#starting off with all three libraries that were highlighted as well as io and pandas... io is used for making strings whereas pandas helps with doing "excel-like" stuff in python from what was
%matplotlib inline
import matplotlib.pyplot as plt
from matplotlib import pylab
import numpy as np
from numpy import arange,array,ones
import scipy as py
from scipy import stats
from io import StringIO
import pandas as pd

file = "//Users//RenOnly.//Documents//3510.KeplerIII.txt" #reading in data from the file
titles = ["Orbiting", "Orbiter", "Orbiter Type", "Semimajor Axis (AU)", "Orbital Period (Years)"] #titles of columns for lists that may be used later on
np.genfromtxt(StringIO(file)) #generate strings from the file for each column
np.names=titles #shorthand for titles just in case they are used
np.usecols=("Semimajor Axis (AU)", "Orbital Period (Years)") #not sure if this does anything but I listed it just in case

#setting variables to be used for extracted data, this part is for the Sun stuff only, Planets
centralo1a = np.genfromtxt(file, usecols=[0], dtype=str, skip_header=2, skip_footer=21)
oplanet1a = np.genfromtxt(file, usecols=[1], dtype=str, skip_header=2, skip_footer=21)
otype1a = np.genfromtxt(file, usecols=[2], dtype=str, skip_header=2, skip_footer=21)
smaxis1a = np.genfromtxt(file, usecols=[3], skip_header=2, skip_footer=21, dtype=float)
per1a = np.genfromtxt(file, usecols=[4], skip_header=2, skip_footer=21, dtype=float)

#setting variables to be used for extracted data, this part is for the Sun stuff only, Dwarf Planets
centralo1b = np.genfromtxt(file, usecols=[0], dtype=str, skip_header=11, skip_footer=16)
oplanet1b = np.genfromtxt(file, usecols=[1], dtype=str, skip_header=11, skip_footer=16)
otype1b = np.genfromtxt(file, usecols=[2], dtype=str, skip_header=11, skip_footer=16)
smaxis1b = np.genfromtxt(file, usecols=[3], skip_header=11, skip_footer=16, dtype=float)
per1b = np.genfromtxt(file, usecols=[4], skip_header=11, skip_footer=16, dtype=float)

#setting variables to be used for extracted data, this part is for the Jupiter stuff only, Moons
centralo2 = np.genfromtxt(file, usecols=[0], dtype=str, skip_header=19, skip_footer=10)
oplanet2 = np.genfromtxt(file, usecols=[1], dtype=str, skip_header=19, skip_footer=10)
otype2 = np.genfromtxt(file, usecols=[2], dtype=str, skip_header=19, skip_footer=10)
smaxis2 = np.genfromtxt(file, usecols=[3], dtype=float, skip_header=19, skip_footer=10)
per2 = np.genfromtxt(file, usecols=[4], skip_header=19, skip_footer=10, dtype=float)

#setting variables to be used for extracted data, this part is for the Saturn stuff only, Moons
centralo3 = np.genfromtxt(file, usecols=[0], dtype=str, skip_header=25, skip_footer=0)
oplanet3 = np.genfromtxt(file, usecols=[1], dtype=str, skip_header=25, skip_footer=0)
otype3 = np.genfromtxt(file, usecols=[2], dtype=str, skip_header=25, skip_footer=0)
smaxis3 = np.genfromtxt(file, usecols=[3], dtype=float, skip_header=25, skip_footer=0)
per3 = np.genfromtxt(file, usecols=[4], skip_header=25, skip_footer=0, dtype=float)

#making sure I have the right sets of data by printing what is being read for each variable for the Sun's Planets
#print(centralo1a)

```
#print(oplanet1a)
#print(otype1a)
#print(smaxis1a)
#print(per1a)

#making sure I have the right sets of data by printing what is being read for each variable for the Sun's Dwarf Planets
#print(centralo1b)
#print(oplanet1b)
#print(otype1b)
#print(smaxis1b)
#print(per1b)

#making sure I have the right sets of data by printing what is being read for each variable for Jupiter
#print(centralo2)
#print(oplanet2)
#print(otype2)
#print(smaxis2)
#print(per2)

#making sure I have the right sets of data by printing what is being read for each variable for Saturn
#print(centralo3)
#print(oplanet3)
#print(otype3)
#print(smaxis3)
#print(per3)

#changing float type to arrays so that numbers with decimals can be manipulated and scaled
sm1a=np.array(smaxis1a)
#print(sm1)
pd1a=np.array(per1a)
#print(pd1)
sm1b=np.array(smaxis1b)
#print(sm1)
pd1b=np.array(per1b)
#print(pd1)
a=np.array(smaxis2)
#print(a)
b=np.array(per2)
#print(b)
c=np.array(smaxis3)
#print(c)
d=np.array(per3)
#print(d)

#scaling data to make sure that the units are the same so they can be accurately represented on the same linear and log scales
sm2=(1/149600000)*(1000)*a
pd2=(1/365)*b
sm3=(1/149600000)*(1000)*c
pd3=(1/365)*d
```

```
#print(sm2) #making sure that the 10^3 km scale has been changed to AU properly for Jupiter
stuff
#print(pd2) #making sure that the days scale has been changed to Years properly for Jupiter
stuff
#print(sm3) #making sure that the 10^3 km scale has been changed to AU properly for Saturn
stuff
#print(pd3) #making sure that the days scale has been changed to Years properly for Saturn
stuff

#testing pie chart of number of P type orbits of the Sun and D type orbits of the Sun
n = 3
Z = np.ones(n)

Z[0] = 5
Z[1] = 1.5*(Z[0])
Z[-1] = 3.2*(Z[0])

plt.figure(figsize=(10, 6), dpi=80)
plt.axes([0.025, 0.025, 0.95, 0.95])

plt.pie(Z, explode=Z*.0025, colors = ['%f' % (i/float(n)) for i in range(n)])
plt.axis('equal')
plt.xticks(()
       )
plt.yticks(())
plt.title('Orbiters in Our Solar System')
plt.show()

# making the completely linear plot of data, defining parameters so that the lines are different

plt.figure(figsize=(10, 6), dpi=80)
plt.plot(sm1a,pd1a,'o',linestyle='-',c="green")
plt.plot(sm1b,pd1b,'*',linestyle='-',c="orange")
plt.plot(sm2,pd2,'s',linestyle='-',c="blue")
plt.plot(sm3,pd3,'<',linestyle='-',c="pink")
plt.xlabel("Semimajor Axis (AU)")
plt.ylabel("Orbital Period (Years)")
plt.xscale('linear')
plt.yscale('linear')
plt.title('Linear Plot of Semimajor Axis vs. Orbital Period')
plt.show()


# testing log plot with data on the same graph
#plt.subplot(222)
plt.figure(figsize=(10, 6), dpi=80)
plt.plot(sm1a,pd1a,'o',linestyle='-',c="green")
plt.plot(sm1b,pd1b,'*',linestyle='-',c="orange")
plt.plot(sm2,pd2,'s',linestyle='-',c="blue")
plt.plot(sm3,pd3,'<',linestyle='-',c="pink")
plt.xlabel("Semimajor Axis (AU)")
plt.ylabel("Orbital Period (Years)")
plt.yscale('log')
plt.xscale('log')
```

```
plt.title('Logarithmic Plot of Semimajor Axis vs. Orbital Period')
plt.grid(True)
plt.show
```