LESSON MAKER PRO

Power of Ten

Write, compare, and reason with huge and tiny numbers.

GRADE 8 · MA.8.NSO.1.4

MA.8.NSO.1.4 "Express numbers in scientific notation to represent and approximate very large or very small quantities. Determine how many times larger or smaller one number is compared to a second number."

NAME _____ DATE _____

SCIENTIFIC NOTATION STEPS

Scientific notation has a number from 1 to less than 10 multiplied by a power of 10. Move the decimal left for a positive exponent and right for a negative exponent. To compare two numbers, divide the larger quantity by the smaller quantity.

WORKED EXAMPLE

Write 72,000,000 in scientific notation.

1. Place the decimal after the first nonzero digit: 7.2
2. Count 7 places from 72,000,000 to 7.2.
3. The decimal moved left, so use a positive exponent: 7.2 x 10^{7}.

Answer: 7.2 x 10^{7}

PRACTICE 6 problems

1 Write 4,500,000 in scientific notation.

ANSWER _____

2 Write 0.000083 in scientific notation.

ANSWER _____

3 Write 6.2 x 10^{8} in standard form.

ANSWER _____

4 Write 9.1 x 10^{-4} in standard form.

ANSWER _____

5 How many times larger is 3 x 10^{9} than 6 x 10^{6}?

ANSWER _____

6 How many times smaller is 4 x 10^{-8} than 2 x 10^{-5}?

ANSWER _____

APPLY IT Show your work

1 A game download contains 2.4×10^{10} bytes. A saved screenshot contains 3×10^{7} bytes. How many times larger is the game download than the screenshot?

WORK SPACE

ANSWER _____

2 A high-speed camera takes one photo every 0.016 second. A slow-motion camera takes one photo every 0.00025 second. Write each time in scientific notation. Then find how many times as often the slow-motion camera takes photos.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student says that 6.4×10^{-5} is 1,000 times larger than 8×10^{-8} because the exponents differ by 3. Is the student correct? Explain your reasoning and state the correct factor.

WORK SPACE AND ANSWER

Power of Ten

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write 4,500,000 in scientific notation.	**4.5×10^{6}**
2	Write 0.000083 in scientific notation.	**8.3×10^{-5}**
3	Write 6.2×10^{8} in standard form.	**620,000,000**
4	Write 9.1×10^{-4} in standard form.	**0.00091**
5	How many times larger is 3×10^{9} than 6×10^{6}?	**500 times larger**
6	How many times smaller is 4×10^{-8} than 2×10^{-5}?	**500 times smaller**

PART 2 · APPLY IT

1. **800 times larger** Divide 2.4×10^{10} by 3×10^{7}. The result is 0.8×10^{3}, which equals 800.
2. **$0.016 = 1.6 \times 10^{-2}$; $0.00025 = 2.5 \times 10^{-4}$; 64 times as often** Write the times as 1.6×10^{-2} and 2.5×10^{-4}. Divide 1.6×10^{-2} by 2.5×10^{-4} to get 64, so the smaller time interval means 64 times as many photos.

CHALLENGE

No. $(6.4 \times 10^{-5}) / (8 \times 10^{-8}) = (6.4 / 8) \times 10^{3} = 0.8 \times 1{,}000 = 800$, so 6.4×10^{-5} is 800 times larger.

Accept equivalent standard-form answers with correct zeros and equivalent scientific notation with a coefficient from 1 to less than 10. For comparison items, accept equivalent wording such as "500 times as large" or "a factor of 500."