Week 5 Exercises to be reviewed on October 6

In this exercise we will create a program that does 3 calculations for the user, the area of a circle based on its radius, the distance between two x,y coordinates, and the maximum value in a list of numbers. First set up your functions to accomplish each calculation, then add a menu to allow the user to choose which calculation they would like to do, followed by a prompt for the input of the numbers or lists to use for the calculation.

1. Create a program with a function that calculates the area of a circle by taking a radius from the user. The formula is:

\[ \text{Area} = \pi r^2 \]

   - We could use 3.14159 for pi, but let's import the math module and use the "pi constant" instead.
     ```python
     import math
     math.pi  # returns 3.14159...
     ```
   - To square a number, we raise it the 2\text{nd} power. To raise a number to any power in python we use the ** operator. For example >>> x**4 = x^4

2. Add a function that takes two points p1 and p2 as two element lists and returns the distance between two points on the x-y coordinate system (x_1,y_1) and (x_2,y_2). The formula is:

\[ \text{distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

You may use the following code to guide the algorightm, but make sure to change the parameters of distance() from 4 separate values, to two lists each with two elements representing the x and y of that point. You can then access the values of each point with the list[n] notation. Example p1 = [3,2] -> p1[0] returns 3

Also try to condense a few of the lines of code into multiple statements on fewer lines.

```python
def distance(x1,y1,x2,y2):
    # distance = sqrt( (x2 - x1)^2 + (y2 - y1)^2 )
    # Find the difference between x2 and x1
    dx = x2 - x1
    # Find the difference between y2 and y1
    dy = y2 - y1
    # Square each of the differences
    dx = dx**2
```
dy = dy**2
# Add those differences
ds = dx + dy
# Return the distance
return ds**.5

# Can we do this with less lines of code?

3. Add a function that finds the maximum number in a list of numbers and returns it. Make sure to name it something other than “max”.

4. Add a menu that asks the user to select a function, then take their input and produce an output and keep going until they decide to exit.

Guiding comments

# define a function that takes a radius and returns the area of the circle with that radius
    # square the radius
    # calculate the area A = pi * r^2
    # return the area
    # could we do this in one line of code?

# define a function that takes in two points (each one as list with two elements) and returns the distance between those points
def distance(p1,p2): # where p1 is [x₁, y₁] and p2 is [x₂, y₂]
    # Find the difference between x₂ and x₁
    # Find the difference between y₂ and y₁
    # Square each of the differences
    # Add those differences
    # Take the square root of that sum (raise to .5 power)
    # Return the distance

# define a function that takes a list of points and returns the maximum number in that list
    # create a variable ‘max’ and set it to the first element of the list
    # iterate through the list
        # if the current number is greater than max
            # set that number to max
    # at the end of iteration, return max