The purpose of this worksheet is to practice the implicit DO loop construct to read (and then manipulate) data from an input file.

Tasks

1. Download the gzipped archive `COVID19Cases.tgz` from the class website.

2. Use `tar -tzvf` to inspect the content of this archive.

3. Use `tar -xzvf` to extract the content of the archive. This will create a sub-directory named `COVID19Cases` which contains the data file `COVID19.dat`. Use `more` and `tail` to display the first/last 10 lines of data of this data file. The data show the number of COVID-19 cases reported in the US from 1 March 2020 through 7 April 2020. The first column lists the time in days, the second column shows the number of COVID-19 cases.

4. Write a structured and well-commented Fortran program which uses the implicity `DO` loop construct to read the data from `COVID19.dat`, computes the base-10 `log` of the number of COVID-19 cases, and writes the logarithmic values of the COVID-19 cases as a function of time to an output data file. The syntax will be something like this:

```
      DO
      READ (100, *, end=20) time, COVID19_cases
      WRITE(200, *) time, LOG10(COVID19_cases)
      END DO
   20 CONTINUE
```

5. If `python` or `python3` is installed on your machine, create a plot which shows the data of `COVID19.dat` graphically. This is done by executing the following command in a termial

```
$ python COVID19.py
```

where `COVID19.py` is a short python plotting script that looks as follows:

```python
import numpy as np
import matplotlib.pyplot as plt

# Create a new figure of size 8x6 points
plt.figure(figsize=(8,6), dpi=100)

x, y = np.loadtxt('COVID19.dat', unpack=True)
plt.plot(x,y, color='blue', linewidth=2.0, linestyle='--', label='Data set 1')

plt.xlabel('Time  (Days)', fontsize=15)
plt.ylabel('COVID-19 Cases Reported in the US', fontsize=15)
plt.legend(loc='upper left', fontsize=15)
plt.title('COVID-19 Cases', fontsize=15)
plt.text(1, 10000, 'March 1, 2020', rotation=90, fontsize=10)
plt.text(38, 250000, 'April 7, 2020', rotation=90, fontsize=10)
```

```
plt.savefig('COVID19.dat.pdf')
plt.show()
```

The script can be downloaded from the class website. If it runs successfully on your machine, a plot will be created that is named `COVID19.dat.pdf`.

Rename your Fortran source code to `LastFirst_WS10.f90` and email this file together with `COVID19.dat.pdf` to `ewhart317@gmail.com`. Put `PHYS 317 WS 10` in the subject line.