LESSON MAKER PRO

Imaginary Power Moves

Find real values hidden in powers of i.

GRADE 8 · 8A.NS.A.3

8A.NS.A.3 "Define the imaginary number i such that $i^2 = -1$."

NAME _____ DATE _____

THE BIG IDEA

The imaginary number i is defined so that $i^2 = -1$. To simplify an expression, replace each i^2 with -1. Powers of i repeat in a cycle of four: i, -1, -i, 1.

WORKED EXAMPLE

Simplify $(5i)^2$.

1. Square each factor: $(5i)^2 = 5^2 \cdot i^2$.
2. Replace i^2 with -1: $25 \cdot (-1)$.
3. Multiply: $25 \cdot (-1) = -25$.

Answer: -25

PRACTICE 6 problems

1 Simplify i^2.

ANSWER _____

2 Simplify $3i^2$.

ANSWER _____

3 Simplify i^3.

ANSWER _____

4 Simplify i^4.

ANSWER _____

5 Simplify $(2i)^2$.

ANSWER _____

6 Simplify i^6.

ANSWER _____

APPLY IT Show your work

1 A game designer uses $(4i)^2$ to calculate a change in a player's points. What integer is the change? Does the player's score rise or fall?

WORK SPACE

ANSWER _____

2 A game-design club tests a display by entering i^{10}. What number should appear on the display?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Without multiplying i by itself 2026 times, find i^{2026}. Explain how the repeating pattern gives your answer.

WORK SPACE AND ANSWER

ANSWER KEY

Imaginary Power Moves

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify i^2.	**-1**
2	Simplify $3i^2$.	**-3**
3	Simplify i^3.	**-i**
4	Simplify i^4.	**1**
5	Simplify $(2i)^2$.	**-4**
6	Simplify i^6.	**-1**

PART 2 · APPLY IT

1. **-16 points; the score falls.** $(4i)^2 = 16i^2 = -16$. A negative change lowers the score.
2. **-1** $i^{10} = (i^4)^2 \cdot i^2 = 1 \cdot (-1) = -1$.

CHALLENGE

-1. Powers of i repeat every four powers. Since 2026 divided by 4 leaves a remainder of 2, i^{2026} has the same value as i^2, which is -1.

Accept any correct method that uses $i^2 = -1$ or the four-power cycle. For the challenge, the explanation must connect 2026 to a remainder of 2 when divided by 4.