaginary number (Im). An imaginary number is usually represented by 'i' or 'j', which is equal to √-1. Therefore, the square of the imaginary number gives a negative value. Since, $i = \sqrt{-1}$, so, $i^2 = -1$ The complex number is basically the combination of a real number and an imaginary number. The complex number is in the form of a + ib, where a = real number and ib = imaginary number. Also, a,b belongs to real numbers and $i = \sqrt{-1}$. Hence, a complex number is a simple representation of addition of two numbers, i.e., real number and an imaginary number. One part of it is purely real and the other part is purely imaginary.  Based on the above information, answer the following questions. (a) Express $\frac{3-i}{5+6i}$ in the form $(a + ib)$. (2) (b) Express $i^{15}-3i^7+2i^{109}+i^{100}-i^{17}+5i^3$. in the form $(a + ib)$. (2)
57	A conjugate of a complex number is another complex number that has the same real part as the original complex number, and the imaginary part has the same magnitude but opposite sign. If we multiply a complex number with its conjugate, we get a real number. A complex number z is purely real if and only if $\bar{z} = z$ and is purely imaginary if and only if $\bar{z} = -z$ Based on the above information, answer the following questions. (a) Find the conjugate of the following : $(2 + i)^2$ (1) (b) Find the multiplicative inverse of $(4 - 3i)$. (1) (c) Express $(3 + 4i)(6 - 3i)(5 + i)$ in the form $(a + ib)$. (2)

Answers

1	A
5	C
9	C
13	B
17	D
21	1
25	$x = \frac{6}{17}, y = -\frac{7}{17}$

2	B
6	A
10	D
14	A
18	B
22	$0 + i$
26	$\theta = n\pi, n \in \mathrm{N}$

3	A
7	B
11	A
15	B
19	0
23	$\frac{4}{25} + \frac{3}{25}i$
28	$\frac{307}{442} - \frac{599}{442}i$

4	B
8	A
12	D
16	C
20	$\frac{2}{13} + \frac{3}{13}i$
24	$x = \frac{3}{4}, y = \frac{33}{4}$
29	$1 + 2\sqrt{2}i$

32	-2	33	$-1 + 2i$
34	16	35	1
36	11	37	1
38	-1	39	$x^2 + y^2 = (a^2 + b^2)(c^2 + d^2)(e^2 + f^2)$
40	$\frac{5}{34} + \frac{3}{34}i$	41	$4i$
42	Conjugate = $\frac{22}{7} - \frac{3}{7}i$	43	$x = \frac{5}{13}, y = \frac{14}{13}$
45	$0 - \frac{3}{2}i$.	46	$-\frac{4}{5} - \frac{3}{5}i$
47	$2 - 2i$	48	2
49	$x = 3, y = -3$.	50	-1
53	$-\frac{4}{5} - \frac{3}{5}i$	54	$x = \frac{5}{13}, \ y = \frac{14}{13}$
55	$\frac{4}{25} + \frac{3}{25}i$	56i	$\frac{9}{61} - \frac{23}{61}i$
56ii	$1 - 2i$	57i	$3 - 4i$
57ii	$\frac{4}{25} + \frac{3}{25}i$	57iii	$135 + 105i$