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# ECE 175 Computer Programming for Engineering Applications

Fall 2021

## Lab Assignment #4

Wednesday, September 29, 2021

### Relevant Programming Concepts:

- File I/O
- Pass by Reference

### Problem 1 (10 points): Find Integer in a Data File

You are given a file named *Wednesdays\_Data.dat* that contains only integers. Write a *C* program that

- Prompts the user to enter an integer.
- Opens the file *Wednesdays\_Data.dat* for reading only.
- Prints an error, and exits the program, if the file is not found.
- If the file is found then the program
  - Counts how many integers are found in the file.
  - Counts how many times the user-entered integer is found in the file.
  - Prints the results to the screen.
  - Closes the file

Example executions, given that the file *Wednesdays\_Data.dat* contains

```
204
-474
308
204
378
496
77
-99
204
-832
-99
-844
-99
-99
-542
827
-99
652
77
992
```

### Sample Code Execution: Red text indicates information entered by the user

```
Enter an integer: 2
There are a total of 20 integers in the file
The integer 2 was found 0 times.
```

```
Enter an integer: -99
There are a total of 20 integers in the file
The integer -99 was found 5 times.
```

```
Enter an integer: 204
There are a total of 20 integers in the file
The integer 204 was found 3 times.
```

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**Problem 2 (20 points): Approximating  $\pi$** 

The value of  $\pi$  can be approximated using the Gregory-Leibniz series

$$\pi \approx 4 \left( \frac{1}{1} - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} \cdots \right)$$

For instance, if the desired accuracy is  $10^{-6}$ , the absolute difference between the current calculation of  $\pi$  and the previous calculation of  $\pi$  is less than  $10^{-6}$ .

Write a *C* function that calculates the value of  $\pi$  with a variable level of accuracy and appends the output to the file *MyPi.txt*. Your code must use the function prototype

```
double Pi_value(int numaccuracy);
```

Test your code for code for accuracy levels of 2, 3, 4, 5, 6, 7, 8.

**Sample Code Execution:** Red text indicates information entered by the user

```
To what precision do you wish to calculate Pi? 2
pi = 3.1465677472, within accuracy of 1E-2.
```

```
To what precision do you wish to calculate Pi? 3
pi = 3.1420924037, within accuracy of 1E-3.
```

```
To what precision do you wish to calculate Pi? 6
pi = 3.1415931536, within accuracy of 1E-6.
```

```
To what precision do you wish to calculate Pi? 8
pi = 3.1415926486, within accuracy of 1E-8.
```

For the sample executions the output file *MyPi.txt* contains

```
pi = 3.1465677472, within accuracy of 1E-2.
pi = 3.1420924037, within accuracy of 1E-3.
pi = 3.1415931536, within accuracy of 1E-6.
pi = 3.1415926486, within accuracy of 1E-8.
```