Algebra 1 7.4

*8th grade standard

Express numbers in scientific notation*

Find products and quotients of numbers in scientific notation

scientific notation

exponent

standard form

$(1-10) \times$ expon.

$50,000 \overset{+4}{-4}$

5×10^{4}

activity: triangle puzzles

whiteboards

KeyConcept Standard Form to Scientific Notation

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.

1. Number between 1-10 by moving decimal point
2. How far did you move it?
   (Remember, every place value is x10)
3. 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 +8 −8

~~201~~

~~20.1~~

2.01×10^8

3×10^4

☆ 2.01×10^8

$2.01 \cdot 10^8$

b. 0.000051

+5
-5

~~51~~

5.1×10^{-5}

GuidedPractice

1A. 68,700,000,000

1B. 0.0000725

What does 10^2 mean?

↓

$10 \cdot 10 = 100$

2.1×10^2

2.100

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Example 2 Scientific Notation to Standard Form

Express each number in standard form.

a. 6.32×10^9

6,320,000,000

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

b. 4×10^{-7}

0.0000004

2A. 3.201×10^{6}

2B. 9.03×10^{-5}

Commutative property of multiplication $3 \cdot 5 = 5 \cdot 3$

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.

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

$24.5 \cdot 10^{2}$ (+) -1

2.45×10^{3}

2450

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

56.55×10^{-3} (+1, −1)

5.655×10^{-2}

0.05655

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

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

60.84×10^{-8} (+1, −1)

6.084×10^{-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.

$0.42 \times 10^{5+1}$ (-1)

4.2×10^{4}

$42{,}000$

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

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

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

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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.

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.

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.