**CSC 101 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Four Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Objectives:

* Continue understanding of basic output and input (cin/cout)
* C++ mathematical operators
* Integer Arithmetic
* Understanding the make utility and Makefiles

Procedures:

1. Boot up your Ubuntu Linux USB key and log in.

2. Open a terminal. At the command prompt, use the manual pages to investigate the g++ compiler. Issue the command:

man g++

Describe the function and operation of the g++ compiler:

3. Use the man page to determine the meaning of the following command line options:

-c

-S

-E

-o

4. Examine the program listing below:

1 #include<iostream>

2 using namespace std;

3

4 int main()

5 { X Y Z A

6 int x=9, y=4, z=7, a=0; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

7

8 a = x + z \* y;

9 cout << "A1 is " << a << endl;

10 a = x \* y / z; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

11 cout << "A2 is " << a << endl;

12 a = x % 4; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

13 cout << "A3 is " << a << endl;

14 a = x % 4 + z % 4; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

15 cout << "A4 is " << a << endl;

16 a = x / y; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

17 cout << "A5 is " << a << endl;

18 a = -x \* y + 3; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

19 cout << "A6 is " << a << endl;

20 a = x \* (y - 2) / z; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

21 cout << "A7 is " << a << endl;

22 a = x \* (y - 2) % z; \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

23 cout << "A8 is " << a << endl;

24

25 return 0;

26 }

Use the space to the right of the listing to trace the program, filling in the correct values for each variable on every line. Below, list what you think will be the output of the program:

5. Type in the program using a text editor and save the source file as ‘prog4a.cpp’. Compile the program. What command did you use to accomplish this?

6. Run the program, comparing its output to your estimate in the previous step. Explain any difference between your estimation and the actual output of the program.

7. Using the shell, create a new directory called lab4

Copy the source file ‘prog4a.cpp’ into the new lab4 directory and change into the lab4 directory.

8. Preprocess the source file by issuing the command:

g++ -E prog4a.cpp > prog4a.preprocessed

Examine the prog4a.preprocessed file. Type the command:

less prog4a.preprocessed

What information is found in this file?

Scroll all the way down to the end of the file. There should be variable declarations for cin, cout, and cerr just above your main function. List the declarations for the cin, cout, and cerr stream objects below:

9. Take a directory listing in the lab4 directory by typing the command:

ls

What files are currently in the directory?

10. Compile the prog4a.cpp file by issuing the command:

g++ -c prog4a.cpp

Take another directory listing. What file was created by the compilation process?

11. Issue the command:

File prog4a.o

What type of file is it?

12. Link your object code into an executable file by issuing the command:

g++ -o prog4a prog4a.o

What new file was created by this command?

Use the file command to determine what type of file the new file is:

13. Issue the command:

g++ -S prog4a.cpp

What new file was created by this command?

Use the file command to determine what type of file the new file is:

Open the file and examine its contents.

14. Create a new directory named lab4a and copy your prog4a.cpp source file into it. Change into that directory and take a directory listing. What files are currently in the lab4a directory?

15. Type the command:

pwd

What is the output of the command?

What does the pwd command do?

16. Issue the following command:

man make

Read the DESCRIPTION section of the man page. In addition, visit and read:

http://mrbook.org/tutorials/make/

What is the function of the make command?

17. Open a text editor and type the following text (make sure to use tabs for indentation):

all: prog4a

prog4a: prog4a.o

g++ prog4a.o -o prog4a

prog4a.o: prog4a.cpp

g++ -c prog4a.cpp

clean:

rm -rf \*.o prog4a

Save the file in your lab4a directory with the name:

Makefile

18. Take a directory listing in the lab4a directory. What files are present in that directory?

19. Issue the command:

make

20. Take another directory listing. What files are now present in the directory?

21. Issue the command:

file \*

What types of files are present?

22. Issue the command:

make clean

Take a directory listing. What files are present in the directory?

23. Issue the command:

make prog4a.o

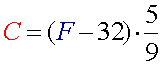
What is the output of the command?

24. Again issue the command:

make

What is the output of the command?

25. Create a C++ program that converts temperatures from the Fahrenheit to the Celsius scale. Your program should minimally accept the input of a temperature in degrees Fahrenheit from the keyboard, convert it to Celsius, and output the converted results to the screen. The conversion formula is:



Create an IPO chart below to begin the design process. Then use this IPO chart to write a complete C++ program to implement the above, including a banner which identifies your name, the date, and class section. Remember to use appropriate data types and meaningful names for your variables. Add judicious comments to document your code. Hand in the source code for your program to your instructor.

26. Create a C++ program that calculates the average of 3 test scores (test scores should be in the range 0-100). Input the test scores from the keyboard, then calculate and display the average of the scores. Create an IPO chart that shows your program design, then implement a complete C++ program, making sure to include a banner and comments. Remember to use appropriate data types and meaningful names for your variables. Hand in a copy of the source code for this program along with this lab sheet.