

Scientific Notation

Really small numbers like .000,000,000,000,000,917 and really large numbers like 528,000,000,000,000,000 have lots of zeros when written in *standard form* (the way we normally write numbers). When the same numbers are written in *scientific notation* you don't have to write all the zeros. The smaller number looks like 9.17×10^{-16} when written in scientific notation and the larger number looks like 5.28×10^{17} .

Numbers written in scientific notation have 4 parts.

- A decimal number that has exactly one digit in front of the decimal point and that digit can not be a zero.
- A times 10 part ($\times 10$).
- An exponent.
- A sign on the exponent.

To write a number in scientific notation you must meet the four conditions above.

- Move the decimal point until it only has one digit in front of it but that digit can not be a zero.
- Add a times 10 part “ $\times 10$ ”.
- Put an exponent on the times ten part, the value of the exponent is the number of spaces you moved the decimal point.
- Put a sign on the exponent. *The sign tells which direction to move the decimal point back to get the original number.* A common error here is that people use the direction they moved the decimal to get the number in scientific notation instead of the direction they will have to move the decimal point back to get the original number.

It is easy **to convert numbers from scientific notation to standard form** because numbers written in scientific notation tell you how to rebuild the original number.

- The exponent tells you how many places to move the decimal point to get the original number.
- The sign on the exponent tells which direction to move the decimal point. If the sign is positive move the decimal point in the positive direction, to the right just like on a number line. If the sign is negative move the decimal in the negative direction, to the left just like on a number line.
- To rebuild the original number from 9.17×10^{-16} you need to move the decimal point to the left 16 spaces. You get .000,000,000,000,000,917 which is the original number in standard form
- To rebuild 5.28×10^{17} move the decimal 17 spaces to the right to get 528,000,000,000,000,000. which is the original number in standard form.