

UNIVERSITY OF BIRMINGHAM

School of Engineering

Computing for Engineers – Assessed Lab 1 (approx. 2 hour exercise)

07-08 November 2022 (Week 7 Semester 1)

This is an assessed lab exercise.

Statement of good academic conduct

By submitting this assignment, I understand that I am agreeing to the following statement of good academic conduct.

I confirm that this assignment is my own work and I have not worked with others in answering the exercises in this assignment.

I confirm that I have not asked, or paid, others to undertake any part of this work for me.

I confirm that I have read and understood the University regulations on plagiarism
<https://intranet.birmingham.ac.uk/as/registry/policy/conduct/plagiarism/index.aspx>

I understand that if concerns are raised about my work I may need to participate in a viva (oral examination) of my work. I also understand that my progress and/or graduation may be delayed whilst these concerns are investigated under the Code of Practice on Academic Integrity or Code of Practice on Plagiarism.

Your C Source code for Exercise A and Exercise B must be uploaded to Canvas by
Tuesday 08 November 2022, 11:59 (midday)

Your code must be uploaded as a **.c** file (C Source file).
In most cases you will need to upload the two files called “main.c” (one for each exercise).

Do not upload .docx files, .pdf or any other format.

Do not email the code to the course lecturer or to any other member of staff or PGTA.
Only Canvas submissions will be marked.

If you have any problems uploading your code, consult the Module Lecturer **well before** the above deadline. Once the deadline has expired, your mark for the Assessment will be deducted 5 marks per day or part of a day.

The Module Lecturer cannot extend any deadlines for this assignment for any reason. If you wish to be considered for an extension, you will need to apply for Extenuating Circumstances via Engineering Welfare.

Do not discuss the exercise with any other person, inside or outside the University. Do not get help from any other person. The submitted assessment must be your own work.

You should only use Canvas, your own notes and your own programs as sources of help.

You should only use techniques which have been discussed during Lectures, Labs or Tutorials.

Acceptable sources of help:

- Your own notes
- The Study Guide on Canvas for this module
- The Lecture / Lab and Tutorial videos for this module on Canvas / Panopto
- Any programs which you have written yourself during the labs this Semester
- You may use published Books, as long as you provide a full reference (Name and Author of Book, Publisher Name, Year of Publication).

Sources which are **not acceptable**:

- Help from any other person, inside or outside the University
- Any website, forum, social media, video, audio, email or messaging, or any other information source, other than the Canvas page for this module
- Self-published books and course notes from other Universities or online courses

Assessed lab exercises

A. The Earth and most other planets are *oblate spheroids*. This means that the diameter of the planet is slightly larger at the equator compared with the poles.

Write a program to enter the diameter of the planet at the equator in kms (d_e), and the diameter of the planet at the poles (d_p), and work out the volume of the Earth V .

The equations are:

$$r = \frac{1}{2}d_e$$

$$h = \frac{1}{2}(d_e - d_p)$$

$$V_1 = \frac{4}{3}\pi r^3$$

$$V_2 = \frac{\pi h^2}{3}(3r - h)$$

$$V = V_1 - 2V_2$$

Notes:

- Your program should print out V_1 , V_2 and V in units of km^3 .

- If the user enters a negative value for d_e or d_p an error message should be displayed.
- If the user enters a value for d_e which is less than d_p an error message should be displayed.
- Volumes must be displayed in exponential notation.

Sample output (the numbers entered in Run 3 are the actual values for the Earth:)

Run 1:

```
Interplanetary mass calculator
Enter the equatorial diameter in km: 12742
Enter the polar diameter in km: 12799
Error - the equatorial diameter must be greater than the polar diameter
```

Run 2:

```
Interplanetary mass calculator
Enter the equatorial diameter in km: 12742
Enter the polar diameter in km: -12799
Error - your diameters must be positive
```

Run 3:

```
Interplanetary mass calculator
Enter the equatorial diameter in km: 12742
Enter the polar diameter in km: 12725
V1 = 1.083207e+012 km    V2 = 1.445447e+006 km
The volume of the planet is 1.083204e+012 km^3
```

B. We are developing a program which will display advertising messages on a website.

There are 8 possible advertising messages, and each time the program is run **exactly two** messages should be **randomly** displayed.

The product being promoted is a wireless headphone set, with built-in voice activated fitness tracking and training features.

The 8 possible messages are:

"Great News"
 "The Awakening"
 "Born to Run"
 "Walk and Talk"
 "Sport Fever"
 "Peak Performance"
 "New Horizons"
 "Non Stop"

Run 1:

```
The all-new Intro to Comp Fitness Headphones!
Non Stop
Born to Run
```

Run 2:

```
The all-new Intro to Comp Fitness Headphones!
Walk and Talk
Non Stop
```

Run 3:
The all-new Intro to Comp Fitness Headphones!
Peak Performance
New Horizons

Notes

- The program should not have any input. Any input in your program will result in a loss of marks.
- You don't need to use strings, arrays or functions. A selection block with appropriate loops is sufficient.
- Only reduced credit will be given if you repeat or duplicate long sections of code.
- Only the eight advertising messages listed above may be displayed. Do not add, remove or modify any of the messages.
- In order to generate a random integer q between 1 and 8, you need to include *stdlib.h*, and then use

`q = rand() % 8 + 1;`

- You should also include *time.h*, and then call the following function **once** at the start of your main program:

`srand(time(NULL));`

If you don't do this then you will get the same messages every time you run your program.

- The two displayed messages **must not** be the same. e.g. the following is **not allowed**:

Walk and Talk
Walk and Talk

- The second message **must not be** dependent on the first message in any way e.g. displaying message N and message $N+1$ would not be acceptable. Both messages should be independent and random.

END OF THE ASSESSMENT