LESSON MAKER PRO

Tiny to Huge

Write measurements in scientific notation and choose useful units.

GRADE 8 · 8.AF.A.6.a

8.AF.A.6.a "Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities."

NAME _____ DATE _____

MAKE NUMBERS MANAGEABLE

Scientific notation writes a number as $a \times 10^n$, where a is at least 1 but less than 10. Move the decimal left to get a positive exponent, or right to get a negative exponent. Choose a unit that makes the measurement easy to read: 1 kilometer = 10^3 meters, 1 micrometer = 10^{-6} meter, and 1 nanometer = 10^{-9} meter.

WORKED EXAMPLE

A thin fiber is 0.0000084 meter wide. Write its width in scientific notation in meters, then express it in micrometers.

1. Move the decimal 6 places right: 0.0000084 meter = 8.4×10^{-6} meter.
2. Since 1 micrometer = 10^{-6} meter, 8.4×10^{-6} meter = 8.4 micrometers.

Answer: 8.4×10^{-6} meter; 8.4 micrometers

PRACTICE 6 problems

1 A game trailer gets 5,300,000 views. Write the view count in scientific notation.

ANSWER _____

2 A dust speck is 0.000025 meter wide. Write its width in scientific notation in meters.

ANSWER _____

3 A game update is 3.2×10^9 bytes. Express its size in gigabytes. Use 1 gigabyte = 10^9 bytes.

ANSWER _____

4 A phone screen pixel is 0.000055 meter wide. Express its width in micrometers.

ANSWER _____

5 A hiking trail is 6.7×10^4 meters long. Express its length in kilometers.

ANSWER _____

6 A strand of material is 9×10^{-9} meter wide. Express its width in nanometers, then explain why nanometers make the width easier to read.

ANSWER _____

APPLY IT Show your work

1 A group rides 1.25×10^5 meters in a bike fundraiser. Their goal was 120 kilometers. How many kilometers beyond their goal did they ride?

WORK SPACE

ANSWER _____

2 Two features on a phone chip are 0.000000032 meter and 0.000000014 meter wide. Express each width in nanometers. How many nanometers wider is the first feature?

WORK SPACE

ANSWER _____

CHALLENGE One step up

One fitness app shows a bike route as 2.4×10^7 centimeters. Another app shows a different route as 2.6×10^2 kilometers. Which route is longer, and by how many kilometers? Show both distances in kilometers. Use 1 kilometer = 10^5 centimeters.

WORK SPACE AND ANSWER

Tiny to Huge

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A game trailer gets 5,300,000 views. Write the view count in scientific notation.	**5.3×10^6 views**
2	A dust speck is 0.000025 meter wide. Write its width in scientific notation in meters.	**2.5×10^{-5} meter**
3	A game update is 3.2×10^9 bytes. Express its size in gigabytes. Use 1 gigabyte = 10^9 bytes.	**3.2 gigabytes**
4	A phone screen pixel is 0.000055 meter wide. Express its width in micrometers.	**55 micrometers**
5	A hiking trail is 6.7×10^4 meters long. Express its length in kilometers.	**67 kilometers**
6	A strand of material is 9×10^{-9} meter wide. Express its width in nanometers, then explain why nanometers make the width easier to read.	**9 nanometers. This unit avoids writing a tiny decimal in meters.**

PART 2 · APPLY IT

1. **5 kilometers** Convert 1.25×10^5 meters to 125 kilometers. Then subtract the 120-kilometer goal.
2. **32 nanometers and 14 nanometers; the first is 18 nanometers wider.** Each nanometer is 10^{-9} meter, so the widths are 32 and 14 nanometers. Subtract 14 from 32.

CHALLENGE

The first route is 240 kilometers, and the second is 260 kilometers. The second route is 20 kilometers longer because 260 - 240 = 20.

Accept correct unit abbreviations such as km, nm, and GB. For the written explanation, accept any clear statement that nanometers avoid a very small decimal in meters.