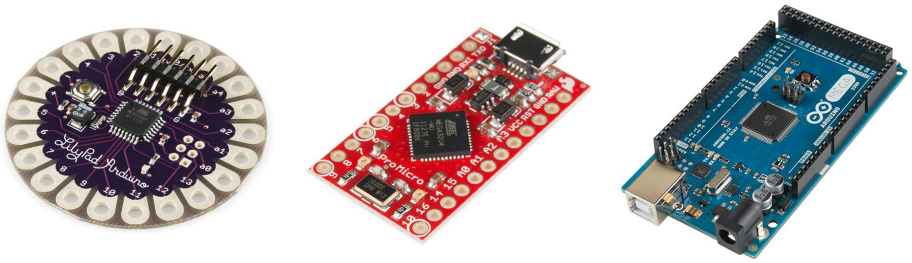
What is Arduino?

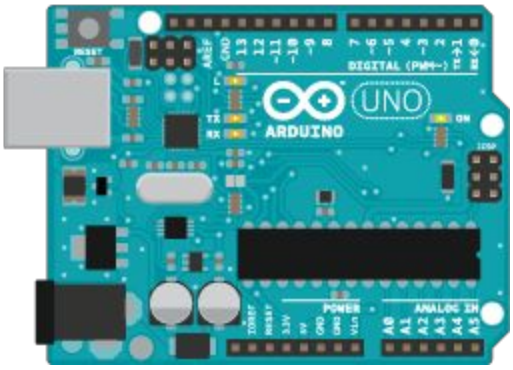
Arduino first and foremost is an open-source computer hardware and software company. The ***Arduino Community*** refers to the project and user community that designs and utilizes microcontroller-based development boards. These development boards are known as ***Arduino Modules,*** which are open-source prototyping platforms. The simplified microcontroller board comes in a variety of development board packages.



(From left to right) Lilypad, Sparkfun Pro Micro, Arduino Mega

The most common programming approach is to use the Arduino IDE, which utilizes the C programming language. This gives you access to an enormous Arduino Library that is constantly growing thanks to open-source community.

Arduino IDE is not: AVR Studio (Yes, we know you loved EE 346, but unfortunately you won't be utilizing Assembly Language)



Arduino Uno dev. board (Fritzing part graphic)

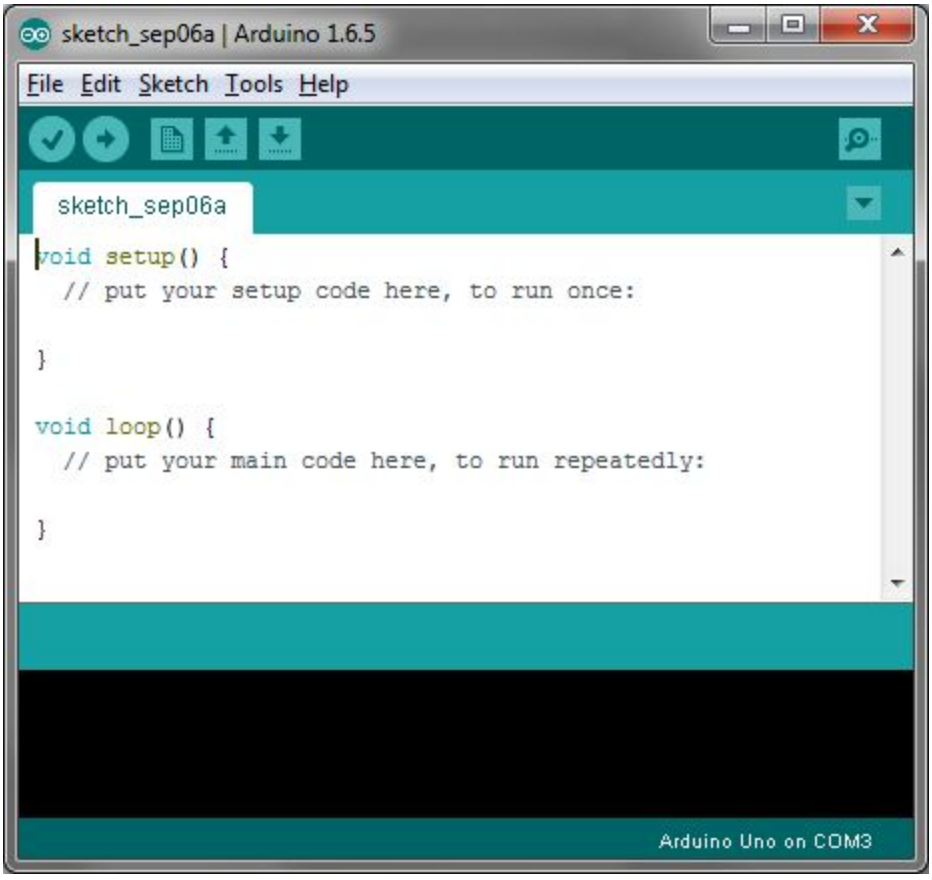
Find out all the information you ever wanted to know about Arduino here:
https://learn.sparkfun.com/tutorials/what-is-an-arduino

