

Visualizing Nanometers

Materials:

Used Envelopes

Fingernails

Pencil

Try This:

A well published quote about nanoscale is that your fingernails grow one nanometer per second.

<http://www.nisenet.org/public>, <http://www.mrsec.wisc.edu/Edetc/nanoscale/index.html>

Let's try a "Back of the Envelope" calculation to check the veracity of this statement.

How often do you trim your fingernails? How much do you cut off?

Let's assume that you trim your fingernails once every two weeks, and that you trim about 2 mm off of your nails.

We can express this as a rate: 2 mm/2 weeks or 1 mm/week

Let's use some of our "sneaky names for one" for some unit conversion fun! We are starting with a rate of 1 mm/week. We want to end up with nanometers/second. First let's get nanometers in our numerator:

$$\frac{1 \text{ mm}}{\text{week}} \cdot \frac{1000 \mu\text{m}}{1 \text{ mm}} \cdot \frac{1000 \text{ nm}}{1 \mu\text{m}} = \frac{1,000,000 \text{ nm}}{\text{week}}$$

and now, let's get seconds in our denominator:

$$\frac{1,000,000 \text{ nm}}{\text{week}} \cdot \frac{1 \text{ week}}{7 \text{ days}} \cdot \frac{1 \text{ day}}{24 \text{ h}} \cdot \frac{1 \text{ h}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ s}}$$

$$= 1.65 \text{ nm/s}$$

Our "Back of the Envelope" calculation is well within an order of magnitude!