

E in answer? I Didn't Ask for Scientific Notation! MathPrint view

Objectives:

- Review powers of 10 and how they appear on a GC
- Review scientific notation
- Translate calculator answers to standard notation

Review powers of 10 and how they appear on a GC

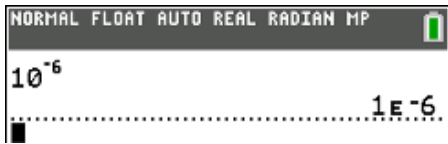
If a number is written in the “normal” way, that’s called standard notation.

Example 1: Write 10^{-6} in standard notation.

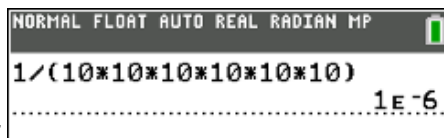
$$\text{Solution: } 10^{-6} = \frac{1}{10^6} = \frac{1}{10 \times 10 \times 10 \times 10 \times 10 \times 10} = \frac{1}{1,000,000} =$$

Answer: 0.000001

Example 2: Use your GC to calculate 10^{-6} . Notice the unusual form of the GC’s final answer!



or



Review scientific notation

Scientific notation can be used to write any number as $a \times 10^b$, where

$1 \leq a < 10$ (This means that a has one nonzero digit to the left of the decimal point) and b is an integer $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$.

The GC replaces the $\times 10$ by **E** and moves the exponent b down, so $a \times 10^b$ looks like $a \mathbf{E} b$.

IMPORTANT: The GC abbreviation $a \mathbf{E} b$ is NOT correct mathematical notation, so do not write **E** as a final answer.

To write a number in scientific notation, determine a and b .

To find a , start on the left side of the number and find the first non-zero digit. Write it and all digits that follow (including zeros in between) until the last non-zero digit.

To find b when it's *positive*, find how many times you *multiply* a by 10 to get the original number.

To find b when it's *negative*, find how many times you *divide* a by 10.

Some people find b by counting the number of places the decimal point is moved.

Example 3: Write 30,200 in scientific notation.

Solution: $a = 3.02$, multiply by 10 four times, or move the decimal point 4 places, so $b = 4$

Answer: 3.02×10^4

Example 4: Write 0.0004087 in scientific notation.

Solution: $a = 4.087$ Divide by 10 four times, or move the decimal point 4 places, so $b = -4$

Answer: 4.087×10^{-4}

Example 5: Write 3.901 in scientific notation

$a = 3.901$ We do not need to multiply or divide by 10, so the exponent b is zero.

Answer: 3.901×10^0

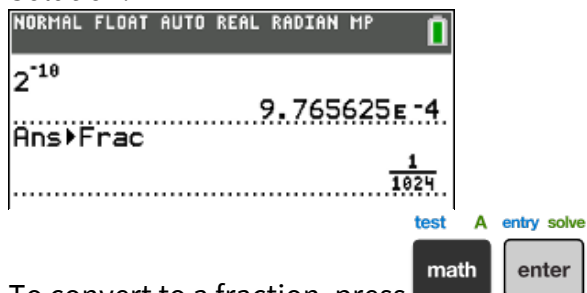
Translate calculator answers to standard notation

The GC automatically displays very large or very small numbers in scientific notation using $a E b$, which is “calculator speak”, instead of correct mathematical notation in the form $a \times 10^b$.

Example 6: Calculate 2^{-10} and write your answer a) in scientific notation, b) in standard notation and c) as a fraction.

Notice: This is base 2, not base 10. Scientific notation ALWAYS uses powers of 10.

Solution:



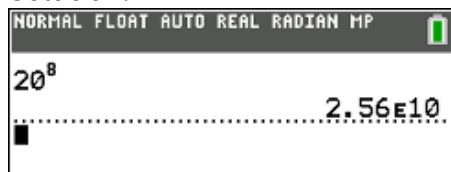
To convert to a fraction, press **math** **enter**.

After calculating, write standard notation by dividing 9.765625 by 10 four times, (or moving the decimal point 4 places left, putting in three zeros.)

Answers: a) 9.765625×10^{-4} b) 0.0009765625 c) $\frac{1}{1024}$

Example 7: Calculate 20^8 and write your answer a) in scientific and b) standard notations.

Solution:



After calculating, write standard notation by multiplying 2.56 by 10 ten times, (or by moving the decimal point 10 places right and putting in eight zeros.)

Answers: a) 2.56×10^{10} b) 25,600,000,000


Try It!

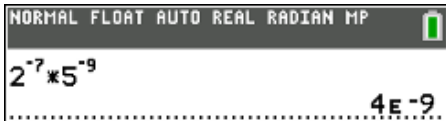
Calculate and write in standard notation.

1) $2^7 \cdot 5^9 \cdot 11^3$

2) $2^{-7} \cdot 5^{-9}$

Answers

2)  means
332,750,000,000

3)  means
0.000000004