Notes for Zigyasa Ritwajeet Jha

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1 Introduction to Scientific Notation for Numerals

Instead of zeros, for convenience, we like to express numbers in terms of a single digit (which may or may not have fractional or decimal components) multiplied by a power of 10. Because adults are lazy, instead of writing 10^A every time, they write eA to express that the number before it is multiplied by 10^A. By the way, in your *scientific*™ calculator, you can actually use that, and in fact people use it all the time. Please refer to the examples below.

Numbers bigger than 1 can be written with a positive value of the exponent.

$$\begin{aligned} 700 &= 7 * 10^2 && = 7e2 \\ 352 &= 3.52 * 10^2 && = 3.52e2 \\ 5326.6 &= 5.2366 * 10^3 && = 5.3266e3 \\ 32 &= 3.2 * 10^1 && = 3.2e1 \\ 4,900,000,000 &= 4.9 * 10^9 && = 4.9e9 \\ 3.2 &= 3.2 * 10^0 && = 3.2e0 \end{aligned} \tag{1}$$

Although no one writes Equation (1) like that.

Numbers smaller than 1 can be written with a negative value of the exponent.

$$\begin{aligned} 0.7 &= 7 * 10^{-1} && = 7e-1 \\ 0.00000256 &= 2.56 * 10^{-6} && = 2.56e-6 \end{aligned}$$

Units are no different. Instead of writing $1m = 100cm$, we can write a more efficient $1m = 1e2cm$. Similarly instead of writing $1cm = \frac{1}{100}m$ or $1cm = 0.01m$, we write $1cm = 1e{-}2m$. This becomes even more important when we are talking about squares or cubes of unit quantities, such as areas and volumes.

$$\begin{aligned} 0.75cm = 0.75 * 10^{-2}m \quad &= 0.75e - 2m \\ \text{or, } 0.75cm = 7.5e - 1cm \quad &= 7.5e - 3m \\ (0.75cm)^2 = (0.75e - 2m)^2 &= 0.5625e - 4m^2 \\ \text{or, } (0.75cm)^2 = 5.625e - 5m^2 & \end{aligned}$$

2 Q113 of NCERT Class 8 Mathematics Exemplar

Note: Don't be intimidated when I use $\frac{dV}{dt}$ or $\frac{dh}{dt}$ instead of Volume per unit time and height per unit time. It's just some standard notation which you'll probably learn first about, in class XI. Through this question, I wanted to highlight how using simple scientific notation saves you from the awkwardness of counting zeros or digits after decimal points.

$$\begin{aligned} \frac{dV}{dt} &= \pi r^2 \frac{dh}{dt} \\ \text{Here, } \frac{dV}{dt} &= \frac{22}{7} * (0.75e - 2m)^2 * (7m/s) \\ \text{or, } \frac{dV}{dt} &= 22 * \left(\frac{3}{4}e - 2m\right)^2 * (1m/s) \\ \text{or, } \frac{dV}{dt} &= 22 * \left(\frac{9}{16}e - 4m^2\right) * (1m/s) \end{aligned}$$

In one hour, total volume transported would be:

$$\begin{aligned} V &= 22 * \left(\frac{9}{16}e - 4m^2\right) * (1m/s) * 3600s \\ \text{or, } V &= 44550e - 6m^3 \end{aligned}$$

But, $1m^3 = 1000l$. So:

$$\begin{aligned} V &= 44500e - 6m^3 * 1000l/m^3 \\ \text{or, } V &= 44500e - 3l \\ \text{or, } V &= 44.5l \end{aligned}$$

Funnily enough NCERT provides the correct value in l but incorrect value in cm^3.