LESSON MAKER PRO

# Tiny Power Patterns

*Use patterns to read powers of 10 with negative exponents.*

**GRADE 7 · 7.NS.1.a**

**7.NS.1.a** "Investigate and describe powers of 10 with negative exponents by examining patterns."

NAME _____ DATE _____

## POWERS GET SMALLER

A negative exponent on 10 means to use the reciprocal of a positive power of 10. Each time the exponent decreases by 1, divide the value by 10, so the 1 moves one place farther right in the decimal.

## WORKED EXAMPLE

Write $10^{-4}$ as a decimal.

1. Use the reciprocal rule: $10^{-4} = 1/(10^4)$.
2. Find the positive power: $10^4 = 10{,}000$.
3. Write 1/10,000 as a decimal: 0.0001.

**Answer: 0.0001**

## PRACTICE 6 problems

**1** Write $10^{-1}$ as a decimal.

**ANSWER** _____

**2** Write $10^{-2}$ as a decimal.

**ANSWER** _____

**3** Write $10^{-3}$ as a decimal.

**ANSWER** _____

**4** Write $10^{-5}$ as a fraction with a numerator of 1.

**ANSWER** _____

**5** Complete the pattern: 0.00001, 0.000001, ___.

**ANSWER** _____

**6** Which is greater: $10^{-7}$ or $10^{-9}$?

**ANSWER** _____

## APPLY IT Show your work

**1** During a coding challenge, a computer completes one tiny operation in $10^{-3}$ second. Write this time as a decimal.

WORK SPACE

**ANSWER** _____

**2** A player has a $10^{-5}$ chance of finding a rare item in each reward box. Write the chance as a decimal. If the player opens 1,000,000 reward boxes, how many rare items should the player expect on average?

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

Order $10^{-2}$, $10^{-5}$, and $10^{-7}$ from greatest to least. Explain how the pattern of powers of 10 supports your answer.

WORK SPACE AND ANSWER

**ANSWER KEY**

# Tiny Power Patterns

**GRADE 7 · 7.NS.1.a**

## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Write $10^{-1}$ as a decimal. | **0.1** |
| 2 | Write $10^{-2}$ as a decimal. | **0.01** |
| 3 | Write $10^{-3}$ as a decimal. | **0.001** |
| 4 | Write $10^{-5}$ as a fraction with a numerator of 1. | **1/100,000** |
| 5 | Complete the pattern: 0.00001, 0.000001, ___. | **0.0000001** |
| 6 | Which is greater: $10^{-7}$ or $10^{-9}$? | **$10^{-7}$** |

## PART 2 · APPLY IT

1. **0.001 second** Use the pattern for negative exponents: $10^{-3} = 0.001$.
2. **0.00001; 10 rare items on average** First, $10^{-5} = 0.00001$. Then multiply 1,000,000 by 0.00001 to get 10.

## CHALLENGE

**$10^{-2}$, $10^{-5}$, $10^{-7}$. Each step to a more negative exponent divides the value by 10, so the value gets smaller.**

Accept equivalent decimal forms without a leading zero, such as .1. For the challenge, accept any accurate explanation that more negative exponents of 10 produce smaller positive values.