Also, checkout sparkfun's Arduino Buying Guide for further information on available dev. boards:
https://www.sparkfun.com/arduino_guide

Arduino IDE: Initial Setup

Download Arduino Integrated Design Environment (IDE) here (Most recent version: 1.6.5):
https://www.arduino.cc/en/Main/Software

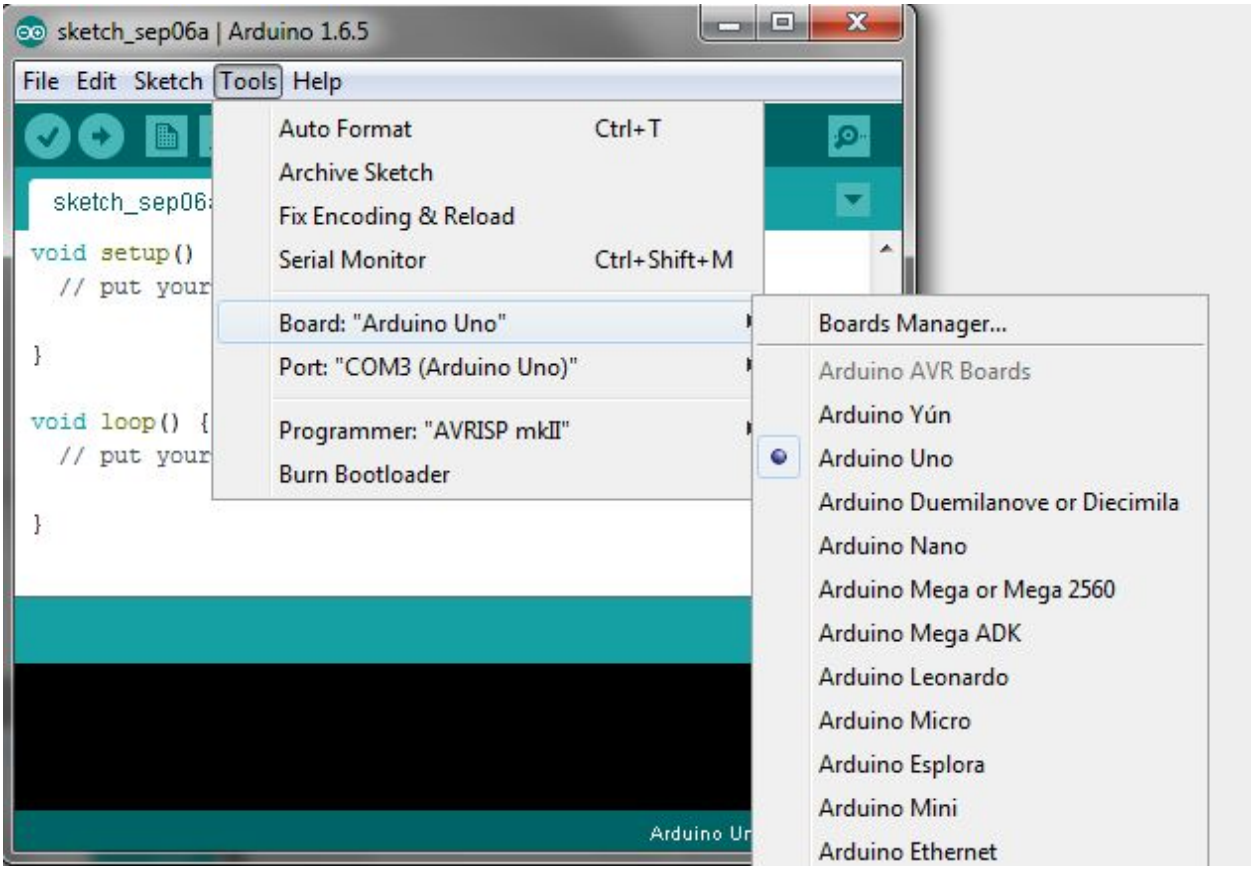
This is the Arduino IDE once it's been opened. It opens into a blank sketch where you can start programming immediately. First, we should configure the board and port settings to allow us to upload code. Connect your Arduino board to the PC via the USB cable.



