# **Homework 0820: C++ and LaTeX**

Due: 20 August, noon

## **C++ Introduction**

In this class, you will need to create C++ programs using a Unix-style terminal command-line environment. You are required to use llvm-clang version 7.0 or higher. You can use your own computer if you have the correct software installed, or you can use the department’s server ice. There are also native Linux computers in the nerdery. These instructions assume ice.

## **Create and Run a C++ Program**

Use the following instructions to create, compile, and run a C++ program.

1. Log onto a virtual Windows computer using view.truman.edu.
2. Log onto *ice* by clicking Start, scrolling to and expanding X2Go Client for Windows, and running the X2Go Client application. If this is your first time using x2go, you will have the New Session preferences window open.
3. On the Session preferences page enter ice for the Session name, ice.truman.edu for the Server Host, your Truman username for the Session Login, and choose XFCE for the Session type. Click OK (if you can't see OK, just press Enter). Then click on the session icon to initiate a connection. If you get a Host key verification failed message, click on Yes. At the Debian login dialog on ice, enter your Truman username and password. Once you have a desktop, expand it to full screen size.
4. When you have finished using the X2Go session, make sure you log out of ice; don’t simply close the X2Go window.
5. Open a command prompt (terminal) window on ice by clicking the Terminal Emulation icon along the bottom row.
6. Make a directory for your work. In the terminal window, issue a command such as  
    $ mkdir cs310  
    Note: for interoperability, you should *never* use spaces, or punctuation other than hyphens, underscores, or periods, in the names of directories or files. File and directory names follow the same rules as identifiers in programs.
7. Change your working directory to be the directory you just created with the command:  
    $ cd cs310
8. Create an empty source code file for your program:  
    $ touch hello\_world.cpp
9. Open the new file with an editor such as geany or bluefish or Emacs with the command  
    $ geany hello\_world.cpp &
10. Modify the preferences of the editor to ensure you use 2 *spaces* for indentation with **no tabs**. If you use Emacs, you can use [this file](http://borax.truman.edu/310/c01/emacs), saved as “.emacs” (without the quotes) in your home directory for the correct Emacs setup.
11. Type the text of [hello\_world.cpp](http://borax.truman.edu/310/0820/hello_world.cpp) into the editor buffer and save it.
12. Switch back to the terminal window, which should still have its working directory as cs310.
13. Use the clang compiler to compile and link the source code into an executable program by issuing the command:  
     $ clang++ -pedantic-errors -Weverything -Wno-c++98-compat -std=c++11 -o hello\_world hello\_world.cpp
14. If there are no error messages, a file named hello\_world will have been created in your directory. Make sure you can see this when you issue the command  
     $ ls -l
15. If there are warning or error messages, read them carefully, especially noting the line number or numbers which are referenced, fix the errors using the editor, save your changes, and re-run the compile command.
16. When the compiler runs cleanly and creates an executable file for your program, run the program in the terminal window with the command:  
     $ ./hello\_world

## **Homework Assignment Part 1**

Follow the same procedure to create the rectangle-area program copied from [this handout](http://borax.truman.edu/310/0820/rectangle_area.cpp.pdf). Remember, *no tab characters* in the file!

By noon on Thursday, 20 August, submit the C++ source code file (**NOT** the executable file) to the [homework submission](http://borax.truman.edu/310/submit.php) page.

## **LaTeX Introduction**

In this class, you will need to create PDF documents using LaTeX as the typesetting engine.

## **Create and Typeset a Document**

Follow steps 1 through 7 in the C++ instructions above. Then continue:

1. Create an empty source code file for your program:  
    $ touch hello\_world.tex
2. Open the new file with an editor such as geany or bluefish or Emacs with the command  
    $ geany hello\_world.tex &
3. Type the text of [hello\_world.tex](http://borax.truman.edu/310/0820/hello_world.tex) into the editor buffer and save it.
4. Switch back to the terminal window and typeset the document with the command  
    $ pdflatex hello\_world
5. If there are no error messages, a file named hello\_world.pdf will have been created in your directory. Make sure you can see this when you issue the command  
    $ ls -l
6. If there is an error message (starting with a !), read it carefully. Note the line number which is referenced (starting with l.), fix the error using the editor, save your changes, and re-run the pdflatex command.
7. When the typesetting engine runs cleanly and creates a PDF file for your document, view the document with the command:  
    $ atril hello\_world.pdf &

## **Homework Assignment Part 2**

Follow the same procedure to create a LaTeX file copied from [this handout](http://borax.truman.edu/310/0820/template.tex.pdf). You will need to supply some of the answers to complete this file. Some of the source relies on features of the [amsmath](http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/required/amsmath/amsldoc.pdf) package.

By noon on Thursday, 20 August, submit the LaTeX source code file and the typeset PDF to the [homework submission](http://borax.truman.edu/310/submit.php) page.

## **Additional Notes**

If you have macOS, you can do the C++ work on your computer after you install Xcode version 9.0 or later. Note that for this course you need to use command-line tools in the Terminal app to ensure you are using the correct command-line switches, not the Xcode IDE. You will also need a LaTeX installation, such as MacTex or TeXstudio.

If you have a Windows computer, you will have to figure out how to install clang and llvm (minimum version 7), the powershell, and a LaTeX system. Courtesy of Dr. Neitzke, [here](http://borax.truman.edu/CodeBlocks_and_Clang_installation_guide_Windows.pdf) is a set of instructions for installing clang + llvm and Code::Blocks on Windows computers.

The best setup for this class is to install Linux on your own computer. Assuming you have Debian Stretch or Ubuntu 18.04 or later, you will need to install the clang and llvm packages on your system, as well as a text editor such as bluefish, emacs, or vim-gnome. For the LaTeX assignments, you will need at least the texlive-latex-recommended and texlive-extra-utils packages to have a functioning LaTeX system.

To share files between ice and your network drives, plus lots of other useful information, see the [FAQ](http://ice.truman.edu/faq/) that Dr. Bindner maintains.