Lab 1: Solving Simple Problems in C

Objectives:
- Become familiar with writing simple C programs
- Solve problems involving simple arithmetic in C
- Work with C integer and floating-point math
- Introduce basic of C programming

Starting Point:
lab1_skel.c
lab1_3.c
lab1_5.c

Turn-In:
Submit a single PDF file on Canvas using the Lab 01 assignment link by the start of lab next week (**Before** the beginning of Lab 02).
1. Upload all source code for this week's lab in Canvas. Zip all file into a single .zip file. Name the zip file **cpre185s18_lab01_yourlastname.zip**
2. Include screenshots of code output in your lab report. Screenshots can be gathered using the snipping tool.
3. Turn in a lab report describing your experiences with this lab. **Follow the lab report format** and reference the sample lab report on Canvas.

Process:
Download the lab1_skel.c file. You will be using it as a template for the problems in this lab.

Problem 1: Creating Your Own Program
By now you should be familiar with the basics of the compiler as well as C program structure. Use Notepad++ to modify the lab1_skel.c file to display your full name as well as the course title and today's date, each on a **new line**. Save it as lab1_1.c .

Be sure to include in your lab report a description of what problems you encountered in building your program. You will also need to **capture the output of your program** for your lab report using NPPExport.

Problem 2: A Simple Program with Input

Create another file, lab1_2_1.c, by copying your lab1_skel.c file and renaming it lab1_2_1.c.

This time, put the following code into your program:

Do not copy and paste this code, it will not compile correctly if you do. The quotations generally do not copy as unicode. You will have more luck and enjoy the lab more if you just retype the code.

```c
int x, y;
printf("Enter a width: ");
scanf("%d",&x);
printf("Enter a height: ");
scanf("%d",&y);
printf("A %d by %d rectangle's area is %d\n", x,y,
x*y);
```

Compile, debug, and run lab1_2_1. **Grab a screenshot.**

Now, save lab1_2_1.c as lab1_2_2.c. Modify lab1_2_2.c so that it computes and prints the volume of an x by y by z rectangular prism (box) instead of a rectangle. You need to find the equation to calculate the volume on your own.

Run your program and test it on a 2 by 64 by 8 prism. **Grab a screenshot.**

Problem 3: Mysterious Output

1. Download the example source code, lab1_3.c.
2. Compile and run the program.
3. Using the material that we reviewed in lecture this week, describe the reason behind each of the 'incorrect' program outputs. In each case, a unique error has been made when using the printf() display function. Pay close attention – <u>these mistakes are often pitfalls in later labs</u>!
   For your lab report, show a corrected program and explain the erroneous output by placing comments wherever corrections were made.

Problem 4: Simple Arithmetic

1. Write a program (lab1_4.c) to perform the following arithmetic operations and display the calculation and results to the screen. Pay attention to the sample output format and sample code. All doubles must be displayed to two decimal places, and ints should be outputted as whole numbers. **All calculations should be performed and assigned to an appropriate variable of the specified type. Do NOT alter the syntax of the equations.**

a. int = 6427 + 1725
b. int = (6971 * 3925) – 95
c. double = 79 + 12 / 5
d. double = 3640.0 / 107.9
e. int = (22 / 3) * 3
f. int = 22 / (3 * 3)
g. double = 22 / (3 * 3)
h. double = 22 / 3* 3
i. double = (22.0 / 3) * 3.0
j. int = 22.0 / (3 * 3.0)
k. double = 22.0 / 3.0 * 3.0

Now develop equations to solve the following problems, put the code in lab1_4.c. Be sure to describe how you came up with the formula.

l. Calculate the area of a circle with circumference 23.567
m. Convert 14 feet to meters.
n. Convert 76 degrees Fahrenheit to Centigrade.

(1 ft = 0.3048 m $\qquad$ $T_c = (T_F - 32) / 1.8$)

Sample Program Output

```
1 + 2 = 3
45.00 + 2.00 = 47.00
1 ft = 0.30 m
```

Sample Code

int = 1+2 would be performed by the following piece of code:

```
int answer;
answer = 1 + 2;
```

2. Compile and run your program.
3. Review the output of your program paying particular attention to arithmetic problems (a.) through (k.).
   For each case where the output differs from the normal arithmetic result, explain the C program output. **Include the output and explanations in your lab report. You do not need to correct the program.**
4. Capture the output into a text file by running the program using the redirection operator you learned about in lab1 in the command line.
   ./lab1_4 > lab1_4_out.txt

Problem 5: Working with I/O - Pythagorean Theorem

You will create a program that finds the length of one side of a triangle using the pythagorean theorem. $c^2 = b^2 + a^2$

1. Download the lab1_5.c code, we have included a line of code to help you calculate the the square root of a value.
2. Add two scanf statements, with accompanying printf statements, that prompt the user to enter a value for a and b.
3. Using the scanned in values, calculate the value of c and print it out to the screen.
4. Compile and test your program several times with different values for a and b.
5. Run your program with a=5 and b=9, **capture a screenshot of the output**.
6. Be sure to include your source code in your lab report.

Hints: Read your lab0 manual to see an example of how to use scanf() to scan value. Note that the format specifier needs to be changed to %lf to work with a double.

Ending the Lab Session

1. Leave your source code on your U: drive.
2. Be sure to log off your workstation before leaving lab!