

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

CHALLENGE

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

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

- 0.001 second** Use the pattern for negative exponents: $10^{-3} = 0.001$.
- 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.