Assignment 1

Due Tuesday, Jan 25

January 19, 2022

Instructions

For this assignment, you should write a Python script that solves the four problems below. The first line of your file should contain a comment stating:

> The code for this project represents my own, independent work. I have neither given nor received help on this assignment from other students.

Add another comment with your name after this comment.

You should include a blank line before the solution to each problem below, and each problem should start with a comment briefly describing the problem you are solving. There is a 20% penalty for not including these comments. Your script should solve all four problems below, in the order they are described.

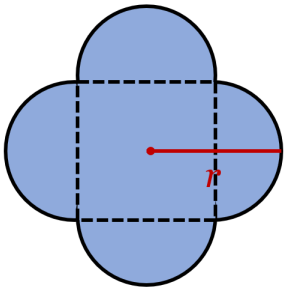
Important note # 1: to receive full credit, your code should follow directions exactly. Do not print anything other than what is requested.

Important note # 2: I strongly recommend you aim to complete the lab 1–2 days before it is due, especially if you are new to programming. This buffer should give you time to go through the problems and double check that your solutions output the correct answers to these problems. Starting early will also give you time to visit office hours or post on Piazza if you have any questions about what the problems are asking or how you would start solving them. This extra time will become even more important later in the semester as the programming assignments become more challenging.

Problems

1. Write Python code to estimate the area of a circle with circumference 100 and print this area. Your code should print the area of this circle on a line by itself *and nothing else*. You can find the area of a circle of radius r using the formula $A = \pi r^2$, and you can find the circumference of a circle with radius r using the formula $C = 2\pi r$. You should use a value of $\pi = 3.1416$ in your code.

2. Write Python code to estimate the area of a *flower* with radius 4.5 and print this area. A flower is a shape formed by a square abutted on all four sides by a semicircle. A diagram of a flower with radius r appears below:



Note that the radius of a flower is measured from the center of the square to the farthest point on the semicircles. You can use the formula $A = \pi r^2$ to find the area of a circle with radius r, and you can use the formula $A = s^2$ to find the area of a square with side length s. As before, use a value of $\pi = 3.1416$ to estimate the area.

Hint: you'll want to use some scratch paper to work out how to calculate the area of a flower. Once you have a formula that you think is correct, try writing code to estimate the area of a flower with radius 1 to test that your code is correct. A flower with radius 1 should have an area of 2.5708. Just be sure to change the radius in this problem to 4.5 before you submit your code.

3. Write Python code that prompts the user to enter a radius and outputs the area of a flower with the given radius. Your prompt should be "Enter the radius of a flower: " (include a space after the colon), and the script should print the flower's area *(and nothing else)* after the user types in the radius.

   Hint: think carefully about what kind of data you want the user to enter: is it text, an integer, or a decimal number? Also, here is a small table of values you can use to check whether your calculations are correct:

Radius	Area
1	2.5708
1.5	5.7843
2	10.2832
2.5	16.0675

4. Write Python code that prompts the user to enter the principle (initial money), APR (interest rate), and number of years for a loan with compound interest, and output the dollar value of the loan after this time. You can calculate the value of a loan with principle P, interest rate r, and time t as $V = Pe^{rt}$, where e is Euler's number. You should use a value of $e = 2.718$ when estimating the value of the loan.

   You should prompt the user to enter the principle, interest rate, and time as "Enter the principle: ", "Enter the interest rate: ", and "Enter the time

(in years): " (with a space at the end of each prompt). You should then output the value of the loan *and nothing else* (including no dollar sign). You do not need to (and should not) round the amount to two decimal places; just print out the value of the loan using all of the decimal places calculated.

Hint: here is a small table of values you can use to test your code:

Principle	Rate	Time	Value
10000	0.05	1	10512.65646376286
10000	0.05	5	12839.92133809273
10000	0.26	1	12968.951246118606
20000	0.05	1	21025.31292752572