CS1010: LAB ASSIGNMENT 1

0 INTRODUCTION

This lab requires you to do 3 simple exercises.

You may assume that the input data are according to specification, and hence there is no need to do input data validation, unless otherwise stated.

If you have any questions on the task statements, you may post your queries on the relevant IVLE discussion forum. However, do not post your programs (partial or complete) on the forum before the deadline!

Mark allocation is as follows (60% correctness, 20% style, 20% design):

- Exercise 1: 1 mark
- Exercise 2: 1 mark
- Exercise 3: 3 mark

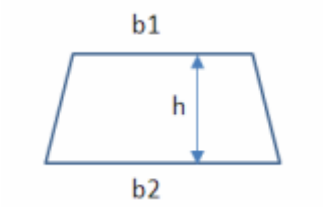
1 EXERCISE 1: TRAPEZOID AREA

1.1 LEARNING OBJECTIVES

- Reading input (scanf) and writing output (printf).
- Using data types: int and float.
- Using format specifier in output.
- Simple arithmetic computation.
- Using math function.

1.2 TASK STATEMENT

Calculate the area of trapezoid.



$$area = \left(\frac{b1 + b2}{2}\right)h$$

Where **b1**, **b2** are the lengths of each base, **h** is the height.

Write a program **area.c** that accepts positive integers **b1**, **b2** and **height** and computes the **area** of the trapezoid, presented in **two decimal places**.

1.3 SAMPLE RUNS

Sample run using interactive input (user's input shown in blue; output shown in **bold purple**).

Sample run #1:

```
Enter b1: 1
Enter b2: 1
Enter height: 2
Amount = 2.00
```

Sample run #2:

```
Enter b1: 3
Enter b2: 4
Enter height: 3
Amount = 10.50
```

1.4 SKELETON PROGRAM AND TEST DATA

The skeleton program is provided: **area.c**

Test input: **area1.in | area2.in| area3.in**

Test output: **area1. out | area2. out| area3. out**

1.5 IMPORTANT NOTES

- Do you remember to include the correct header files?
- If your program cannot be compiled, have you forgotten a certain compiler option?
- Print out the computed amount correct to **2 decimal places**.
- CodeCrunch awards mark for correctness ONLY if your output adheres to the given format. Hence, do not add any other characters (even blanks) that are not asked for in your output, or change the spelling of words in your output. The following outputs are all considered incorrect:
    - `area = 2.00` (reason: "Area" misspelt as "area")
    - `Area=2.00` (reason: spaces around the = sign are missing)
    - `  Area = 2.00` (reason: additional spaces before " Area ")
    - `Area  =  2.00` (reason: too many spaces around the = sign)
    - `Area = 2.00.` (reason: additional dot at end of line)
- The skeleton program provided contains a few printf() statements, which you should not change, or your output will not be the same as the require one.
- Also remember to have a newline character (\n) in the last line of output of your program.

1.6 ESTIMATED DEVELOPMENT TIME

The time here is an estimate of how much time we expect you to spend on this exercise. If you need to spend way more time than this, it is an indication that some help might be needed.

- Devising and writing the algorithm (pseudo-code): 5 minutes
- Translating pseudo-code into code: 5 minutes
- Typing in the code: 5 minutes
- Testing and debugging: 15 minutes
- Total: 30 minutes

2 EXERCISE 2: CYLINDER

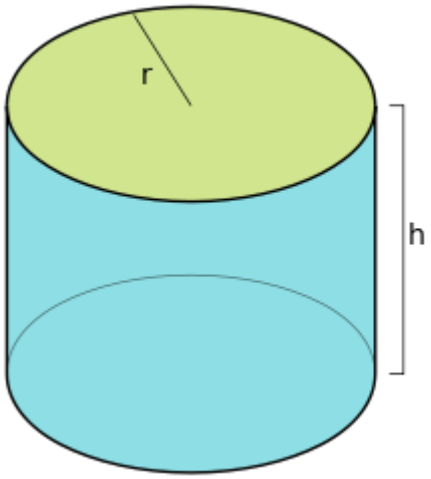
2.1 LEARNING OBJECTIVES

- Reading input (scanf) and writing output (printf).
- Using data types: int and double.

- Using format specifier in output.
- Simple arithmetic computation.
- Using math function.
- Writing your own user-defined functions.

