LESSON MAKER PRO

Complex Number Moves

Compute with real and imaginary parts.

HIGH SCHOOL · MT.PLUS.NUM.REAS.2.a

MT.PLUS.NUM.REAS.2.a "Understand there is a complex number i such that i² = −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, and"

NAME _____ DATE _____

RULES TO USE

Use $i^2 = -1$, and write each result in the form a + bi. To add or subtract, combine real parts and imaginary parts separately. To multiply, distribute; to divide, multiply the numerator and denominator by the conjugate of the denominator, which has the opposite sign before i.

WORKED EXAMPLE

Multiply (7 + 8i)(9 - 6i).

1. Distribute: $63 - 42i + 72i - 48i^2$.
2. Combine imaginary terms: $63 + 30i - 48i^2$.
3. Use $i^2 = -1$: $63 + 30i + 48$.
4. Combine real terms: $111 + 30i$.

Answer: 111 + 30i

PRACTICE 6 problems

1 Add (2 + 3i) + (4 - i). Write the result in a + bi form.

ANSWER _____

2 Subtract (5 + i) - (2 + 4i). Write the result in a + bi form.

ANSWER _____

3 Multiply (1 + 2i)(3 + i). Write the result in a + bi form.

ANSWER _____

4 Multiply (4 - 3i)(1 - 2i). Write the result in a + bi form.

ANSWER _____

5 Divide (1 + 3i)/(1 - i). Write the result in a + bi form.

ANSWER _____

6 Divide (5 + i)/(2 - i). Write the result in a + bi form.

ANSWER _____

APPLY IT Show your work

1 A game developer represents a sprite's position on a screen with the complex number 2 + i. A screen effect multiplies its position by 1 + i. What complex number represents the new position? Write your answer in a + bi form.

WORK SPACE

ANSWER _____

2 A music app models an audio signal with a complex number. A filter multiplies the input by 2 + i to produce the output 5 + 5i. What was the input? Write your answer in a + bi form.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find the exact value of (4 + 2i)/(1 + i) in a + bi form. Then explain how you can check your answer by multiplication.

WORK SPACE AND ANSWER

ANSWER KEY

Complex Number Moves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Add (2 + 3i) + (4 - i). Write the result in a + bi form.	**6 + 2i**
2	Subtract (5 + i) - (2 + 4i). Write the result in a + bi form.	**3 - 3i**
3	Multiply (1 + 2i)(3 + i). Write the result in a + bi form.	**1 + 7i**
4	Multiply (4 - 3i)(1 - 2i). Write the result in a + bi form.	**-2 - 11i**
5	Divide (1 + 3i)/(1 - i). Write the result in a + bi form.	**-1 + 2i**
6	Divide (5 + i)/(2 - i). Write the result in a + bi form.	**9/5 + 7/5i**

PART 2 · APPLY IT

1. **1 + 3i** Multiply: $(2 + i)(1 + i) = 2 + 3i + i^2 = 1 + 3i$.
2. **3 + i** Divide (5 + 5i) by 2 + i. Multiplying the numerator and denominator by 2 - i gives (15 + 5i)/5 = 3 + i.

CHALLENGE

The quotient is 3 - i. Check: (3 - i)(1 + i) = 4 + 2i.

Accept equivalent simplified expressions in a + bi form, including 1.8 + 1.4i for problem 6. For the challenge, the multiplication check must reproduce the original numerator.