Modern Physics

Speed of light

$$c = f\lambda = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$$

Problem 1.- Microprocessors work at frequencies of the order of GHz, so the finiteness of the speed of light can play a role constraining their size.
What is the maximum size of a chip that works at 4 GHz if we want to be sure that any signal can travel to the other side of the device in less than one clock cycle?

Solution: One cycle of the clock is the inverse of the frequency, so

$$T = \frac{1}{4\times10^9\,\text{Hz}} = 0.25\text{ns}$$

And in that time the maximum distance that an electric signal can travel is:

$$d = ct = 3\times10^8\,\text{m/s}\times0.25\text{ns} = 7.5\text{cm}$$

You do not want the diagonal of the chip to be larger than that, otherwise the signals will not reach the other side of the chip in time for the next cycle.