LESSON MAKER PRO

Imaginary Number Moves

Use i to work with negative square roots and products.

HIGH SCHOOL · A1P.NQ.A.3

A1P.NQ.A.3 "Define the imaginary number i such that $i^2 = -1$."

NAME _____ DATE _____

THE BIG IDEA

The imaginary unit i is defined so that $i^2 = -1$. To simplify the square root of a negative number, split off -1 and use $\sqrt{(-1)} = i$. When multiplying expressions with i, replace i^2 with -1.

WORKED EXAMPLE

Simplify $\sqrt{(-121)}$.

1. $\sqrt{(-121)} = \sqrt{(121)} \cdot \sqrt{(-1)}$
2. $\sqrt{(121)} \cdot \sqrt{(-1)} = 11 \cdot i$

Answer: 11i

PRACTICE 6 problems

1 Simplify $\sqrt{(-9)}$.

ANSWER _____

2 Simplify $(4i)^2$.

ANSWER _____

3 Simplify $\sqrt{(-64)}$.

ANSWER _____

4 Simplify $(3i)(5i)$.

ANSWER _____

5 Simplify i^4.

ANSWER _____

6 Find both solutions to $x^2 = -25$.

ANSWER _____

_____

APPLY IT Show your work

1 A game developer tests an equation solver with $x^2 + 81 = 0$. What two results should the solver display?

WORK SPACE

ANSWER _____

2 An audio-editing app multiplies the complex factors 2i and 8i while processing a sound effect. What is their product?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student claims $\sqrt{(-9)} \cdot \sqrt{(-16)} = \sqrt{(144)} = 12$. Explain the error and find the correct product.

WORK SPACE AND ANSWER

ANSWER KEY

Imaginary Number Moves

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify $\sqrt{(-9)}$.	**3i**
2	Simplify $(4i)^2$.	**-16**
3	Simplify $\sqrt{(-64)}$.	**8i**
4	Simplify $(3i)(5i)$.	**-15**
5	Simplify i^4.	**1**
6	Find both solutions to $x^2 = -25$.	**x = 5i and x = -5i**

PART 2 · APPLY IT

1. **x = 9i and x = -9i** Subtract 81 to get $x^2 = -81$. Both 9i and -9i square to -81.
2. **-16** Multiply to get $16i^2$, then replace i^2 with -1.

CHALLENGE

The rule $\sqrt{a} \cdot \sqrt{b} = \sqrt{(ab)}$ does not apply when a and b are negative real numbers. Here, $\sqrt{(-9)} \cdot \sqrt{(-16)} = (3i)(4i) = 12i^2 = -12$.

For the two equations, accept the solutions in either order. In the challenge, accept any explanation that correctly identifies the square-root rule error and gives -12.