Python programming exercises

Log on to a computer and double click on the folder icon at the bottom of the screen. Now we need to navigate to the Python installation on the computer and run it.
Click on ***This PC*** at the left of the window.
Double click on ***CourseMaterial.***
Double click on ***Physics***.
Double click on ***ComputerWorkshop***.
Double click on ***Anaconda2***
Double click on ***Scripts***
Double click on the ***Spyder*** application (the icon with the small blue rectangle).
Now wait for the *Spyder* programme to open – this is a programme developer environment that will allow you to edit files and run Python code. Click on the spanner symbol near the top of the screen and select IPython console. Click in the "Graphics" tab and choose "Automatic" in the drop down menu in Graphics backend. Now kill ***Spyder*** and restart it.

Insert your USB stick into one of the slots on the computer.

You are now going to write some short programmes (or scripts) in python. These will all have the name testN.py, where the N will be a number 1, 2, 3, …
You will use ***Spyder*** to create and run these scripts.

Type the following into the left-hand ***Spyder*** window:

```
print 'Hello world!'
```

Now save the file as test1.py in the PlanetHuntingWithPython2019 folder on your memory stick. To do this select **Save As…** in the File menu. Navigate to the USB Drive (E:) and then to the PlanetHuntingWithPython2019 folder. Then type the File name test1.py in the dialogue box and press **Save**.

To run your script click on the green "Play" button (the green arrow) at the top of the screen. You should see "Hello world!" appear in the IPython console on the right side of the ***Spyder*** window. Congratulations! You have now written and successfully executed your first python script.

We will now write a script to print *Hello world!* ten times using a for-loop. Create a new tab by going to the File menu and select **New file…** Type the following:

```
for i in range (0,10):
        print i, 'Hello world!'
```

Save the script as test2.py just as you saved test1.py above, and then run your script as before. You should see 'Hello world! printed 10 times in the console along with the values of the loop counter i.

We will now write a script that requires the user to input information. Open a new tab and type *exactly* what is written overleaf:

```
name=input('Hello, please input your name ')
print 'I am pleased to meet you',name+'. '
print 'I hope you are having a good day.'
```
Save the script as test3.py and run it as you did with the previous scripts. When prompted, type your name into the console on the right of the ***Spyder*** window and press the enter key. Note you will need to use inverted commas as follows: 'Josephine Bloggs'

Now we will assign a value to a variable, *x*, square it, and output the answer. You should think of a variable as a location in memory that stores a value that is labelled by the variable name. Create the following script (test4.py) and run it:
```
x=10.
xsquared=x**2
print 'The square of ', x, '=', xsquared
```

Now we will introduce the *if* statement. Create and run the following script (test5.py):
```
for i in range (0,10):
        if i == 1:
                print 'i now has the value ',i
        elif i == 5:
                print 'i now has the value ',i
print 'The loop has now finished. Goodbye.'
```

We will now plot some data in python. You will see a folder DATA in the PlanetHuntingWithPython2019 folder on the memory stick, which contains numerous files. We are going to read the data in the file *xy.txt* and plot them. Create and run the script (test6.py). When it has run click on the graphics icon at the bottom of the screen.
```
import numpy as np
import matplotlib.pyplot as plt
x, y = np.loadtxt('DATA/xy.txt', unpack=True)
plt.plot(x,y)
plt.show()
```

Now we are going to plot a light-curve for the transiting planet Kepler-8b. Create and run the following script (test7.py):
```
import numpy as np
import matplotlib.pyplot as plt
z, t, flux = np.loadtxt('DATA/KIC006922244.tbl',unpack=True, skiprows=3)
plt.plot(t,flux,'b.')
plt.show()
```
You should get a plot consisting of blue dots that represent the brightness of the star (measured in arbitrary units) as a function of time. The large number of dips coming down to approximately -0.01 seen in the light curve correspond to the transits. The values of time along the x-axis are measured in days since 12:00 mid-day on 1st January 2009. Using the **zoom button** (the one that looks like a magnifying glass) at the top of the plot window, can you estimate the date and time of the first transit? What is the orbital period of the planet?