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Scientific notation (Revision)

Scientific notation is a form of presenting very large numbers or very small numbers in a simpler form.

As we know, the whole numbers can be extended till infinity, but we cannot write such huge numbers in a piece of paper. it is difficult to represent a few numbers in their expanded form. Hence, we use scientific notations...

For example, 100000000 can be written as 10^8 or 1×10^8 which is the scientific notation. Here the exponent is positive.

Similarly, 0.0000001 is a very small number which can be represented as 10^{-8} or 1×10^{-8} where the exponent is negative.

Scientific Notation Definition

As discussed in the introduction, the scientific notation helps us to represent the numbers which are very huge or very tiny in a form of multiplication of single-digit number and 10 raised to the power of the respective exponent. The exponent is positive if the number is very large and it is negative if the number is very small. The general representation of scientific notation is:

$$k \times 10^n; \quad 1 \leq k < 10$$

Scientific Notation Rules

To determine the power or exponent of 10, let us understand how many places we need to move the decimal point after the single-digit number.

1.   If the given number is multiples of 10 then the decimal point has to move to the left, and the power of 10 will be positive.

Example: $6000 = 6 \times 10^3$ is in scientific notation.

2.   If the given number is smaller than 1, then the decimal point has to move to the right, so the power of 10 will be negative.

Example: $0.006 = 6 \times 0.001 = 6 \times 10^{-3}$ is in scientific notation.

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Positive and Negative Exponent

When the scientific notation of any large numbers is expressed, then we use positive exponents for base 10.

For example:

$20000 = 2 \times 10^4$, where 4 is the positive exponent.

When the scientific notation of any small numbers is expressed, then we use negative exponents for base 10.

For example:

$0.0002 = 2 \times 10^{-4}$, where -4 is the negative exponent.

Scientific Notation Examples

The examples of scientific notation are:

(a) $490000000000000000000000000000 = 4.9 \times 10^{28}$

(b) $1230000000 = 1.23 \times 10^9$

(c) $50500000 = 5.05 \times 10^7$

(d) $0.000000000000000097 = 9.7 \times 10^{-17}$

(e) $0.0000212 = 2.12 \times 10^{-5}$

Practice Questions

Problem 1: Convert the following numbers into scientific notation.

1. 281000000000000000000000000000000
2. 7890000000000000000000000000000000000000000
3. 0.00000000000000000000542

Problem 2: Convert the following into standard form.

1. 3.5×10^{25}
2. 2.89×10^{-16}
3. 9.8×10^{-12}