

Python 2

Due: Monday, October 26th by 5pm

Using the Bright Star Dataset: "BrightStars.dat"

Write a Python program that will create a new data file with the following 5 columns:

Catalog#	RA	Dec	Distance	Absolute Magnitude
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With RA and Dec in decimal degrees (i.e 12.2345 34.2365) and Distance in light years.

RA and Dec should have 4 digits after the decimal (i.e 12.2345) Distance and AbMag should have 2 digits after the decimal (i.e 4.39)

Your rows should look something like:

BXXXX	XX.XXXX	XX.XXXX	X.XX	X.XX
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Email To Me:

- 1) The new data file that you have created.
- 2) Your python program.

Helpful Hints

Break the Program Into Parts

Like all programs, try to break the task up into its parts. The original BrightStars.dat has RA and Dec different units than what we want. There is no "distance" or "absolute magnitude" in Brightstars.dat, but there are parallax and magnitude. We'll need to use them to derive the distance and absolute magnitude.

The math stuff:

- a. We will have to make some functions to convert RA and Dec units.
- b. We will need to make a function to convert parallax to distance (in light years)
- c. We will need to use magnitude and parallax to calculate absolute magnitude.

The programming stuff:

- d. We need to read data from the original BrightStars.dat file and do operations on it.
- e. We need to write our new variables to a file with the proper formatting. Hint: use `ascii.write()` from `astropy.io` since it can easily handle writing mixed data types to a file.

The checking (to do after you can successfully run the code):

- f. Are all the units correct?
- g. Can we do any sanity checks?

Now that we have divided up the problem, start by making sure you know the math that is needed.

- a. How do you convert RA and Dec. in hours, min, sec to decimals hours or degrees?

ra (in decimal degrees) = RAhours + RAmin/60. + RAssec/3600.

dec (in decimal degrees) = Decdeg + Decmin/60. + Decsec/3600.

- b. The distance in parsecs is just $1/\text{parallax}$ if parallax is in arcseconds. There are 3.2616 lightyears/parsec. *Hint: BrightStars.dat uses milli-arcseconds instead of arcseconds, so you'll need to convert to arcseconds first.*

- c. Absolute magnitude is related to parallax (P) and apparent magnitude (mag) by:

$\text{AbsMag} = \text{mag} + 5. * (\text{Log}_{10}(\text{P}) + 1)$

(careful, Log_{10} is log base 10.)

After writing the functions, write in the main part of the program a "call" to the functions you just wrote. Try to run your program! Don't worry if things do not work the first time. If you get an error, the next step is debugging! Are you using floats when doing multiplication or division? This gives you better precision than using integers. Make sure all the syntax is correct. Are you missing any parentheses? Did you properly indent your code? Don't hesitate to help one another debug. Also don't hesitate to use online tutorials—Google is your friend. You are free to work together, but everyone must write his or her own module.