

EECS 10: Assignment 2

Prepared by: Emad Arasteh, Prof. Rainer Doemer

October 3, 2018

Due Wednesday October 17, 2018 at 12:00pm

1 Homework Problem 1: Volume of a hollow pipe [20 Points]

Write a program that calculates the volume of a hollow cylinder pipe. See Figure 1. Your program should ask for the length (height of the pipe) L , inner (r) and outer radius (R) of the pipe, and then output the thickness ($R-r$) and the volume of the pipe. You may assume that $\pi = 3.14159$ and use floating point variables.

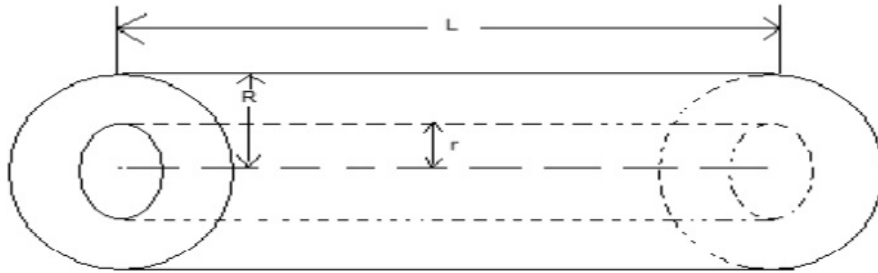


Figure 1: Hollow cylinder (pipe) with inner radius r , outer radius R and length L .

When executed, your program output should look as follows:

```
Please enter the inner radius of the pipe (r): 3.2
Please enter the outer radius of the pipe (R): 4.2
Please enter the length of the pipe (L): 4
The thickness of the pipe is: 1.000000
The volume of the pipe is: 92.991028
```

The files that you should submit for this assignment are: **pipe.c**, **pipe.txt**, **pipe.script**.

NOTE: In the **pipe.txt** file, explain the formulae that you used and limit this to a few sentences only. Your **pipe.script** should contain program output for length = 5, outer radius = 5.2 and inner radius = 4.2

2 Bonus: Total Surface Area of a pipe [5 points]

Extend the previous program to calculate the total surface area of the pipe using the the length, inner and outer radius of the pipe. The total surface area is defined as :

Total surface area = Area of outer cylinder + Area of inner cylinder + Twice the area of the cross section (area of the rings at the ends)

You may assume that $\pi = 3.14159$ and use floating point variables for the calculations. When executed, your program should print.

```
Please enter the inner radius of the pipe (r): 3.2
Please enter the outer radius of the pipe (R): 4.2
Please enter the length of the pipe (L): 4
The thickness of the pipe is: 1.000000
The volume of the pipe is: 92.991028
Surface area of the inner pipe: 80.424706
Surface area of the outer pipe: 105.557426
Surface area of the rings: 46.495514
The total surface area of the pipe: 232.477646
```

NOTE: Include the code for this calculation in the same **pipe.c** file that you submit for Problem 1. In the **pipe.txt** file, explain the formulae that you used and limit this to a few sentences only. Your **pipe.script** should contain program output for length = 5 , outer radius = 5.2 and inner radius = 4.2

3 Homework Problem 2: Distance tracker [20 Points]

Write a C program that computes the sum of two non-negative integer distances. Your program should prompt for the distances in miles, yards, feet, and inches for 2 distance values, then display the results. In addition, display each summed distance after it has been entered. (See additional instructions below)

When you run your program, it should look like this:

```
Please enter two distance values m1, y1, f1, i1, m2, y2, f2, and i2.
i1: 18
f1: 7
y1: 1820
m1: 10
Distance 1 is 11 miles, 62 yards, 2 feet, 6 inches.
i2: 16
f2: 4
y2: 3480
m2: 5
Distance 2 is 6 miles, 1721 yards, 2 feet, 4 inches.
The sum of the distances is 18 miles, 24 yards, 1 foot, and 10 inches.
```

Summed values for yards, feet, and inches must carry over accordingly. For example: if your inches value exceeds 11, it must carry over to the feet value (12 inches = 1 foot). Hint: Convert and store each distance as inches before the addition in order to properly handle carryover in your computation. After you obtain your sum, convert it back to the appropriate distances so that it can be displayed. You can use the * (multiplication), / (division), and % (modulo) operators to help you with this assignment.

The files that you should submit for this assignment are:

- **distance.c**: the source code file.
- **distance.txt**: the brief text file describing the design of your program, i.e. the steps required for the calculation.
- **distance.script**: the typescript file to show that your program works with the following 2 distances: 20 miles, 1780 yards, 13 feet, and 25 inches. 25 miles, 3850 yards, 35 feet, and 13 inches.

4 Submission

Submission for these files will be similar to last week's assignment. The only difference is that you need to create a directory called **hw2/**. Put all the files for assignment 2 in that directory and run the `~eecs10/bin/turnin.sh` command to submit your homework.