Arduino IDE Default Window

IDE: Board Setup

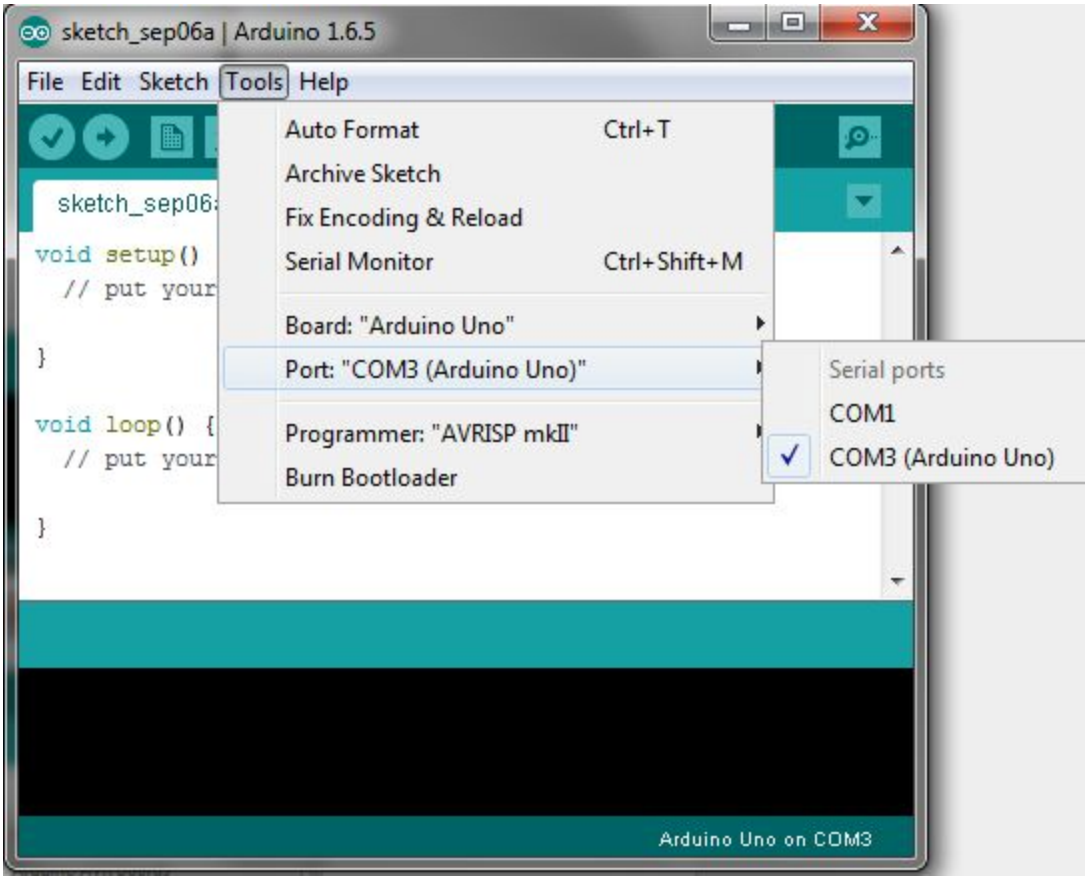
You have to tell the Arduino IDE what board you are uploading to. Select the **Tools** pulldown menu and go to **Board.** This list is populated by default with the currently available Arduino Boards that are developed by Arduino. If you are using an Uno or an Uno-Compatible Clone (ex. Funduino, SainSmart, IEIK, etc.), select Arduino Uno. If you are using another board/clone, select that board.



