LESSON MAKER PRO

How Big Is It?

Compare and estimate with scientific notation.

GRADE 8 · 8.AF.A.5

8.AF.A.5 "Estimate and compare very large or very small numbers in scientific notation."

NAME _____ DATE _____

COMPARE THE POWERS

For positive numbers in scientific notation, compare the powers of 10 first. If the powers match, compare the coefficients. To estimate how many times greater one number is, divide the coefficients and subtract the exponents.

WORKED EXAMPLE

How many times as large is 4.8×10^{12} as 1.6×10^{11}?

1. Divide the coefficients: 4.8 / 1.6 = 3.
2. Divide the powers of 10: $10^{12} / 10^{11} = 10^{1}$.
3. Multiply: $3 \times 10^{1} = 30$.

Answer: 30 times as large

PRACTICE 6 problems

1 Which is greater, 5.4×10^{8} or 8.1×10^{7}?

ANSWER _____

2 Which is greater, 3.6×10^{-4} or 8.8×10^{-5}?

ANSWER _____

3 Write < or > in the blank: 9.2×10^{-6} ___ 1.1×10^{-5}.

ANSWER _____

4 How many times as large is 6.4×10^{9} as 3.2×10^{8}?

ANSWER _____

5 Order from least to greatest: 6.1×10^{-3}, 5.8×10^{-4}, 7.3×10^{-3}.

ANSWER _____

6 Estimate how many times as large 8.9×10^{10} is as 3.1×10^{9}. Round each coefficient to the nearest whole number first.

ANSWER _____

APPLY IT Show your work

1 A video on your phone uses 8.1×10^8 bytes of storage. A photo uses 3.9×10^6 bytes. Estimate how many times as much storage the video uses. Round each coefficient to the nearest whole number first.

WORK SPACE

ANSWER _____

2 A feature on a phone chip is about 2.1×10^{-8} meters wide. A strand of hair is about 7.9×10^{-5} meters wide. Estimate how many times wider the hair is. Round each coefficient to the nearest whole number first.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A lab measures three tiny particles. Particle A is 6.7×10^{-7} meters wide, B is 2.4×10^{-6} meters wide, and C is 8.1×10^{-8} meters wide. Order them from smallest to largest. Then estimate how many times as wide B is as C by rounding their coefficients to the nearest whole number. Show how you found your estimate.

WORK SPACE AND ANSWER

ANSWER KEY

How Big Is It?

GRADE 8 · 8.AF.A.5

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Which is greater, 5.4×10^8 or 8.1×10^7?	**5.4×10^8**
2	Which is greater, 3.6×10^{-4} or 8.8×10^{-5}?	**3.6×10^{-4}**
3	Write < or > in the blank: 9.2×10^{-6} ___ 1.1×10^{-5}.	**<**
4	How many times as large is 6.4×10^9 as 3.2×10^8?	**20 times as large**
5	Order from least to greatest: 6.1×10^{-3}, 5.8×10^{-4}, 7.3×10^{-3}.	**5.8×10^{-4}, 6.1×10^{-3}, 7.3×10^{-3}**
6	Estimate how many times as large 8.9×10^{10} is as 3.1×10^9. Round each coefficient to the nearest whole number first.	**About 30 times as large**

PART 2 · APPLY IT

1. **About 200 times as much storage** Round to 8×10^8 and 4×10^6. Then $(8 / 4) \times 10^2 = 200$.
2. **About 4,000 times wider** Round to 2×10^{-8} and 8×10^{-5}. Then $(8 / 2) \times 10^3 = 4{,}000$.

CHALLENGE

C, A, B. About 25 times as wide, since $(2 / 8) \times 10^2 = 25$.

For estimation items, accept equivalent calculations that use the specified coefficient rounding. For comparisons, students can give the number or the requested symbol.