LESSON MAKER PRO

Tiny Powers, Big Numbers

Use powers of ten to write, compare, and order positive numbers.

GRADE 7 · 7.NS.1

7.NS.1 "The student will investigate and describe the concept of exponents for powers of ten and compare and order numbers greater than zero written in scientific notation..."

NAME _____ DATE _____

NEGATIVE POWERS OF TEN

When the exponent drops by 1, the value is divided by 10. A power such as 10^{-n} equals $1/10^n$, and multiplying by it moves a decimal point left n places.

WORKED EXAMPLE

Write 10^{-4} as a fraction and as a decimal.

1. Start with $10^0 = 1$.
2. Divide by 10 four times: $10^{-4} = 1/10^4$.
3. Write 10^4 as 10,000: 1/10,000 = 0.0001.

Answer: 1/10,000 = 0.0001

PRACTICE 6 problems

1 Write 10^{-3} as a fraction and as a decimal.

ANSWER _____

2 Write 10^{-5} as a fraction and as a decimal.

ANSWER _____

3 Write 7.3×10^2 in decimal form.

ANSWER _____

4 Write 0.0000068 in scientific notation.

ANSWER _____

5 Write <, >, or =. 2.9×10^7 ___ 8.1×10^6

ANSWER _____

6 Order from least to greatest: 5.2×10^{-2}, 7.8×10^{-3}, 1.6×10^{-1}, 9.0×10^{-2}

ANSWER _____

APPLY IT Show your work

1 A game update uses 3.5×10^8 bytes. A new character pack uses 6.2×10^6 bytes. Which uses more storage? How many more bytes does it use?

WORK SPACE

ANSWER _____

2 For a slow-motion video, one frame lasts 0.008 seconds. A second clip has frames that last 3.6×10^{-3} seconds. Which frame lasts longer? Write both times in scientific notation.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Without converting to ordinary decimals, order these numbers from least to greatest. Then explain how you decided: 6.7×10^{-8}, 2.3×10^{-6}, 9.5×10^{-7}, 1.8×10^{-8}.

WORK SPACE AND ANSWER

ANSWER KEY

Tiny Powers, Big Numbers

GRADE 7 · 7.NS.1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write 10^{-3} as a fraction and as a decimal.	**1/1,000 = 0.001**
2	Write 10^{-5} as a fraction and as a decimal.	**1/100,000 = 0.00001**
3	Write 7.3×10^{2} in decimal form.	**730**
4	Write 0.0000068 in scientific notation.	**6.8×10^{-6}**
5	Write <, >, or =. 2.9×10^{7} ___ 8.1×10^{6}	**>**
6	Order from least to greatest: 5.2×10^{-2}, 7.8×10^{-3}, 1.6×10^{-1}, 9.0×10^{-2}	**7.8×10^{-3}, 5.2×10^{-2}, 9.0×10^{-2}, 1.6×10^{-1}**

PART 2 · APPLY IT

1. **The game update uses more storage, by 343,800,000 bytes.** Convert the amounts to 350,000,000 and 6,200,000. Subtract to get 343,800,000 bytes.
2. **$0.008 = 8 \times 10^{-3}$, and $3.6 \times 10^{-3} = 3.6 \times 10^{-3}$. The first clip's frame lasts longer.** Rewrite 0.008 as 8×10^{-3}. The exponents match, so compare 8 and 3.6.

CHALLENGE

1.8×10^{-8}, 6.7×10^{-8}, 9.5×10^{-7}, 2.3×10^{-6}. A more negative exponent makes a smaller positive power of ten, and coefficients are compared when exponents match.

Accept equivalent decimal forms with trailing zeros. Accept scientific notation only when the coefficient is at least 1 and less than 10, and require the stated comparison or order.