Welcome to the ASTR 105G Lab!

Instructor: Jacqueline McCleary
Office: Astronomy 107A
Email: mccleary@nmsu.edu

All Class Notes are available at
http://astronomy.nmsu.edu/mccleary/astr105.html

Lab #1: Tools for Success a/k/a "The Math Lab"

☺ Don’t Panic ☺

The Metric System

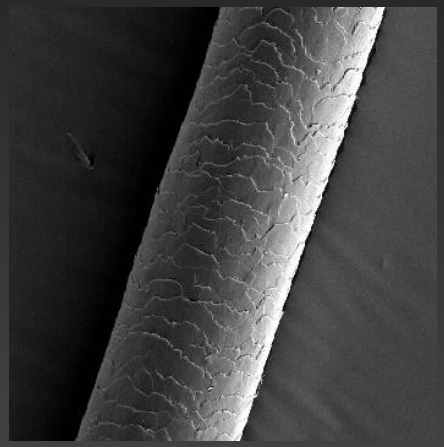
In astronomy (and in life) we encounter things that cover many different size scales:

- The width of a human hair
- The distance to Boston
- The length of the Milky Way

- The metric system provides a standard way of describing all of these...

Width of a human hair:

0.00015 m = 150 µm



Distance to Boston:

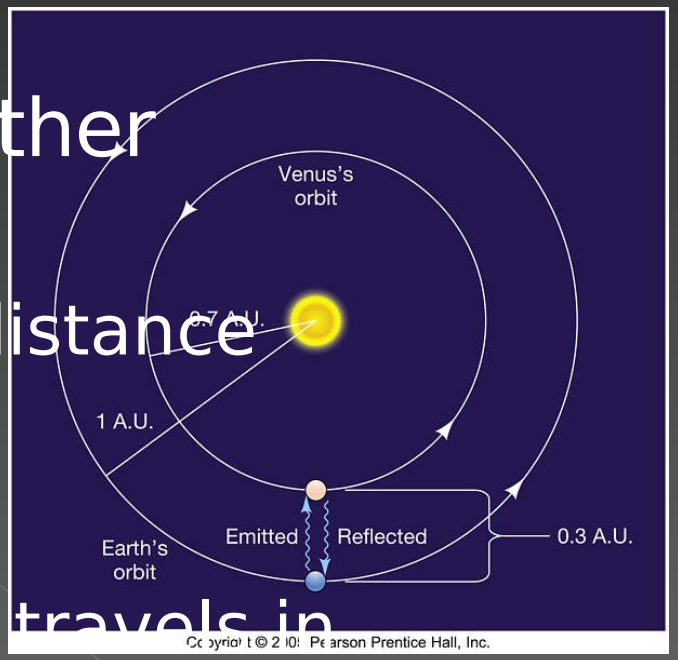
4,000,000 m = 4000 km

Length of Milky Way:

950,000,000,000,000,000,000 m =
950,000,000,000,000,000 km

When the Metric System Just Isn't Good Enough…

- In astronomy, we also use other distance distance scales:
  - The Astronomical Unit (AU): distance between Earth and Sun
  - The Light Year: distance light travels in one year



Unit Conversions

In the metric system, we can easily convert from one scale to another:

The distance to the Moon is 384,000,000 m. What is it in kilometers?

1 km = 1000 m

384,000,000 m = 384,000 km

The Factor Label Method

- Because unit conversions can be tricky, we can express units as a series of factors
- For example, what is 73 mph in m/s?

$$73\ \frac{\text{miles}}{\text{hour}} = \left(\frac{1\ \text{km}}{0.621\ \text{mile}}\right)\left(\frac{1000\ \text{m}}{1\ \text{km}}\right)\left(\frac{1\ \text{hour}}{3600\ \text{s}}\right) = 33\ \text{m/s}$$

- WRITE THIS OUT EVERY TIME until you are comfortable with unit conversions

CHECK YOUR FREAKING UNITS

Before submitting an answer, ask yourself:

1) Did I write the units?
2) Do the units make sense?

Exponents!

Exponents are really just a shorthand way of expressing a number:

$$5^4 = 5 \times 5 \times 5 \times 5 = 625$$

And the “square” of a number is just that number multiplied by itself:

$$3^2 = 3 \times 3 = 9$$

Scientific Notation: Because Scientists are Lazy

- Scientific Notation is another timesaver, this time a way of writing a number with lots of zeros:

950,000,000,000,000,000 km = 9.5×10^{17} km

0.00015 m = 150 μm = 1.5×10^{-4} m

- All we have to do to express a long number in scientific notation is count how many times we move the decimal point to the first non-zero number, and write "x 10 –".
- If we move the decimal point to the left, the blank is a positive number. If we move the decimal point to the right, it's a negative number.