

Input Calculations in Scientific Notation ClassicView

Objectives

- Recognize how the GC abbreviates scientific notation
- Given a calculation in standard notation, write it in scientific notation
- Input a calculation using the GC's **E** notation, by pressing the 2nd function **EE**
- Interpret **E** notation to write answer in standard notation

Recognize how the GC abbreviates 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 $\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$.









Correct scientific notation $a \times 10^b$ looks like $a \mathbf{E} b$ on the GC screen.

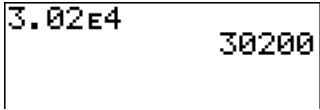
The GC changes $\times 10$ to **E** and moves the exponent b down.

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

Example 1: Input 3.02×10^4 into GC.

CAUTION: We do NOT press  !

Press these buttons        

to see this screen 

3.02×10^4 is equal to 30200, and can appear on the GC as 30200 or 3.02E4.

Given a calculation in standard notation, write it in scientific notation

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 2: Write this calculation in scientific notation: $0.000000008 \times 60,000,000$



Moving the decimal point 9 places is equivalent to dividing 8 by 10^9 to get (8×10^{-9}) .

Moving the decimal point 7 places is equivalent to multiplying 6 by 10^7 .

Answer: $(8 \times 10^{-9})(6 \times 10^7)$

Input a calculation using the GC's E notation by pressing the 2nd function **EE**

The 2nd function **EE** means 'multiply by a power of 10'. It appears as only **E** on the screen.

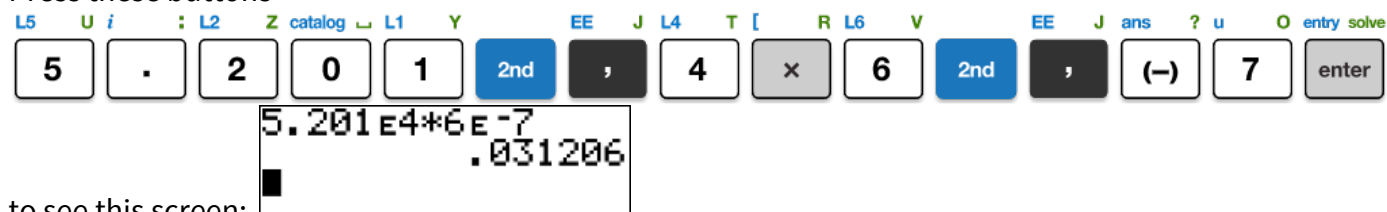
To input a number using **E** notation, press:   between a and b .

CAUTION: Do not type the multiplication symbol or the 10. Also, do not press the caret or exponent.

CAUTION: The **EE** or **E** is NOT the irrational number $e \approx 2.718$.

Example 3: Calculate $(5.201 \times 10^4)(6 \times 10^{-7})$ by typing **E** notation.

Press these buttons



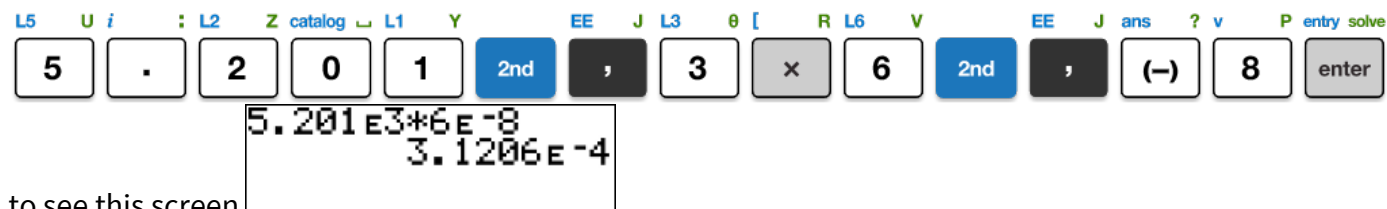
to see this screen:

This answer was automatically displayed in standard notation. But that doesn't always happen!

Interpret E notation to write answer in standard notation

Example 4: Calculate $(5.201 \times 10^3)(6 \times 10^{-8})$ by typing **E** notation. Write answer in standard notation.

Press these buttons



to see this screen

Notice that the result is still in scientific notation, and means 3.1206×10^{-4}

Recall that a negative exponent in the numerator means a positive one in the denominator: $3.1206 \times \frac{1}{10^4}$

Dividing by 10 four times will move the decimal point four places left, requiring three zeros.

Answer: 0.00031206

Try It!

Write in standard notation by typing **E** notation into your calculator.

- 1) 3×10^5 2) 2.116×10^{-3} 3) 3.24×10^0

Calculate by typing **E** notation. Write answer in scientific notation.

- 4) $(3 \times 10^{23})(7 \times 10^{30})$ 5) $(5 \times 10^{-11})(2 \times 10^{-13})$ 6) $\frac{0.000000000000008}{40,000,000,000,000}$ 7) $\frac{6,000,000,000,000}{0.0000002}$

Calculate by writing in scientific notation, then typing **E** notation. Write answer in standard notation.

- 8) $\frac{0.0000000008}{0.002}$ 9) $\frac{7,000,000,000}{5,000,000}$

Answers

- 1) 300,000 6) $\frac{(8 \times 10^{-14})}{(4 \times 10^{13})} = 2 \times 10^{-27}$ 8) $\frac{(8 \times 10^{-9})}{(2 \times 10^{-3})} = 4 \times 10^{-6} = 0.000004$
 2) 0.002116 7) $\frac{(6 \times 10^{12})}{(2 \times 10^{-12})} = 3 \times 10^{24}$ 9) $\frac{7 \times 10^9}{5 \times 10^7} = 1.4 \times 10^2 = 140$
 3) 3.24
 4) 2.1×10^{54}
 5) 1×10^{-23}