Purpose: Assemble and test the breadboard we will use for the rest of the semester. Install the STM32CubeIDE software. Introduction to the IDE (Interactive Debugging Environment) and programming STM boards.

Assemble the hardware: First, place the STM board and all the components in the breadboard according to the "board layout" drawing given on the course web page. Then, use the wiring list on the web page to wire it all up.

Test your wiring: download the file "lab.bin" from the class web page. Plug the USB cable into your STM board and the other end in to your PC. The STM board will then show up in your file manager as a new drive/device with the label NOD_F401RE. Navigate to the "lab.bin" file you downloaded and drag and drop (or copy-paste) it into the NOD_F401RE "drive". This should program the board with the test code This code will light the LEDs one at a time and test stuff out. Note that dragging and dropping a bin file is one way to program the board. This assumes you already have the "bin" file. Normally you will program the board with the IDE.

Download and install the IDE: If you haven't already, download the STM32CubeIDE software from

`https://www.st.com/en/development-tools/stm32cubeide.html`

The current latest is version 1.8.0. You'll need to sign up for a free account. Install after downloading if it is not done automatically

Programming the board with the IDE:
Download the ZIP file associated with this lab from the course web page. Extract the files somewhere your can find them.

Open the STM32Cube IDE
From the menu select:
File --> New -->> STM32 Project from an Existing STM32CubeMX Configuration File (.ioc)
After some moments a dialog box will pop up.
Click "Browse..." next to the STM32CubeMC .ioc file field
and navigate to the location of your .ioc file (in the ZIP file downloaded from the course web page)
Select the file, then click "Open"
Give it a new project name if needed
Click "Next" and near the bottom under "Code Generator Options" click "Add necessary library file as reference in the toolchain project configuration file" then click "Finish"
Click "Yes" to open the perspective (if it asks)

By creating a new project from this .ioc file, our hardware (including pin functions, inputs/outputs) will already be set up
This might take a couple minutes to download the associated files the first time you do it.

Using the IDE:
In the IDE you should have the Project Explorer in a tab on the left.
Note: to clone a project from one lab to the next, right-click on it, click "Copy" then in the blank area below, right-click and select "Paste", Give it a new name (maybe the current lab).
You can then right-click on the "Lab" project and select "Delete", but **do not** check the box that says "Delete project contents on disk…" (unless you want to). Click "OK". This will remove it from the project

In the Project Explorer, expand whatever you called the project (click the little triangle to the left if necessary)
Expand "Core" and then "Inc"
From a files explorer locate the "lcd.h" file in the ZIP file you downloaded from the course web page
If you can, drag and drop this file in the Core-->Inc folder you just opened.
If this doesn't work, select "lcd.h" in your file explorer and hit Control-C (for copy),
then on the Core-->Inc folder of the STM32CubeIDE Project Explorer, hit Control-V to paste it there
The Core-->Inc folder should now show "lcd.h"

Now do the same thing with "main.c" and "lcd.c", but this time drop them in the Core-->Src folder.
Acknowledge that you want to "Overwrite" main.c when asked.

From the main menu click Project-->Build All to build the project

From the main menu click Run-->Run to run the project

The first time you try to download code to a new STM board from STM32CubeIDE, it will pop up a dialog asking if you want to update to new firmware. Click "Open in update mode" and then "Upgrade". Then close the window

Change the program:
In the Project Explorer tab, click on Core-→Src-→main.c to open in in the editor tab. Note that user code should only be entered between the places indicated by the comments. Scroll down to function “main” and make the following changes:

Make the printf() print your name.
Have "`GPIOC->ODR`" count instead of blink
Change the loop delay so blinking/counting happens twice as fast.

After making these changes, “Build” and “Run”.