443,000,002

8

Algebra 1 7.4 4.43×10^{8} *8th grade standard

Express numbers in scientific notation*

Find products and quotients of numbers in scientific notation

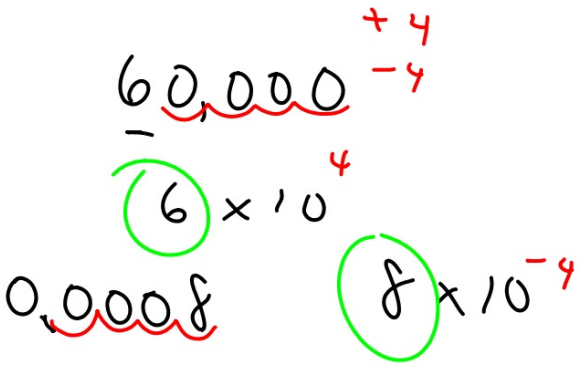
scientific notation

exponent

standard form

activity: triangle puzzles

whiteboards



KeyConcept Standard Form to Scientific Notation

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Step 1 Move the decimal point until it is to the right of the first nonzero digit. The result is a real number a.

Step 2 Note the number of places n and the direction that you moved the decimal point.

Step 3 If the decimal point is moved left, write the number as $a \times 10^{n}$.
If the decimal point is moved right, write the number as $a \times 10^{-n}$.

Step 4 Remove the unnecessary zeros.

Number between 1-10 by moving decimal point

How far did you move it?
(Remember, every place value is x10)

Did it get bigger or smaller?
(we have to keep things equal)

Adjust exponent

Example 1 Standard Form to Scientific Notation

Express each number in scientific notation.

a. 201,000,000

2.01×10

b. 0.000051

5.1×10^{-5}

GuidedPractice

1A. 68,700,000,000

6.87×10^{10}

1B. 0.0000725

7.25×10^{-5}

What does 10^2 mean?

$10^2 = 10 \cdot 10 = 100$

Example 2 Scientific Notation to Standard Form

Express each number in standard form.

a. 6.32×10^6

6,320,000

6320000

"times a decimal" = gets smaller (how much smaller?)

b. $4. \times 10^{-7}$

0.0000004

2A. 3.201×10^{6}

2B. 9.03×10^{-5}

Commutative property of multiplication

Example 3 Multiply with Scientific Notation

Evaluate $(3.5 \times 10^{-3})(7 \times 10^{5})$. Express the result in both scientific notation and standard form.

3.5

5.3

$3.5 \cdot 7 \cdot 10^{-3} \cdot 10^{5}$

24.5×10^{2}

$24.5 \cdot 10^{2-1}$

2.45×10^{3} 2450

10 10 10 10 10

10 10 10

Answer in sci notation and/or standard form
Follow directions

GuidedPractice

Evaluate each product. Express the results in both scientific notation and standard form.

3A. $(6.5 \times 10^{12})(8.7 \times 10^{-15})$

$6.5(8.7)10^{12}\,10^{-15}$

56.55×10^{-3} (+1, −1)

$5.655 \cdot 10^{-2}$ ★ $.05655$

3B. $(7.8 \times 10^{-4})^2$

$(7.8 \cdot 10^{-4})(7.8 \cdot 10^{-4})$

$7.8 \cdot 7.8\ 10^{-4} \cdot 10^{-4}$

$60.84 \cdot 10^{-8}$ (+1, −1)

$6.084 \cdot 10^{-7}$

Grouping

Example 4 Divide with Scientific Notation

Evaluate $\frac{3.066 \times 10^8}{7.3 \times 10^3}$. Express the result in both scientific notation and standard form.

$0.42 \cdot 10^{5}$ $+1$ -1

4.2×10^{4}

$42,000$

Evaluate each quotient. Express the results in both scientific notation and standard form.

4A. $\frac{2.3958 \times 10^3}{1.98 \times 10^8}$

$1.21 \cdot 10^{-5}$

4B. $\frac{1.305 \times 10^3}{1.45 \times 10^{-4}}$

10^{3-4}

$0.9 \cdot 10^{1}$ +1

$9 \cdot 10^{6}$

Real-World Example 5 Use Scientific Notation

MUSIC In the United States, a CD reaches gold status once 500 thousand copies are sold. A CD reaches platinum status once 1 million or more copies are sold.

a. Express the number of copies of CDs that need to be sold to reach each status in standard notation.

500,000 5_5

1,000,000 6_{-6}

Real-World Link

The platinum award was created in 1976. In 2004, the criteria for the award was extended to digital sales. The top-selling artist of all time is the Beatles with 170 million units sold.

Source: Recording Industry Association of America

b. Write each number in scientific notation.

5×10^5

1×10^6

c. How many copies of a CD have sold if it has gone platinum 13 times? Write your answer in scientific notation and standard form.

13,000,000 $\rightarrow 7$

1.3×10^7

7.4 p417
21-61088