LAB #3

Purpose:

The purpose of this lab is to learn how to write a program to solve a stated problem, requiring you to design the solution, use the editor to enter the source program, eliminate the syntax errors, and then test the program. This will be the process followed in all the remaining labs.

Before the lab:

1. Read your notes concerning variable declarations and arithmetic expressions.
2. Read your notes on the math library functions.

During the lab:

PART I: PROGRAMMING EXERCISES
Exercise #1:

a. Using Geany, write a C program that asks the user for four (4) integer numbers and put those into 4 integer variables. Always use a prompt to help guide the user. You can ask for all 4 numbers at once (like 'Enter 4 numbers:') or one by one.
b. Next, have your program produce and output the sum of those four numbers. Be sure the output has a label which tells the user what the output value represents. (eg: Sum of the four values is: 23).
c. Next have your program output the sum of the first two numbers minus the sum of the last two.
d. Next have your program produce and output the sum of the squares of the four numbers.
e. Next have your program produce and output the exact quotient (a real number with a decimal point - a double) of the square root of the sum of the squares of the numbers, divided by the sum of all the numbers. eg for input values 3 4 5 6 this is 0.51 [square root of (9+16+25+36) divided by 18]. Show the output with two decimal digits of accuracy. Are you sure you got your answer right? Try with a calculator and compare with your C program.

Exercise #2:

a. Using Geany, write a C program that creates a table of distance equivalents in yards and miles for 100m, 200m, 400m, and 800m. You would input each value into a variable and then convert it first to yards and then to miles by multiplying it by the appropriate conversion factor. A meter is equivalent to 1.094 yards and 0.0006215 miles. Your program should right justify all the numbers

(see your printf notes from the lectures), aligning them nicely in a column (table) form.

Exercise #3:

a. Using Geany, write a C program that calculates the volume of a sphere. Look for the formula on the Internet and ask the user for the required inputs (prompt the user clearly and label the output).

Exercise #4:

a. Write and run in Geany a C program to find the third angle of a triangle if two angles are given. No clue? Find the formula on the Internet.

Exercise #5:

a. Using Geany, write a C program to compute the sum of the two given integer values (ask the user for them). If the two values are the same, display the triple of their sum. If they are not the same, just display the sum.

Exercise #6:

a. Using Geany, write a C program that asks the user for 3 integer numbers then displays these 3 numbers in descending order. Assume all 3 numbers are different.

PART II: DISCOVERY ACTIVITIES

i. Can you explain why 3+5+8 divided by 3 doesn't give the correct average of the numbers 3, 5, and 8?
ii. Using your text book, or an Internet search (do not ask friends or TA) or simply by experimenting with Geany, explain in a few sentences the differences between the division (/) and the remainder (%) operators.

PART III: LAB REPORT SUBMISSION

1. Submit the .c files for programming exercises 1 to 6.
2. Submit the text file containing the answers to the 2 discovery questions.
3. Submit on D2L/Brightspace under Lab #3. Submissions are due at the end of the lab session. You must submit your work before leaving the lab.

After the lab:

1. Review the steps you took to perform the various operations in the lab.

Homework:

- On paper (no computer needed), do the following programming (write the code by hand as you would on a test or an exam).

4. For any integer $n > 0$, $n!$ is defined as the product $n \times n-1 \times n-2 \ldots \times 2 \times 1$. $0!$ is defined to be 1. It is sometimes useful to have a closed-form definition instead; for this purpose, an approximation can be used. R.W. Gosper proposed the following such approximation formula:

$$n! \approx n^n e^{-n} \sqrt{\left(2n + \frac{1}{3}\right)\pi}$$

Create a program that prompts the user to enter an integer n, uses Gosper's formula to approximate $n!$, and then displays the result. The message displaying the result should look something like this:

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5! equals approximately 119.97003
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- Show your homework to your lab assistant at the **beginning of next week's lab**.
- If you wish, you may try your solution with the computer to see if you got the correct solution (no need to show the computer version).

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