Homework #2

Computational Physics: Fall 2023
Professor Coan & Olness

Due Wednesday 30 August 11:59pm in Canvas upload

0) PROGRAM SUBMISSION:
For problems where you submit code (e.g., #1,2,3) please use the following format so I can EASILY run your code. We'll switch over to GitHub later, but to start with ...

1. Make a new sub-directory with your name and homework # (e.g., olness2)
2. Copy the source code ONLY (not the big executable) into this directory
3. Make a 'doit' file that will compile the code; be sure to use debugging flag '-g'
4. Move up to the upper level directory (where 'olness2' directory is located)
5. Zip this into a zip file: **`zip olness2.zip ./olness2/*`**
6. Upload the zip file to canvas.

1) FizzBuzz: Write a program to print the following output:
(Note, I want you to print the number, colon, space, and then ...)

1:
2:
3: Fizz
4:
5: Buzz
6: Fizz
...
15: FizzBuzz

2) 21 Game:

a) Write a program to play 21. Generate random numbers from [1,10]. Feel free to simplify the rules as you see fit.

b) [Grads]: as part of your program, have the human compete against the computer. Note, you can simplify the play of the computer if you like.

3) Guess the number.

a) Have the compute pick a random number from [1,1000]. You get 10 guesses, and the computer tells you if you are high/low, or correct.

b) [Grads] You pick a number and have the computer guess.

4) Gnuplot exercise. Download the tar file data.tar from the Canvas module into your home directory. Untar it at that location and it should create a tree under the subdirectory 'data'. Change into 'data' and with an 'ls' command verify that the files matching 'maxwell_*.dat' are present. These files describe the Maxwell distribution of molecular speeds in a sample of water vapor. The number in the file name matched by the '*' file globbing character above is the temperature in degrees K corresponding to the distribution. The first column in each file is the speed in m/sec, and the second column the probability per unit speed. Start a gnuplot process and create an image that plots these three data files together. Include appropriate labels on the X and Y axes, an overall plot title, and a key that gives the temperature corresponding to each of the three curves. Generate a PNG graphics file of the image with width 1024 pixels and height 768 pixels and upload it into Canvas.

5) add Programs:

For each of the 7 add programs, write a brief comment/summary explaining what it does and what programming feature I've added compared to the previous one.

Note: I want details. For example in one file I just change the order of the main() and the subroutine(); what does this do???

6) Download the plain text file Quantum.txt from the web. Look at the on-line Linux manual pages for the 'head' and 'tail' commands. Suppose you want to generate a count of the total number of words that appear on the last 20 lines in which the word 'energy' appears in this text file. That is, if you had a list of all the lines from this Quantum.txt file containing the word 'energy', you need the total count of words in the last 20 of these lines. Devise a single Linux command that will give you this count. (Hint: You can use two 'pipe' operations on one command line.) Run your command and report the results.

You can get the file from this location:

https://www.physics.smu.edu/devel/olness/www/22fall3340/

7) [GRADS ONLY] Be creative to approach the following problems. I ALSO want a clear explanation how you figured this out. For the following variable types:

int	float
short int	double
long int	long double
signed int	

a) In C programming, find the largest and smallest value of each type

b) For the non-integer types, demonstrate the limiting case where a+b=a.