Lab 11 Thursday July 26, 2018

Question 1

Write a complete Python program that reads data from a file and displays that data on the screen. Download the file from Moodle, it should be named **data.txt**. Put this file in the same folder/directory as your program.

The first few lines of the file are:

```
(0.000000,128.000000)
(0.098175,64.000000)
(0.196350,32.000000)
(0.294524,16.000000)
```

Each line in the file contains one point represented using polar coordinates. The point is enclosed in parenthesis. The angle in radians is separated from the radius by a comma ','. The angle is before the comma and the radius is after the comma. There are no spaces on a line.

Write a function that begins with the following header:

```
def readFile(filename):
```

This function is given the name of the file containing the data. Read each line from the file and compute an X coordinate and a Y coordinate from the data in the line.

Compute an X coordinate as $x = radius \times cos(angle)$.

Compute an Y coordinate as $y = radius \times sin(angle)$.

Add each X coordinate to a list of X coordinates. Add each Y coordinate to a list of Y coordinates. After all of the coordinates have been added to the lists convert each list into an array.

Return the arrays holding the X and Y coordinates of the points in the file.

Write a function that begins with the following header:

```
def displayCoordinates(xCoords, yCoords):
```

This function is given:

- xCoords - an array of X coordinates
- yCoords - the corresponding array of Y coordinates

The function displays a heading as shown in the sample run of the program. Under the heading the corresponding X and Y coordinates are displayed one pair to a line of output in 21 character positions to 14 decimal places in exponential format.

Write a function that begins with the following header:

```
def main():
```

This function:

- displays a line of dashes using string replication
- calls *readFile* to get the arrays holding X and Y coordinates of the points
- calls *displayCoordinates* to display the arrays of X and Y coordinates
- calls *displayTerminationMessage* to display the termination message

The main program, not to be confused with the function named *main*, contains all *import* statements, the functions and a call to *main*.

A sample run of the program is shown below.

```
------------------------------------------------------------

         X Coordinate            Y Coordinate
 1.28000000000000e+02    0.00000000000000e+00
 6.36918210668707e+01    6.27311160316218e+00
 3.13851261064730e+01    6.24290471501744e+00
 1.53110468174440e+01    4.64455007014018e+00
 7.39103651020825e+00    3.06146685508248e+00
 3.52768477855920e+00    1.88558746896602e+00
 1.66293880520288e+00    1.11114109371872e+00
 7.73010702661962e-01    6.34392980391540e-01
 3.53553448362991e-01    3.53553332823547e-01
 1.58598308251865e-01    1.93252623836383e-01
 6.94462483887235e-02    1.03933722076772e-01
 2.94623222155516e-02    5.51200650368540e-02
 1.19588643376380e-02    2.88712324599067e-02
 4.53569831417177e-03    1.49521926754179e-02
 1.52404395552720e-03    7.66189493673863e-03
 3.82853225653280e-04    3.88719171222708e-03
 6.38230432938984e-10    1.95299999999990e-03

Programmed by Stew Dent.
Date: Wed June 27 15:08:53 2018
End of processing.
```