Practicing Excel Formulae, Scientific Notation, and Unit Conversions:

Today we will be practicing converting units, writing formulae in Excel, estimating, and reading scientific notation. A spreadsheet template is available on canvas, which will require you to write Excel formulae that automate the conversion process for you, so that you do not have to convert over a hundred numbers. You will need the following conversions:

$1\ km = 1,000\ m$, $1\ pc = 3.26\ ly$, $1\ kpc = 1,000\ pc$,

$1\ AU = 1.496 \cdot 10^{11}\ m$, $1\ ly = 9.46 \cdot 10^{15}\ m$, $1\ mi = 1.609\ km$,

Problems:

1. A spreadsheet template is available on canvas. Please download it and use Microsoft Excel to open the file (not the online version, please). Some data is already included. The remaining cells require Excel formulae.

2. Proxima Centauri is the closest star to Earth (other than the Sun, of course!) at a whopping $4.02 \cdot 10^{16}$ meters away from us. Do the unit conversions by hand below to determine the distance to this star in parsecs.

3. Write a formula in the first blank cell in each column to convert the data from (e.g.) meters to (e.g.) AU. You may need to solve for one column before you are able to finish another column.

4. Which of the available units is most practical for discussing the semi-major axis length for Neptune? Why?

5. Roughly how many orders of magnitude are there between the largest and smallest scale in the spreadsheet?

6. The Voyager I probe is the furthest manmade object from Earth. How far away is it in lightyears? Write your answer as both a pure decimal number <u>and</u> in scientific notation.

7. This spreadsheet has 25 different lengths/distances in units of meters, and requires you to convert each of these quantities to 6 other units. That a total of $6 \times 25 = 150$ conversions! Imagine doing this by hand! Excel made this rather quick, so you can imagine how powerful such a tool is when one is dealing with 10,000 records! Although fast, we should double check our formulae for *accuracy* by comparing the value you found in problem 2 to the value calculated by the spreadsheet. Do they agree? (Remember – always try to check and make sense of your answers! Always pause and ask yourself if your answers make sense.)

8. Without doing any explicit math, use the values from the spreadsheet to roughly estimate the distance from New York City, NY to Denver, CO in units of kilometers. Explain your reasoning.

9. Finally, let's add another row. <u>Estimate</u> the width of campus in miles or kilometers and then extend the formulae in the spreadsheet to convert this number into kpc, pc, AU, etc.