GRADE 7 ACCELERATED · UNIT 3 · LESSON 8

Writing Large Numbers in Scientific Notation

MA.8.NSO.1.4

I can write a large number in scientific notation, read one back into standard form, and find how many times larger one number is than another.

Warm-Up

1. Rewrite with a positive exponent: $4x^{-3}$
2. Find the value: $(10^2)^3$
3. Find the value: $\sqrt{121}$
4. In 4,500,000, which place is the 4 in?

Warm-Up

1. Rewrite with a positive exponent: $4x^{-3}$ **$4/x^3$**
2. Find the value: $(10^2)^3$ **$10^6 = 1{,}000{,}000$**
3. Find the value: $\sqrt{121}$ **11**
4. In 4,500,000, which place is the 4 in? **millions**

Vocabulary

scientific notation

a number written as a product $a \times 10^n$ where a is at least 1 and less than 10, and n is an integer: 2.6×10^7

standard form

the number written out with all of its digits: 26,000,000

coefficient

the factor a in $a \times 10^n$; it must satisfy $1 \leq a < 10$

Notes

I. Powers of ten name the places

10^1	10^2	10^3	10^4	10^5	10^6
10	100	1,000	10,000	100,000	1,000,000

The exponent counts the zeros — and names the place of the 1.

Notes

II. Scientific notation

$$a \times 10^{n} \quad \text{with} \quad 1 \le a < 10$$

$$2{,}000{,}000 = 2 \times 10^{6} \qquad 26{,}000{,}000 = 2.6 \times 10^{7}$$

The coefficient is at least 1 and less than 10: one nonzero digit before the decimal point.

The exponent is how many places the decimal point moves: from 26,000,000. to 2.6 is seven places, so 10^{7}.

Notes

III. How many times larger?

$$\frac{6.4 \times 10^{7}}{3.2 \times 10^{7}} = 2 \qquad \frac{2 \times 10^{5}}{2 \times 10^{2}} = 10^{3} = 1{,}000$$

$$\frac{8.4 \times 10^{6}}{2.1 \times 10^{4}} = 4 \times 10^{2} = 400$$

Divide the coefficients. Divide the powers of 10. Multiply the two results.

On a screen, 8.4E6 means 8.4×10^{6}.

Example 1

In 2018, funding for education in Florida totaled 30,100,000,000 dollars.

Express this value in scientific notation.

Example 1

$$30{,}100{,}000{,}000 = 3.01 \times 10^{10}$$

$$3.01 \times 10{,}000{,}000{,}000 = 30{,}100{,}000{,}000$$

Answer: 3.01×10^{10}

Your Turn

A painting sold for 110,500,000 dollars. Write this value in scientific notation.

Your Turn

A painting sold for 110,500,000 dollars. Write this value in scientific notation.

Move the point 8 places left: 1.105

$1.105 \times 10^{8} = 110{,}500{,}000$

Answer: 1.105×10^{8}

Example 2

How many times larger is 8.1×10^8 than 5.4×10^7 ?

Example 2

$$\frac{8.1}{5.4} = 1.5$$

$$\frac{10^8}{10^7} = 10^1 = 10$$

$$1.5 \times 10 = 15$$

Answer: 15 times larger

Your Turn

Everglades alligators: 2.0×10^5

Florida alligators: 1.5×10^6

About how many times larger is the Florida number?

Your Turn

Everglades alligators: 2.0×10^5

Florida alligators: 1.5×10^6

About how many times larger is the Florida number?

Divide the numbers: $1.5 \div 2.0 = 0.75$

Divide the powers: $10^6 \div 10^5 = 10^1$

$0.75 \times 10^1 = 7.5$

Answer: about 7.5 times larger

Whiteboards · Question 1 of 9

Write 4,000,000 in scientific notation.

Answer it.

Whiteboards · Question 1 of 9

Write 4,000,000 in scientific notation.

The 4 is in the millions place: $1{,}000{,}000 = 10^6$

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

Answer: 4×10^6

Whiteboards · Question 2 of 9

Write 7.2×10^4 in standard form.

