LESSON MAKER PRO

Complex Plane Moves

Track complex numbers as points, shifts, and rotations.

HIGH SCHOOL · HSN-CN.B

CCSS.Math.Content.HSN-CN.B "Represent complex numbers and their operations on the complex plane."

NAME _____ DATE _____

POINTS AND OPERATIONS

A complex number a + bi matches the point (a, b) on the complex plane. Add or subtract complex numbers by combining real parts and imaginary parts. Multiplying a + bi by i gives -b + ai, which rotates its point 90 degrees counterclockwise about the origin.

WORKED EXAMPLE

Represent $z = 11 - 12i$ and iz as points on the complex plane.

1. For $z = 11 - 12i$, the real part is 11 and the imaginary part is -12.
2. So z is the point (11, -12).
3. $iz = i(11 - 12i) = 11i - 12i^2$.
4. Since $i^2 = -1$, $iz = 12 + 11i$, so its point is (12, 11).

Answer: z: (11, -12); iz = 12 + 11i: (12, 11)

PRACTICE 6 problems

1 What point represents $z = -5 + 2i$ on the complex plane?

ANSWER _____

2 Write the complex number represented by the point (7, -4).

ANSWER _____

3 Find $(3 + 6i) + (-8 - 9i)$.

ANSWER _____

4 Find $(4 - 5i) - (-2 + 3i)$.

ANSWER _____

5 Find $i(-6 + 5i)$.

ANSWER _____

6 Let $z = 2 - 7i$ and $w = -3 + 4i$. Find $z + w$ and the point that represents it.

ANSWER _____

APPLY IT Show your work

1 An esports map designer represents a player's move from the origin by z = -4 + 3i. A power-up adds the movement 6 - 5i. What complex number and coordinate show the player's new position?

WORK SPACE

ANSWER _____

2 An animation student places a logo point at z = 5 + 2i. A 90-degree counterclockwise rotation about the origin is modeled by multiplying by i. Find the complex number and coordinate of the image.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A point starts at z = 3 - 4i. Its image is found by multiplying by i three times. Find the final complex number and coordinate. Explain how the point moves.

WORK SPACE AND ANSWER

Complex Plane Moves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	What point represents z = -5 + 2i on the complex plane?	**(-5, 2)**
2	Write the complex number represented by the point (7, -4).	**7 - 4i**
3	Find (3 + 6i) + (-8 - 9i).	**-5 - 3i**
4	Find (4 - 5i) - (-2 + 3i).	**6 - 8i**
5	Find i(-6 + 5i).	**-5 - 6i**
6	Let z = 2 - 7i and w = -3 + 4i. Find z + w and the point that represents it.	**-1 - 3i; (-1, -3)**

PART 2 · APPLY IT

1. **2 - 2i; (2, -2)** Add real parts: -4 + 6 = 2. Add imaginary parts: 3i - 5i = -2i, so the point is (2, -2).
2. **-2 + 5i; (-2, 5)** Multiply: $i(5 + 2i) = 5i + 2i^2 = 5i - 2$. The image is -2 + 5i, represented by (-2, 5).

CHALLENGE

i^3z = -4 - 3i, so the final point is (-4, -3). Each multiplication by i rotates the point 90 degrees counterclockwise, so three multiplications rotate it 270 degrees counterclockwise.

Accept complex numbers written with terms in either order, such as -3i - 5 instead of -5 - 3i. Coordinates must list the real part first and the imaginary coefficient second.