Scientific Notation Might be Rounded! Classic View

Objectives

- Review scientific notation on the graphing calculator
- Identify significant digits
- Use significant digits to identify rounded results

Review scientific notation on the graphing calculator

Scientific notation can be used to write any number as $a \times 10^b$, where
$1 \le a < 10$ (This means that a has one nonzero digit to the left of the decimal point) and
b is an integer $\{\ldots -3, -2, -1, 0, 1, 2, 3, \ldots\}$.

The GC replaces the $\times 10$ by **E** and moves the exponent b down, so $a \times 10^b$ looks like a **E** b.
The number a is also called the **significant digits** or **significant figures** of $a \times 10^b$.

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

The GC uses its own abbreviation for scientific notation. **6E18** means 6×10^{18}

To input a number using scientific notation, use: 

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

Identify significant digits

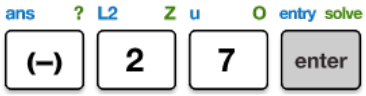
Example 1: What are the significant digits in 5.201×10^4?
The number a is also called the **significant digits** or **significant figures** of $a \times 10^b$.
Answer: 5.201 are the significant digits.

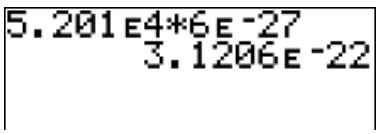
IMPORTANT: The zero in 5.201 is significant, because it holds the hundredths place for another digit, 1, in the thousandths place.

Use significant digits to identify rounded results

Example 2: Calculate $\left(5.201 \times 10^4\right)\left(6 \times 10^{-27}\right)$. What are the significant digits in the answer? Does this appear to be rounded?

Press these buttons: 

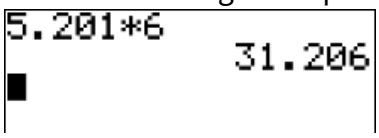


See this screen: 

Answer: 3.2106×10^{-2}, significant digits are 3.2106. This does not appear to be rounded.

Example 3: Check for rounding in the previous calculation by multiplying only the significant digits.

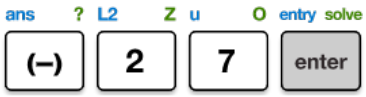
See this screen:



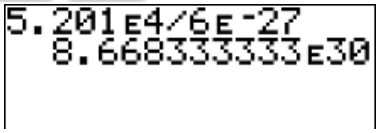
While the significant figures are in different decimal places, 31.206 has the same digits as 3.1206, in the same order. In particular, the last digit 6 is the same.
Answer: The result in Example 2 is not rounded.

Example 4: Calculate $\frac{(5.201\times10^{4})}{(6\times10^{-27})}$. Then divide only the significant figures to determine whether the result is exact or approximate.

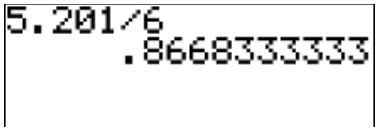
Press these buttons:



See this screen:



Significant digits only:

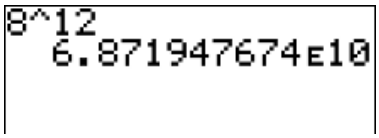


Remember that sometimes rounding is chopping off digits. The calculator rounded to fit on the screen.
Answers: $8.668333333\times10^{-22}$ This is a rounded answer.

Example 5: Calculate 8^{12}. What are the significant digits? Does this appear to be rounded?
Notice: the question has base 8, not base 10. Scientific notation ALWAYS uses powers of 10.

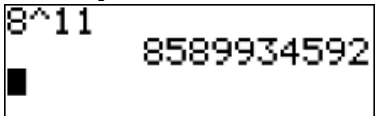
Press these buttons:

See this screen:



Answers: 6.871967674×10^{10} or 68,719,676,740. The significant digits are 6.871947674.
This appears to be rounded because all ten digits were used on the screen.

Example 6: Calculate 8^{12} by calculating 8^{11}, then multiplying by 8 by hand. Is this the same as before?



Answers: $8,589,934,592\times8=68,719,476,736$
The last two digits are not the same as Ex 5. The other answer was rounded to the nearest ten.