Answer it.

Whiteboards · Question 2 of 9

Write 7.2×10^4 in standard form.

$10^4 = 10{,}000$

$7.2 \times 10{,}000 = 72{,}000$

Answer: 72,000

Whiteboards · Question 3 of 9

A stadium's renovation used 356,000 bolts.

The stadium seats 71,000 people.

Write the number of bolts in scientific notation.

Answer it.

Whiteboards · Question 3 of 9

A stadium's renovation used 356,000 bolts.

The stadium seats 71,000 people.

Write the number of bolts in scientific notation.

Move the point 5 places left: 3.56

$3.56 \times 10^5 = 356{,}000$

Answer: 3.56×10^5

Whiteboards · Question 4 of 9

Which is greater, 9.5×10^5 or 1.2×10^6 ?

Answer it.

Whiteboards · Question 4 of 9

Which is greater, 9.5×10^5 or 1.2×10^6 ?

$$9.5 \times 10^5 = 950{,}000$$

$$1.2 \times 10^6 = 1{,}200{,}000$$

Answer: 1.2×10^6

Whiteboards · Question 5 of 9

Which is 52,000,000 written in scientific notation?

A. 5.2×10^{8}

B. 5.2×10^{7}

C. 52×10^{6}

D. 5.2×10^{6}

Answer it.

Whiteboards · Question 5 of 9

Which is 52,000,000 written in scientific notation?

Move the point 7 places left: 5.2

$5.2 \times 10^{7} = 52{,}000{,}000$

Answer: B — 5.2×10^{7}

Whiteboards · Question 6 of 9

How many times larger is 6×10^8 than 6×10^5 ?

A. 1.6

B. 3

C. 1,000

D. 300

Answer it.

Whiteboards · Question 6 of 9

How many times larger is 6×10^8 than 6×10^5 ?

$6 \div 6 = 1$

$10^8 \div 10^5 = 10^{8-5} = 10^3 = 1{,}000$

Answer: C — 1,000

Whiteboards · Question 7 of 9

How many times larger is 8.5×10^9 than 1.7×10^5 ?

Answer it.

Whiteboards · Question 7 of 9

How many times larger is 8.5×10^9 than 1.7×10^5 ?

Divide the numbers: $8.5 \div 1.7 = 5$

Divide the powers: $10^9 \div 10^5 = 10^4$

$5 \times 10^4 = 50{,}000$

Answer: 50,000

Whiteboards · Question 8 of 9

A computer displays a number as 3.5E9.

Write the number in standard form.

Answer it.

Whiteboards · Question 8 of 9

A computer displays a number as 3.5E9.

Write the number in standard form.

3.5E9 means 3.5×10^9

$3.5 \times 10^9 = 3{,}500{,}000{,}000$

Answer: 3,500,000,000

Whiteboards · Question 9 of 9

Marcus writes $70{,}000{,}000$ as 70×10^6.

Is his expression equal to 70,000,000? Is it scientific notation? Explain.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Marcus writes 70,000,000 as 70×10^6.

Is his expression equal to 70,000,000? Is it scientific notation? Explain.

$70 \times 10^6 = 70{,}000{,}000$, so it is equal.

The first number must be at least 1 and less than 10. 70 is not.

$7 \times 10^7 = 70{,}000{,}000$

Answer: Equal, yes. Scientific notation, no: 70 is not less than 10. 7×10^7.

Independent Set

1. Write $8{,}200{,}000$ in scientific notation.
2. Write 6.4×10^5 in standard form.
3. Write $915{,}000{,}000$ in scientific notation.
4. Which is greater, 4.7×10^7 or 9.3×10^6 ?
5. How many times larger is 9×10^7 than 3×10^4 ?
6. A computer displays a number as 7.4E8. Write it in standard form.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 3 test.

Today's skills — all required

Convert between standard and scientific notation: large numbers — 2AL

Compare large numbers — WEZ

Powers of ten — LJQ