Week 1

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Reading

We will begin with a brief introduction to Celestial Coordinate Systems. One thing to remember is that pretty much all these coordinate systems are essentially Spherical Polar Coordinates. So if you have any confusions regarding those, start out with a revision of Spherical Coordinates (especially conversion to Cartiesian Coordinates and vice-versa). We will also be (eventually) needing to look up spherical trigonometry, so do brush up on your triangle laws

For starting on Celestial Coordinates, we consider 2 coordinate systems first: the Horizontal(from Horizon, not sleeping line) System and the Equatorial System.
Recommended Resource: YouTube video on Celestial Coordinate Systems.
Additional Reading: A very detailed text which deals with Spherical Trigonometry, which you should get started with this week.

Fun Activity: Install Stellarium on your laptop, and play around with the time feature (you can go forward and backward in time) and also note the movement of the stars, planets, Moon and Sun. You can switch on/off the different grids for coordinate systems, and see how the coordinates of an object change with time. Experiment as much as you need (want) to.

Programming

We will be using quite a bit of programming in Python. This is primarily because of Astropy, which has a lot of functionality for astronomers, including support for celestial coordinate systems. Once you have finished the recommended reading, we will start with Astropy.

Since everybody should ideally have the same versions of Python, and the packages etc, it is highly encouraged that you use virtual environments. The easiest way to do this is to use `conda` from either Miniconda3 or Anaconda3. I use Miniconda, and install packages myself. The steps to set up are:

```
conda activate base
conda update conda
conda env create -f environment.yml
```

You will need to use the environment.yml file, which will be shared on Slack (ideally this should be GitHub, and once the project is done, will be).

For now, you must do the following:

1. Familiarize yourself with GitHub (and Git). Make a test repository, and add in a dummy file. Make sure you understand what a commit is, how to make branches, and how to push your local changes to a branch on GitHub.

2. Create the conda environment. Start by making a function to convert cartesian to spherical coordinates and vice versa.

3. We will be using Classes, and `astropy.coordinates` in the following weeks, so do look up what they are, and how they are used.