2.2 TASK STATEMENT

Write a program **cylinder.c** that reads two positive integers representing the radius and height of a cylinder, and computes (1) its surface area, and (2) volume.



You may assume that

1. The cylinder is a closed cylinder (the surface including the top and bottom as well as the lateral area)
2. The surface area and volume of the cylinder does not exceed the maximum value representable in the int data type.
3. π (pi) = 3.14

2.3 SAMPLE RUNS

Sample run using interactive input (user's input shown in blue; output shown in **bold purple**).

Sample run #1:

```
Enter radius: 1
Enter height: 1
Surface area = 12.56
Volume = 3.14
```

Sample run #2:

```
Enter radius: 12
Enter height: 10
Surface area = 1657.92
Volume = 4521.60
```

2.4 SKELETON PROGRAM AND TEST DATA

The skeleton program is provided here: **cylinder.c**

Test input: **cylinder1.in | cylinder2.in| cylinder3.in**

Test output: **cylinder1. out | cylinder2. out| cylinder3. out**

2.5 IMPORTANT NOTES

- Write two functions: compute_surface_area() and compute_volume() to compute the surface area and volume of the cylinder respectively. You are to determine what parameters to include for the functions.
- Do not use global variables. Global variables are variables that are declared outside all functions. Use of global variables will incur a big penalty.
- In writing functions, we would like you to include function prototypes before the main() function, and the function definitions after the main() function.
- The area and volume should be of double type.
- If your program cannot be compiled, have you forgotten a certain compiler option?
- Did you give descriptive names to your variables? Giving single-letter variable names (such as l, w, h) will incur some penalty.

2.6 ESTIMATED DEVELOPMENT TIME

The time here is an estimate of how much time we expect you to spend on this exercise. If you need to spend way more time than this, it is an indication that some help might be needed.

- Devising and writing the algorithm (pseudo-code): 5 minutes
- Translating pseudo-code into code: 10 minutes
- Typing in the code: 10 minutes (most of the code is already given in the skeleton program)
- Testing and debugging: 20 minutes
- Total: 45 minutes

3 EXERCISE 3: CHICKENS AND RABBITS

3.1 LEARNING OBJECTIVES

- Reading input (scanf) and writing output (printf).
- Using data type: int.
- Simple arithmetic computation.
- Writing function.
- Using selection statement.
- Simple problem solving.

3.2 TASK STATEMENT

A farmer has M chickens and rabbits in total. He counted N legs altogether. How many chickens and how many rabbits are there?

You are to find the number of chickens and the number of rabbits given the total number of heads and the total number of legs.

You are to write a program **chicken_rabbit.c** to read in the total number of heads and the total number of legs, and to the number of chickens and the number of rabbits.

You may assume that all inputs are positive integers, and the outputs must be integers since the minimum unit of the animal is 1. If the inputs fail to get integer results, then you should output "-1 -1" instead.

3.3 SAMPLE RUNS

Sample run using interactive input (user's input shown in blue; output shown in **bold purple**).

Sample run #1:

```
Enter total head number: 17
Enter total leg number: 48
Chicken Number = 10
Rabbit Number = 7
```

Sample run #2:

```
Enter total head number: 17
Enter total leg number: 55
Chicken Number = -1
Rabbit Number = -1
```

3.4 SKELETON PROGRAM AND TEST DATA

The skeleton program is provided here: **chicken_rabbit.c**

Test input:

chicken_rabbit 1.in | chicken_rabbit 2.in| chicken_rabbit 3.in

Test output:

chicken_rabbit 1. out | chicken_rabbit 2. out| chicken_rabbit 3. out

3.5 IMPORTANT NOTES

Write two functions: compute_rabbit_number() and compute_chicken_number () to compute the rabbit number and chicken number respectively. You are to determine what parameters to include for the functions. You may write other supporting functions if necessary.

In writing functions, we would like you to include function prototypes before the main() function, and the function definitions after the main() function.

3.6 ESTIMATED DEVELOPMENT TIME

The time here is an estimate of how much time we expect you to spend on this exercise. If you need to spend way more time than this, it is an indication that some help might be needed.

- Devising and writing the algorithm (pseudo-code): 40 minutes
- Translating pseudo-code into code: 15 minutes
- Typing in the code: 15 minutes
- Testing and debugging: 30 minutes
- Total: 100 minutes

4 DEADLINE

The deadline for submitting all programs is **2 Feb, 11:59pm, 2015**. Late submission will NOT be accepted.