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**Lab Four Date:\_\_\_\_\_\_\_\_\_2/10/23\_\_\_\_\_\_\_**

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:

g++ it does preprocessing, compilation, assembly and linking to generate a source code.

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

-c - compile or assemble source files, but do not link.

-S Stop after the stage of compilation proper: do not assembly.

-E Stop after the preprocessing stage: do not run the compiler proper.

-o (file) Place the primary output in file file. This applies to whatever sort of output is being produced, whether it be executable file, an object file, an assembler file or preprocessed c code.

4. Examine the program listing below:



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:

A1 is 37

A2 is 5

A3 is 1

A4 is4

A5 is 2

A6 is -33

A7 is 2

A8 is 4

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?

g++ -o labl prog4a.cpp

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.

no difference

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?

Preprocessing data. Data not seen by the user and is not important to the user. Data that is removed and changed

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:

using namespace std;

static ios\_base::Init\_\_ioinit;

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

ls

What files are currently in the directory?

prog4.cpp, prog4a.preprocessed.

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?

prog4a.o

11. Issue the command:

File prog4a.o

What type of file is it?

Object code(application/x-object)

prog4a.o: ELF 64-bit LSB relocatable, x86-64, version 1 (SYSV), not stripped

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?

prog4a

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

executable

13. Issue the command:

g++ -S prog4a.cpp

What new file was created by this command?

plain text document

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

assembler source, ASCII text

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?

prog4a.cpp

15. Type the command:

pwd

What is the output of the command?

/home/trilogy/Documents/lab4a

What does the pwd command do?

list all the files in the present working directory.

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?

The make utility will determine automatically which pieces of a large program need to be recompiled, and issue the command to recompile them.

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

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?

Makefile prog4a.cpp

19. Issue the command:

make

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

Makefile, prog4a, prog4a.cpp, prog4a.o

21. Issue the command:

file \*

What types of files are present?

ASCII text, executable, C++ source, relocatable.

22. Issue the command:

make clean

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

Makefile, prog4a.cpp

23. Issue the command:

make prog4a.o

What is the output of the command?

prog4a.o

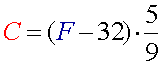
24. Again issue the command:

make

What is the output of the command?

prog4a

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.

| Input | Process | Output |
| --- | --- | --- |
| None | Prompts the user to enter the temperature in Fahrenheit. | none |
| input Fahrenheit | C = (F - 32) \* 5/9 | Display temperature in Celcius |
|  |  |  |
|  |  |  |

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.