

What is scientific notation?

Remember, scientist like to simplify things because we can be lazy.
I don't want to write out 90000000000000000000. WAY TOO MANY 0'S!
So, we use scientific notation.

How it Works

What is 1×10 ? It is 10

What is 1×100 ? It is 100, but let's rewrite this using powers of 10. $1 \times 10^2 = 100$

Scientific notation uses powers of 10 to simplify big and little numbers.

What is $1/1000$? It is 0.001, but let's rewrite this using powers of 10. $1 \times 10^{-3} = 0.001$

Let's look at other numbers in scientific notation:

$$2 \times 10^2 = 200$$

$$2 \times 10^{-2} = 0.02$$

Above 90000000000000000000 in scientific notation is 9×10^{20} way easier!

Notice, I have 20 zeros after the 9 and the notation has ten to the power of 20.

Comparing numbers in scientific notation

This is also a fantastic way to compare numbers. Just look at the exponents.....

$$2 \times 10^2 = 200$$

$$2 \times 10^5 = 200000$$

$$2 \times 10^{-2} = 0.02$$

$$2 \times 10^{-3} = 0.002$$

Notice, positive exponents give us numbers bigger than the number one
and negative exponents give us number smaller than the number one.

The bigger the positive exponent the bigger the number.

The bigger the negative exponent the smaller the number.

Scientific notation form is always the first significant figure followed by a decimal and then the rest of the significant figures. 3200 in scientific notation is 3.2×10^3

Ruane's Tips for Scientific Notation

Standard Notation (another way of saying regular numbers) to Scientific Notation

Note: Only significant figures are used in scientific notation

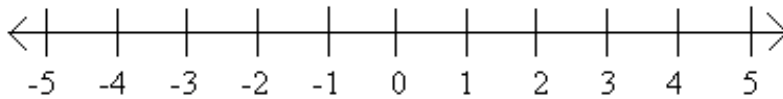
Step 1. Put the number into scientific notation form by writing down the first non-zero number, then a decimal, then all the rest of the **significant figures** $\times 10^?$

Step 2. To figure out the exponent, count how many places you need to get back to the original number. Use a number line to determine if the exponent is negative or positive.

Moving the decimal right is towards the positive part of a number line, so the exponent is positive.

Moving left is towards the negative side of the number line, so the exponent is negative

(First sig fig).(rest of the sig figs) X 10^{number it takes to get back to the original number}



Example #1

203 (all numbers are significant)

Step 1. Put the number in scientific notation form by writing the first non-zero number followed by a decimal and then the rest of the significant digits.

$$2.03 \times 10^2$$

Step 2. Determine the exponent.

To change 2.03 back to the original number, you must move the decimal 2 places to the right (towards the positive side of the number line), so my exponent is 2.

Answer: 2.03×10^2

Example #2

2030 (3 number are significant)

Step 1. Put the number in scientific notation form.

$$2.03 \times 10^3$$

Step 2. Determine the exponent.

To change 2.03 back to the original number, you must to move the decimal 3 places to the right (towards the positive side of the number line), so my exponent is 3

$$\begin{array}{c} 2.030 \\ \underbrace{\quad\quad\quad} \\ 1 \quad 2 \quad 3 \end{array}$$

Answer: 2.03×10^3

Example #3

0.0402 (3 number are significant)

Step 1. Put the number in scientific notation form.

$$4.02 \times 10^2$$

Step 2. Determine the exponent.

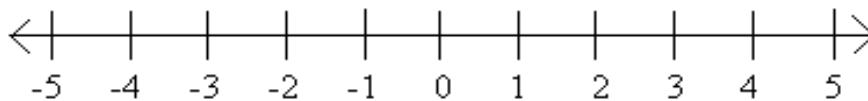
To change 4.02 back to the original number, you must to move the decimal 2 places to the left (towards the negative side of the number line), so my exponent is -2.

$$\begin{array}{c} \underbrace{.04,02}_{2 \quad 1} \end{array}$$

Answer: 4.02×10^{-2}

Changing scientific notation back to standard notation

This is easy! The exponent tells you how many places to move the decimal and the number line tells you which direction to move it.



Example #1

2.03×10^3 Move the decimal 3 places to the right (there is a positive exponent so move towards the positive side of the number line)

I had to add a zero here to move the decimal 3 places

$$\begin{array}{c} \underbrace{2.030}_{1 \quad 2 \quad 3} \end{array}$$

Answer: 2030

Example #2

4.86×10^{-4} Move the decimal 4 places to the left (there is a negative exponent, so move towards the negative side of the number line)

I had to add 3 zeros in to move the decimal place

$$\begin{array}{c} \underbrace{0004.86}_{4 \quad 3 \quad 2 \quad 1} \end{array}$$

Answer: 0.000486

Once again, super fun!! Now let's practice.