# Art of Estimation

To get order-of-magnitude estimates of many things in physics, astrophysics & cosmology it is enough to know a handful of numbers by heart. I recommend working in GeV units (with $\hbar = c = 1$) and restoring whatever units you like at the end.

$\alpha = 10^{-2} = e^2/4\pi$ (rational units)

$m_e = 10^{-3}$ GeV. $m_p = 1$ GeV.

GeV. $= 10^{13}$ K ($eV = 10^4$ K)

$$\text{GeV.} \approx \frac{1}{10^{-24}\text{ sec.}} \approx \frac{1}{10^{13}\text{ cm.}} \approx 10^{-24}\text{ gm.}$$

$M_{\text{Planck}} \approx 10^{19}$ GeV.

$$G_N = \frac{1}{M_{Pl}^2}$$

$$G_F = \frac{1}{10^{10}\,\text{GeV}.^4} \qquad \text{(Fermi constant)}$$

$$1\ \text{yr.} \approx 3 \times 10^7\ \text{sec.}$$

Birthday Remark

It would be appropriate for scientists to celebrate their birthdays in the units they commonly use. To convert, note

$$10^9\ \text{sec.} = 31.7098\ \text{yr.}$$

$$= 31\ \text{yrs.}, 259\ \text{days}$$

↳ note: 365 day years. Yrs must correct for leap years.

Birthdays $\Rightarrow$ celebrate $1\times10^9, 2\times10^9, 3\times10^9$

This could also be used for wedding anniversaries, etc.