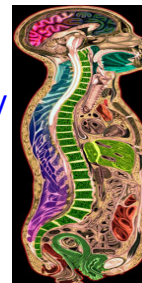


1.10 Scientific Notation

Real world applications of math often require the use of very large or very small numbers.

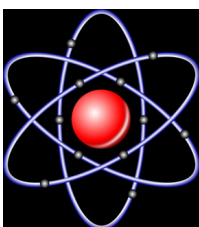
Number of cells in the human body is approximately
37 200 000 000 000



The number of neuronal connections in the human brain is
100 000 000 000 000

The estimated number of atoms in the observable universe is

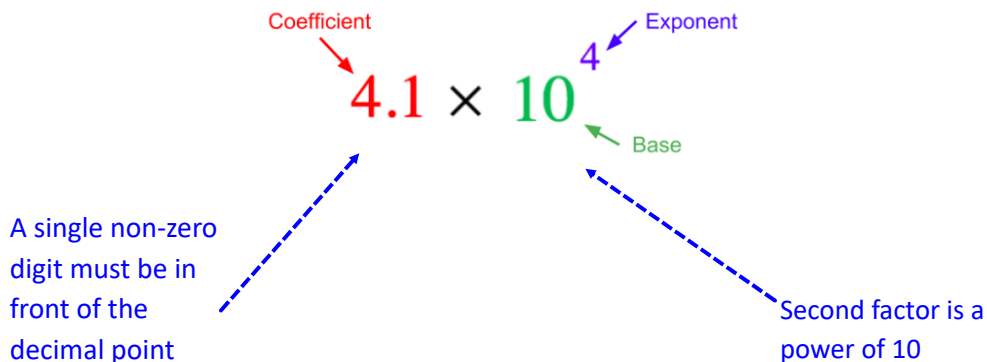
100 000 000 000 000 000 000
000 000 000 000 000 000 000
000 000 000 000 000 000 000
000 000 000



The mass of an electron is approximately
0.000 000 000 000 000 000 000 000 910 938 22 grams

One way to deal with these numbers was to create a new notation called

SCIENTIFIC NOTATION



Ex.1 Which of the following numbers are expressed correctly in scientific notation?

- a) 35.46×10^6 b) 1.2×10^{25} c) 6.42×5^7 d) 8×10^{-14} e) 0.85×10^9
- Handwritten notes: a) NO (Must be 1-9), b) YES, c) NO (must be 10), d) YES, e) NO (Must be 1-9)

Standard vs. Scientific Notation

Moves 6 SPACES RIGHT

Scientific Notation: 3.25×10^6

Standard Notation: $= 3,250,000.$

A positive exponent makes a larger number

This exponent indicates how many spaces the decimal point must move to write the number in standard notation.

Moves 4 SPACES LEFT

Scientific Notation: 7.5×10^{-4}

Standard Notation: $= 0.00075$

A negative exponent makes a smaller number

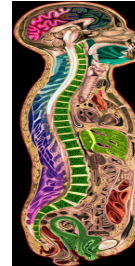
Ex 2. Convert to Standard notation

- a) 8×10^2 b) 4×10^{-7} c) 0.35×10^5 d) 9.5×10^0
- Handwritten notes: a) 2 right = 800, b) 7 left = 0.0000004, c) 5 right = 35000, d) Don't move = 9.5

Converting to Scientific Notation

Let's go back to the examples at the start of the lesson.

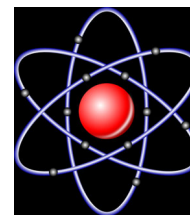
Ex.3 The number of cells in the human body is approximately 37 200 000 000 000. Convert to scientific notation



Standard Notation	Scientific Notation
37 200 000 000 000 =	3.72×10^{13}

Note: Positive exponent

Ex. 4 The mass of an electron is approximately 0.000 000 000 000 000 000 000 000 910 938 22 grams



Standard Notation
0.000 000 000 000 000 000 000 000 910 938 22
Scientific Notation
$\equiv 9.1093822 \times 10^{-28}$

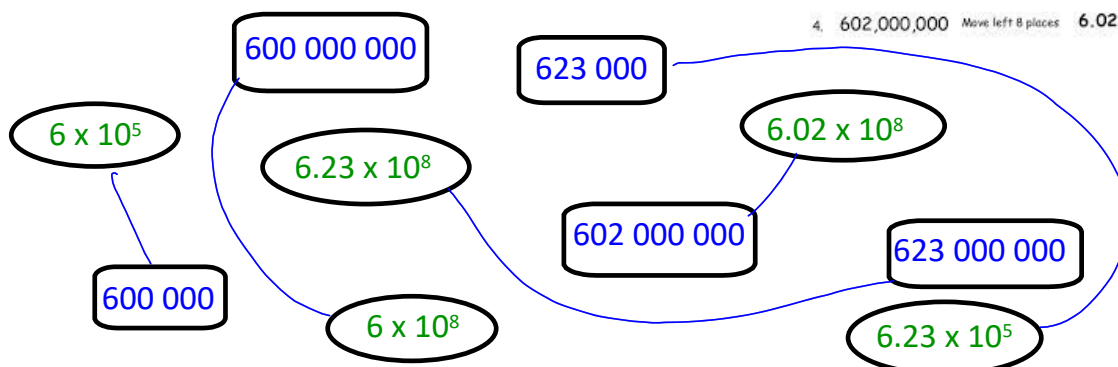
Note: Negative exponent

Decimal \rightarrow Scientific Notation

Move decimal point right or left to arrange one digit to the left of decimal point.

- | | | |
|----------------|---------------------|-----------------------|
| 1. 52,314 | Move left 4 places | 5.2314×10^4 |
| 2. 3.2 | No need to move | 3.2×10^0 |
| 3. .0000428 | Move right 5 places | 4.28×10^{-5} |
| 4. 602,000,000 | Move left 8 places | 6.02×10^8 |

Ex. 5 Match each pair together



Ex. 7 Order the following numbers from largest to smallest

$$\cancel{9.434 \times 10^7}$$

$$\cancel{4.51 \times 10^9}$$

$$\cancel{2.35 \times 10^9}$$

$$8 \times 10^7$$

$$\cancel{5 \times 10^8}$$

$$4.51 \times 10^9$$

$$2.35 \times 10^9$$

$$5 \times 10^8$$

$$9.434 \times 10^7$$

$$8 \times 10^7$$

Ex. 8 Convert each of the following to scientific notation

a) 0.736×10^{-3}

$$= 7.36 \times 10^{-4}$$

b) 14.2×10^{-6}

$$= 1.42 \times 10^{-5}$$