

Complex Number Moves

Add, subtract, multiply, and divide with i .

HIGH SCHOOL • MA.912.NSO.2.1

MA.912.NSO.2.1 "Extend previous understanding of the real number system to include the complex number system. Add, subtract, multiply and divide complex numbers."

NAME _____

DATE _____

OPERATE WITH COMPLEX NUMBERS

Add or subtract by combining real terms with real terms and i terms with i terms. For multiplication, distribute and replace i^2 with -1 . For division, multiply the numerator and denominator by the conjugate of the denominator.

WORKED EXAMPLE

Simplify $(13 + 12i) / (8 - 7i)$.

1. Multiply by $(8 + 7i) / (8 + 7i)$.
2. $((13 + 12i)(8 + 7i)) / ((8 - 7i)(8 + 7i))$
3. $(20 + 187i) / 113$
4. $20/113 + 187/113i$

Answer: $20/113 + 187/113i$

PRACTICE 6 problems

1 $(4 - 9i) + (6 + 5i)$

ANSWER _____

2 $(16 + 5i) - (2 - 9i)$

ANSWER _____

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

ANSWER _____

4 $(-6 + 4i)(3 + i)$

ANSWER _____

5 $(9 + 6i) / (1 - 4i)$

ANSWER _____

6 $(9 - 2i) / (4 + i)$

ANSWER _____

APPLY IT Show your work

- 1** A music app represents the sound components of two audio tracks as $6 + 5i$ and $-4 + 6i$. What complex number represents the combined sound components?

WORK SPACE

ANSWER _____

- 2** A game designer applies a filter with complex multiplier $2 - i$ to an image value z . The filtered value is $11 + 3i$. What was the original value z ?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Simplify: $(3 - 2i) / (1 + i) + (4 + 5i) / (2 - i)$

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	$(4 - 9i) + (6 + 5i)$	10 - 4i
2	$(16 + 5i) - (2 - 9i)$	14 + 14i
3	$(4 + 2i)(5 - 3i)$	26 - 2i
4	$(-6 + 4i)(3 + i)$	-22 + 6i
5	$(9 + 6i) / (1 - 4i)$	-15/17 + 42/17i
6	$(9 - 2i) / (4 + i)$	2 - i

PART 2 • APPLY IT

1. **2 + 11i** Add the real components, then add the imaginary components. The total is $(6 - 4) + (5 + 6)i$.
2. **19/5 + 17/5i** Divide $11 + 3i$ by $2 - i$. Multiply the numerator and denominator by $2 + i$, then simplify.

CHALLENGE

11/10 + 3/10i

Accept equivalent forms, including $(20 + 187i)/113$ for the worked example and $(-15 + 42i)/17$ for problem 5. Answers should be simplified so the denominator is real.