

ENGR 102 - Lab #3b

Assignment: Writing your Programs – To Do individually, in lab or outside

You are to write the following programs, each of which should be done individually. However, you may talk with others in lab about how to go about doing each of them. Please be sure to develop your logic using handwritten notes prior to starting programming.

Activity #1:

This program is meant to help you get practice with writing programs to perform more complex numerical calculations, and specifically to give you practice with vector calculations.

Write a program that calculates the angle between two points, as seen by an observer.

Your program should read in:

- The 3D position of an observer
- The 3D position of the first observed point
- The 3D position of the second observed point

Then, it should calculate and output, *in degrees*, the angle between the points from the viewer's perspective. The steps for doing this are:

- Read in the points from the user. Assume the points will be some (x, y, z) coordinates.
- Calculate the two vectors from the observer to each of the observed points
- Normalize the vectors
- Calculate the dot product between the vectors
- Use that to calculate the angle between the two observed points. Note that the dot product of two normalized vectors gives the cosine of the angle between those vectors.
- Outputs the answer in degrees

Before beginning coding, you should stop and think briefly about the variables you will need for your program.

Activity #2:

This program will integrate many important concepts. You are tasked with writing a Python program that will calculate the area of regular polygon. The program will ask the user to enter the number of sides and to enter the length of a side. The program will output several values. Please use descriptive output providing the user what is being outputted.

Output:

- a) The area of the polygon
- b) The interior angle of the polygon
- c) The diameter of a circle inscribed within the polygon
- d) The diameter of a circle circumscribed outside the polygon

Activity #3:

Convert the program from Activity 2 to a function. I have provided the function definition statement and the return statement.

```
def polygon_calc(num_sides,side_length):
```

#insert your code here

return Area_polygon, angle_polygon, Dia_circle_I, Dia_circle_C