

Math 8

Our Goal: To learn about scientific notation

Warm Up: Exponent review

Today's Homework

- Day 1 - 10.5 Exercises, p.440: 1-24
- Day 2 - 10.6 Exercises, p.446: 1-21
- iready due today

Previous Homework

10.4 Exercises, p.432: 5-27

7    $\frac{7}{1}$    7.0   700%

VII

7,000,000,000.

7 × 10<sup>9</sup>

$$0.\overset{\curvearrowright}{\underset{\curvearrowright}{\underset{\curvearrowright}{000}}8}.$$

-4

$$\boxed{8} \times 10$$

$$7^1 2^{-4} 3^3 d^{-5}$$

$$7 a b c d$$

$$\frac{7 a^2 c^3}{b^4 d^5}$$

$$\frac{g^4 h^{-3}}{j^{-8} k^7} = \frac{g^4 j^8}{h^3 k^7}$$

$$5x^{-2} = \frac{5}{x^2}$$

# Essential Question

How can you read numbers that are written in scientific notation?

## Key Idea

### Scientific Notation

A number is written in **scientific notation** when it is represented as the product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

The factor is greater than or equal to 1 and less than 10.

$$8.3 \times 10^{-7}$$

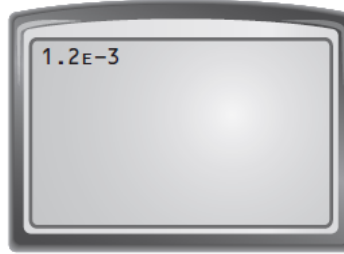
The power of 10 has an integer exponent.

Write the number shown on the calculator display in standard form.

1.



2.



3.



4.



Tell whether the number is written in scientific notation. Explain.

a.  $5.9 \times 10^{-6}$

b.  $0.9 \times 10^8$

## Key Idea

### Writing Numbers in Standard Form

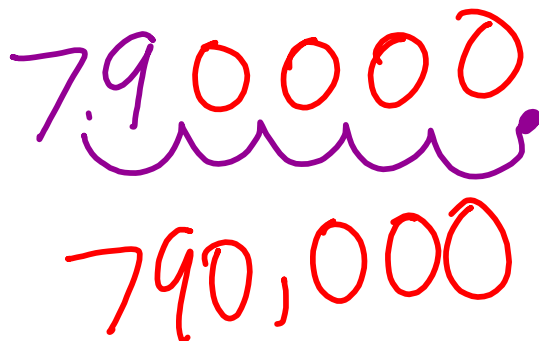
The absolute value of the exponent indicates how many places to move the decimal point.

- If the exponent is **negative**, move the decimal point to the **left**.
- If the exponent is **positive**, move the decimal point to the **right**.

a. Write  $3.22 \times 10^{-4}$  in standard form.



b. Write  $7.9 \times 10^5$  in standard form.



1. Is  $12 \times 10^4$  written in scientific notation? Explain.

**Write the number in standard form.**

2.  $6 \times 10^7$

3.  $9.9 \times 10^{-5}$

4.  $1.285 \times 10^4$

**A dog has 100 female fleas. How much blood do the fleas consume per day?**



A female flea consumes about  $1.4 \times 10^{-5}$  liter of blood per day.

**Write the number in scientific notation.**

1. 0.00034

2. 6,750,000

3. 0.00000007

4. 125,000

5. 15,200,000,000

6. 0.000000000917

## Key Idea

### Writing Numbers in Scientific Notation

**Step 1:** Move the decimal point so it is located to the right of the leading nonzero digit.

**Step 2:** Count the number of places you moved the decimal point. This indicates the exponent of the power of 10, as shown below.

#### *Number Greater Than or Equal to 10*

Use a positive exponent when you move the decimal point to the left.

$$\underbrace{8600}_{3} = 8.6 \times 10^3$$

#### *Number Between 0 and 1*

Use a negative exponent when you move the decimal point to the right.

$$\underbrace{0.0024}_{3} = 2.4 \times 10^{-3}$$



**Elon Musk purchased Twitter for \$44,000,000,000. Write this number in scientific notation.**

**Google purchased YouTube for \$1,650,000,000. Write this number in scientific notation.**

**The 2004 Indonesian earthquake slowed the rotation of Earth, making the length of a day 0.00000268 second shorter. Write this number in scientific notation.**

**Write the number in scientific notation.**

**1. 50,000**

**2. 25,000,000**

**3. 683**

**4. 0.005**

**5. 0.00000033**

**6. 0.000506**

An album has sold 8,780,000 copies. How many more copies does it need to sell to receive the award?



An album receives an award when it sells 10,000,000 copies.

