

Imaginary Number Moves

Add, subtract, and multiply with i .

HIGH SCHOOL • HSN-CN.A.2

CCSS.Math.Content.HSN-CN.A.2 "Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers."

NAME _____

DATE _____

COMBINE AND SIMPLIFY

For addition and subtraction, combine the real parts and combine the i parts. For multiplication, distribute to multiply every term, then replace each i^2 with -1 before combining like terms.

WORKED EXAMPLE

Simplify $(8 + 3i)(2 - 5i)$.

1. Distribute: $16 - 40i + 6i - 15i^2$
2. Replace i^2 with -1 : $16 - 34i + 15$
3. Combine real parts: $31 - 34i$

Answer: $31 - 34i$

PRACTICE 6 problems

1 Simplify $(4 + 7i) + (9 - 6i)$.

ANSWER _____

2 Simplify $(-11 + 16i) + (17 - 9i)$.

ANSWER _____

3 Simplify $(13 - 4i) - (6 + 10i)$.

ANSWER _____

4 Simplify $(-15 + 11i) - (-7 - 12i)$.

ANSWER _____

5 Simplify $(4 + i)(9 - 7i)$.

ANSWER _____

6 Simplify $(10 - 7i)(-4 + 9i)$.

ANSWER _____

APPLY IT Show your work

- 1** In a music-production app, two tracks at the same instant are represented by complex signal values $6 + 11i$ and $14 - 7i$. What complex value represents the combined signal?

WORK SPACE

ANSWER _____

- 2** A video game represents a point on a screen as $6 + 11i$. A visual effect multiplies the point by $4 - 7i$. What complex number represents the new point?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Simplify $(12 + 7i)(-4 - 9i) - (15 - 11i)$. Then explain why the final answer has no real part.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Simplify $(4 + 7i) + (9 - 6i)$.	13 + i
2	Simplify $(-11 + 16i) + (17 - 9i)$.	6 + 7i
3	Simplify $(13 - 4i) - (6 + 10i)$.	7 - 14i
4	Simplify $(-15 + 11i) - (-7 - 12i)$.	-8 + 23i
5	Simplify $(4 + i)(9 - 7i)$.	43 - 19i
6	Simplify $(10 - 7i)(-4 + 9i)$.	23 + 118i

PART 2 • APPLY IT

1. **20 + 4i** Add the real parts, $6 + 14$, and add the i parts, $11i - 7i$. The combined signal is $20 + 4i$.
2. **101 + 2i** Distribute to multiply $(6 + 11i)(4 - 7i)$, then replace $-77i^2$ with 77 . Combine the real and imaginary terms to get $101 + 2i$.

CHALLENGE

-125i. The product is 15 - 136i, and subtracting 15 - 11i makes the real parts 15 - 15, which equals 0.

Accept equivalent standard-form answers such as $13 + 1i$ or $0 - 125i$. Students should distribute fully in multiplication and use $i^2 = -1$ before combining terms.