scientific notation*

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Scientific notation is a manner of expressing real numbers in base 10 which provides a more compact way of writing very large or very small numbers without needing too many zeroes. To put it algebraically, a real x is expressed as $b \times 10^a$, where b is a rational real number with a limited number of decimal places, and a is an integer.

For example, 47420000000000000000000000000000000000000000001701 is written as 4.742×10^{47} in scientific notation, while the reciprocal of that number is written as 2.10881×10^{-48} in scientific notation. The number multiplied by the power of 10 is called the *mantissa*. It is customary to choose the mantissa b to be in the range $0 \leq |b| < 10$ so as to enable easier comparison of values. For example, it is clear from looking at the exponents alone, that of the numbers 3.1403×10^{97} and $-4.58990321 \times 10^{1729}$, the latter has the greater absolute value.

It is understood that some loss of precision is acceptable for the application at hand; that it is not necessary to know the least significant digit, or even hundreds of digits besides the few most significant to be put in the mantissa. This would be unacceptable in most applications of number theory, but it is adequate and even necessary for many applications in scientific fields such as physics, biology, seismography, etc.

Most scientific calculators support scientific notation, with the 10 tacit and possibly the letter "E" (for exponent). Hardware calculators might be limited to exponents $-100 < a < 100$. Software calculators are usually not subject to this limitation.

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