Intro Quiz #2

1. How many km can light go in a year? [**This is the definition of a LIGHT YEAR!**]
   Given:
   - 1 km = 1,000 m
   - Light goes 3×10^8 m per 1 second.
   - 60 seconds = 1 minute
   - 60 minutes = 1 hour
   - 24 hours = 1 day
   - 365 days = 1 year

$$\frac{1\ km}{1000\ m} \times \frac{3\times10^8\ m}{1\ sec} \times \frac{60\ sec}{1\ min} \times \frac{60\ min}{1\ hr} \times \frac{24\ hrs}{1\ day} \times \frac{365\ days}{1\ yr} = \frac{10^{13}\ km}{1\ yr}$$

2. How many minutes are in a year?
   Given:
   - 365 days / 1 yr
   - 24 hr / 1 day
   - 60 min / 1 hr

Estimate: # min / yr

$$\frac{60\ min}{1\ hr} \times \frac{24\ hrs}{1\ day} \times \frac{365\ days}{1\ yr} = \frac{6\times10^5\ min}{1\ yr}$$

3. How many nanoseconds are in a millenium?

Given:

- 1,000 yrs / 1 millenium
- 365 days / yr
- 24 hr / 1 day
- 60 min / 1 hr
- 60 sec / 1 min
- 10^9 nanoseconds / 1 sec

Estimate: # nanoseconds / millenium

$$\frac{10^9 \text{ ns}}{1 \text{ sec}} \times \frac{60 \text{ sec}}{1 \text{ min}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{24 \text{ hr}}{1 \text{ d}} \times \frac{365 \text{ d}}{1 \text{ yr}} \times \frac{10^3 \text{ yrs}}{1 \text{ mill}} = \frac{36 \times 10^{18} \text{ ns}}{1 \text{ mill}}$$

4. How many nm wide is the universe?

Given:

- 1 universe = 30×10^9 light years
- 1 light year = 10^{13} km
- 1 km = 1,000 m
- 10^6 nm = 1 mm
- 10 mm = 1 cm
- 100 cm = 1 m

Estimate: # nm / universe

$$\frac{10^6 \text{ nm}}{1 \text{ mm}} \times \frac{10 \text{ mm}}{1 \text{ cm}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{10^3 \text{ m}}{1 \text{ km}} \times \frac{10^{13} \text{ km}}{1 \text{ ly}} \times \frac{30 \times 10^9 \text{ ly}}{1 \text{ U}} = \frac{3 \times 10^{35} \text{ nm}}{1 \text{ U}}$$