- Ⓐ  $1.22 \times 10^{-7}$
- Ⓑ  $1.22 \times 10^{-6}$
- Ⓒ  $1.22 \times 10^6$
- Ⓓ  $1.22 \times 10^7$

The table shows when the last three geologic eras began. Order the eras from earliest to most recent.



Era	Began
Paleozoic	$5.42 \times 10^8$ years ago
Cenozoic	$6.55 \times 10^7$ years ago
Mesozoic	$2.51 \times 10^8$ years ago

The land area of Virginia is about 39,500 square miles. The land area of Alaska is about 570,000 square miles. The United States land area is about 3,500,000 square miles. Write each of these in scientific notation.

### 10.5 Exercises



#### Vocabulary and Concept Check

- WRITING** Describe the difference between scientific notation and standard form.
- WHICH ONE DOESN'T BELONG?** Which number does *not* belong with the other three? Explain.

$2.8 \times 10^{15}$

$4.3 \times 10^{-30}$

$1.05 \times 10^{28}$

$10 \times 9.2^{-13}$

#### Practice and Problem Solving

Write the number shown on the calculator display in standard form.

3.  $5.6\text{E}12$

4.  $2.1\text{E}-10$

5.  $8.73\text{E}16$

Tell whether the number is written in scientific notation. Explain.

- |                             |                            |                            |
|-----------------------------|----------------------------|----------------------------|
| 6. $1.8 \times 10^9$        | 7. $3.45 \times 10^{14}$   | 8. $0.26 \times 10^{-25}$  |
| 9. $10.5 \times 10^{12}$    | 10. $46 \times 10^{-17}$   | 11. $5 \times 10^{-19}$    |
| 12. $7.814 \times 10^{-36}$ | 13. $0.999 \times 10^{42}$ | 14. $6.022 \times 10^{23}$ |

Write the number in standard form.

- |                          |                           |                         |
|--------------------------|---------------------------|-------------------------|
| 15. $7 \times 10^7$      | 16. $8 \times 10^{-3}$    | 17. $5 \times 10^2$     |
| 18. $2.7 \times 10^{-4}$ | 19. $4.4 \times 10^{-5}$  | 20. $2.1 \times 10^3$   |
| 21. $1.66 \times 10^9$   | 22. $3.85 \times 10^{-8}$ | 23. $9.725 \times 10^0$ |

24. **ERROR ANALYSIS** Describe and correct the error in writing the number in standard form.

$4.1 \times 10^{-6} = 4,100,000$



25. **PLATELETS** Platelets are cell-like particles in the blood that help form blood clots.
- How many platelets are in 3 milliliters of blood? Write your answer in standard form.
  - An adult human body contains about 5 liters of blood. How many platelets are in an adult human body?

10.6 Exercises



**Vocabulary and Concept Check**

- REASONING** How do you know whether a number written in standard form will have a positive or a negative exponent when written in scientific notation?
- WRITING** When is it appropriate to use scientific notation instead of standard form?

**Practice and Problem Solving**

Write the number in scientific notation.

- |                   |                       |                |
|-------------------|-----------------------|----------------|
| 3. 0.0021         | 4. 5,430,000          | 5. 321,000,000 |
| 6. 0.00000625     | 7. 0.00004            | 8. 10,700,000  |
| 9. 45,600,000,000 | 10. 0.000000000009256 | 11. 840,000    |

**ERROR ANALYSIS** Describe and correct the error in writing the number in scientific notation.

12.  $3.6 \times 10^5$

13.  $72.5 \times 10^6$

Order the numbers from least to greatest.

- |  |   |
|--|---|
| 14. $1.2 \times 10^3$ , $1.19 \times 10^3$ , $1.12 \times 10^3$            | 15. $6.8 \times 10^{-5}$ , $6.09 \times 10^{-5}$ , $6.78 \times 10^{-5}$  |
| 16. $5.76 \times 10^{12}$ , $9.66 \times 10^{11}$ , $5.7 \times 10^{10}$   | 17. $4.8 \times 10^{-6}$ , $4.8 \times 10^{-5}$ , $4.8 \times 10^{-8}$    |
| 18. $9.9 \times 10^{-15}$ , $1.01 \times 10^{-14}$ , $7.6 \times 10^{-15}$ | 19. $5.78 \times 10^{23}$ , $6.88 \times 10^{23}$ , $5.82 \times 10^{23}$ |

20. **HAIR** What is the diameter of a human hair written in scientific notation?



Diameter: 0.000099 meter

21. **EARTH** What is the circumference of Earth written in scientific notation?



Circumference at the equator: about 40,100,000 meters

22. **CHOOSING UNITS** In Exercise 21, name a unit of measurement that would be more appropriate for the circumference. Explain.