Unit 8 · Complex Number

WORKSHEET

Full marks 43

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 43

1 Key words [4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

Argand	**conjugate**	**imaginary part**	**imaginary unit**	**modulus**	**order**	**purely imaginary**
real part	**reciprocal**	**triangle inequality**				

The number i with $i^2 = -1$ is the _____. In $z = a + bi$, a is the _____ and b the _____; if $a = 0$ and $b \neq 0$, z is _____. $a - bi$ is the _____ of z, and $\sqrt{a^2 + b^2}$ its _____. The plane on which $a + bi$ is the point (a, b) is the _____ plane. $|z_1 + z_2| \leq |z_1| + |z_2|$ is the _____.

2 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Correct the false ones.

i. $i^{4n+3} = -i$ for every whole number n. ☐

ii. $\sqrt{-4} \times \sqrt{-9} = \sqrt{36} = 6$. ☐

iii. The imaginary part of $3 - 5i$ is $-5i$. ☐

iv. $z\bar{z}$ is a real number, never negative, for every complex number z. ☐

v. $2 + 3i > 1 + 3i$, since $2 > 1$. ☐

vi. Multiplying a complex number by i turns its point 90° anticlockwise about O. ☐

3 Multiple choice [6]

Choose the correct option for each of the following questions.

i. The modulus of $a + bi$ is: [1]

a. $a + b$ **b.** $a^2 + b^2$

c. $\sqrt{a^2 - b^2}$ **d.** $\sqrt{a^2 + b^2}$

ii. i^{51} equals: [1]

a. $-i$ **b.** i

c. 1 **d.** -1

iii. $\dfrac{2 + 3i}{3 - 2i}$ equals: [1]

a. $-i$ **b.** $\dfrac{12 + 5i}{13}$

c. i **d.** 1

iv. The distance between the points $1 + 2i$ and $4 - 2i$ on the Argand plane is: [1]

a. 3 **b.** 5

c. 4 **d.** 7

v. The square roots of $-3 + 4i$ are: [1]

a. $\pm(2 + i)$ **b.** $\pm(1 - 2i)$

c. $\pm(2 - i)$ **d.** $\pm(1 + 2i)$

vi. The smallest positive whole number n for which $(1 + i)^n$ is a positive real number is: [1]

a. 2 **b.** 8

c. 4 **d.** 6

4 Short answers [14]

Write short answers to the following questions.

a. Bibek writes: "$\sqrt{-16} \times \sqrt{-25} = \sqrt{(-16)(-25)} = \sqrt{400} = 20$." Find his mistake and give the right value. [2]

b. Find i^{-3} and $i + i^2 + i^3 + \ldots + i^{100}$. [2]

c. Express $\frac{4 + 3i}{2 - i}$ in the form $a + bi$. [2]

d. Dawa multiplied $2 - i$ by a complex number w and got $5 + 5i$. Find w, and check it. [2]

e. Find the real numbers x and y if $(3x - 2yi)(2 + i)^2 = 10(1 + i)$. **[3]**

f. Prove that $\overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$, and check it for $z_1 = 2 + i$, $z_2 = 1 - 3i$. **[3]**

5 Structured question **[5]**

Answer all the parts.

a. Find the square roots of $7 - 24i$. [2]

b. Hence solve $x^2 - (2 + i)x + (-1 + 7i) = 0$. [3]

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https://science-playground.com/learn/grade-11-math/complex-number

6 Long question [8]

Write a long answer to the following question.

$z = 1 + \sqrt{3}\,i$.

a. Find $|z|$, $\bar{z}$ and $\frac{1}{z}$. [3]

b. Find z^2 and z^3. [3]

c. Find the square roots of z. [2]

7 Think [3]

Describe the points z on the Argand plane with $|z - 1| = |z + 1|$, first by reading the moduli as distances, then by writing $z = x + yi$.

8 Activity: Four quarter turns

(not marked)

On squared paper draw the real and imaginary axes, and plot $z = 3 + 2i$. Work out each product, plot it, and join the points in order.

The number	z	iz	i^2z	i^3z	i^4z
$a + bi$	$3 + 2i$				
The point	$(3, 2)$				

What shape do you get? Why does it close after four steps?