Lab 02

Objectives:

* Write and compile simple c applications in linux.

* Use arithmatic expression in c.

* Use I/O operations as appropriate

* Write simple c programs using arithmatic expressions and I/O operations, to solve simple problems.

Exercise 0:

1. Login to your GitHub account

2. Run the following link to create Lab01 to your Github account https://classroom.github.com/a/_JFUvnIu

3. You have to do the exercises given in the repository and commit and push your solutions into it.

Introduction to C:

C is a versatile and widely-used procedural programming language. Developed in the early 1970s, it remains popular due to its efficiency, portability, and close relationship with the underlying hardware. C has greatly influenced the development of many other programming languages and operating systems. In C programming, data types are used to define the type of data that a variable can store. Expressions are combinations of variables, constants, and operators that produce a single value. Input/output (IO) operations allow interaction between the program and the user, enabling data input and output.

Practice Exercise: Compiling and Running a simple C Program

1. Type the following program using the vi editor.

'''c

// This program display the text “Hello World”

#include <stdio.h>

// function main begins program execution

int main(void)

{

printf("Hello World \n");

return 0;

} //end of function main

'''

3. Save the above program as 'first.c'

4. Compile 'first.c' using the following command.

'''

gcc first.c –o first.o

'''

> 📓 Note:

Here gcc is the C compiler that we are going to use.

-o is used to specify the name of the executable file.

The above command line instructs in the LINUX OS is to compile the first.c program and produce an executable file called first

If you get any syntax errors, edit the file first.c using the vi editor.

6. To run the executable file, type the following.

'./first.o'

> 📓 Note:

Here . is used to represent the current directory (folder).

So ./first.o tells the LINUX OS that the executable file first is in the current directory.

7. Compile the program without using '-o '

'gcc first.c'

Exercise 01

Write a program to assist in the design of a hydroelectric dam. Prompt the user for the height of the dam and for the number of cubic meters of water that are projected to flow from the top to the bottom of the dam each second. Predict how many megawatts (1MW = 106 W) of power will be produced if 90% of the work done on the water by gravity is converted to electrical energy.

Note that the mass of one cubic meter of water is 1000 kg. Use 9.80 meters/second 2 as the gravitational constant g. Be sure to use meaningful names for both the gravitational constant and the 90% efficiency constant. For one run, use a height of $170 m$ and flow of 1.30 x 10^3 m^3 /s. The relevant formula (w = work, m = mass, g = gravity, h = height) is:

w = mgh

Exercise 02

Write a program that calculates the acceleration (m/s^2) of a jet fighter launched from an aircraft-carrier catapult, given the jet's takeoff speed in km/hr and the distance (meters) over which the catapult accelerates the jet from rest to takeoff. Assume constant acceleration. Also calculate the time (seconds) for the fighter to be accelerated to takeoff speed. When you prompt the user, be sure to indicate the units for each input. For one run, use a takeoff speed of 278 km/hr and a distance of 94 meters. Relevant formulas (v = velocity, a = acceleration, t = time, s = distance)

v = at

s = 1/2 a t^2

Exercise 03

Hospitals use programmable pumps to deliver medications and fluids to intravenous lines at a set number of milliliters per hour. Write a program to output information for the labels the hospital pharmacy places on bags of I.V. medications indicating the volume of medication to be infused and the rate at which the pump should be set. The program should prompt the user to enter the quantity of fluid in the bag and the number of minutes over which it should be infused. Output the VTBI (volume to be infused) in ml and the infusion rate in ml/hr.

'''

Sample run:

Volume to be infused (ml) => 100

Minutes over which to infuse => 20

VTBI: 100 ml

Rate: 300 ml/hr

'''

Exercise 04

Metro City Planners proposes that a community conserve its water supply by replacing all the community's toilets with low-flush models that use only 2 liters per flush. Assume that there is about 1 toilet for every 3 persons, that existing toilets use an average of 15 liters per flush, that a toilet is flushed on average 14 times per day, and that the cost to install each new toilet is 150. Write a program that would estimate the magnitude (liters/day) and cost of the water saved based on the community's population.

Submission

Upload your Answers into the relevent folders in the github repository.