LESSON MAKER PRO

Complex Number Moves

Combine, multiply, divide, and find conjugates.

HIGH SCHOOL · MT.PLUS.NUM.REAS.2

MT.PLUS.NUM.REAS.2 "Understand there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b as real numbers by: Adding, subtracting, multiplying, and dividing complex numbers..."

NAME _____ DATE _____

THE BIG IDEA

A complex number has the form a + bi, where a and b are real numbers and $i^2 = -1$. Add or subtract real parts and imaginary parts separately. When multiplying, distribute and replace i^2 with -1. To divide, multiply the numerator and denominator by the denominator's conjugate, which changes the sign of its imaginary part.

WORKED EXAMPLE

Multiply (11 + 13i)(7 - 9i).

1. Distribute: 77 - 99i + 91i - 117i^2
2. Use $i^2 = -1$: 77 - 8i + 117
3. Combine real parts: 194 - 8i

Answer: 194 - 8i

PRACTICE 6 problems

1 Add (2 + 3i) + (5 - 8i).

ANSWER _____

2 Subtract (6 - 4i) - (2 + 5i).

ANSWER _____

3 Multiply (3 + 2i)(4 - i).

ANSWER _____

4 Divide (6 + 8i)/(2 + 2i). Write your answer in a + bi form.

ANSWER _____

5 Find the conjugate of -6 + 4i.

ANSWER _____

6 Find the conjugate of (2 - i)(3 + 4i).

ANSWER _____

APPLY IT Show your work

1 In an audio editor, two tracks have complex amplitudes 4 + 6i and -3 + 2i at the same frequency. What is their combined complex amplitude?

WORK SPACE

ANSWER _____

2 A game engine represents a point with the complex number z = -4 + 3i. Rotating the point 90° counterclockwise multiplies z by i. What complex number represents its new position?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A game designer applies the same complex multiplier w to a point. If w(3 + i) = 2 + 14i, find w in a + bi form. Check your answer by multiplying.

WORK SPACE AND ANSWER

ANSWER KEY

Complex Number Moves

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Add (2 + 3i) + (5 - 8i).	**7 - 5i**
2	Subtract (6 - 4i) - (2 + 5i).	**4 - 9i**
3	Multiply (3 + 2i)(4 - i).	**14 + 5i**
4	Divide (6 + 8i)/(2 + 2i). Write your answer in a + bi form.	**7/2 + 1/2i**
5	Find the conjugate of -6 + 4i.	**-6 - 4i**
6	Find the conjugate of (2 - i)(3 + 4i).	**10 - 5i**

PART 2 · APPLY IT

1. **1 + 8i** Add the real parts and the imaginary parts: (4 - 3) + (6 + 2)i = 1 + 8i.
2. **-3 - 4i** Multiply i(-4 + 3i) = -4i + $3i^2$. Replace i^2 with -1 to get -3 - 4i.

CHALLENGE

w = 2 + 4i. Check: (2 + 4i)(3 + i) = 6 + 14i + $4i^2$ = 2 + 14i.

Accept equivalent expressions that simplify to the listed a + bi forms. For the challenge, the check must show that multiplying by 3 + i gives 2 + 14i.