Arduino IDE: Board Setup Procedure

IDE: COM Port Setup

If you downloaded the Arduino IDE before plugging in your Arduino board, when you plugged in the board, the USB drivers should have installed automatically. The most recent Arduino IDE should recognize connected boards and label them with which COM port they are using. Select the **Tools** pulldown menu and then **Port.** Here it should list all open COM ports, and if there is a recognized Arduino Board, it will also give it's name. Select the Arduino board that you have connected to the PC. If the setup was successful, in the bottom right of the Arduino IDE, you should see the board type and COM number of the board you plan to program. Note: the Arduino Uno occupies the next available COM port; it will not always be COM3.



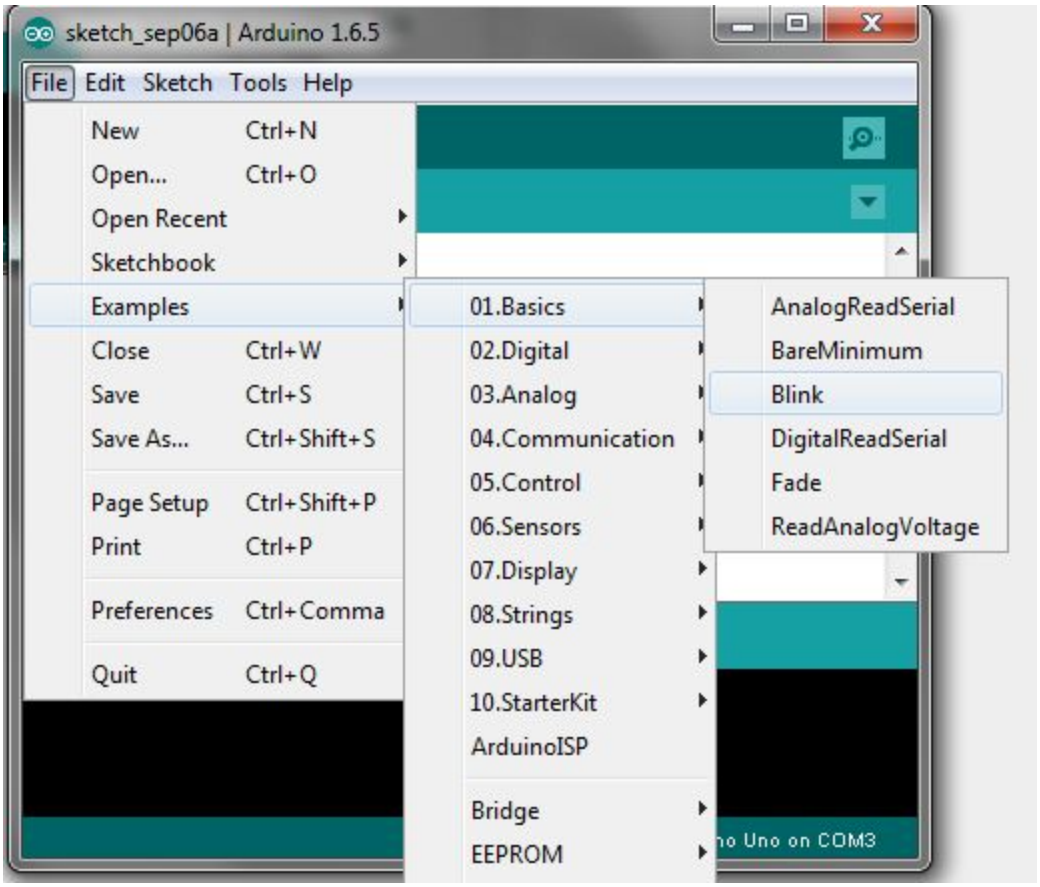
Arduino IDE: COM Port Setup

At this point, your board should be set up for programming, and you can begin writing and uploading code.

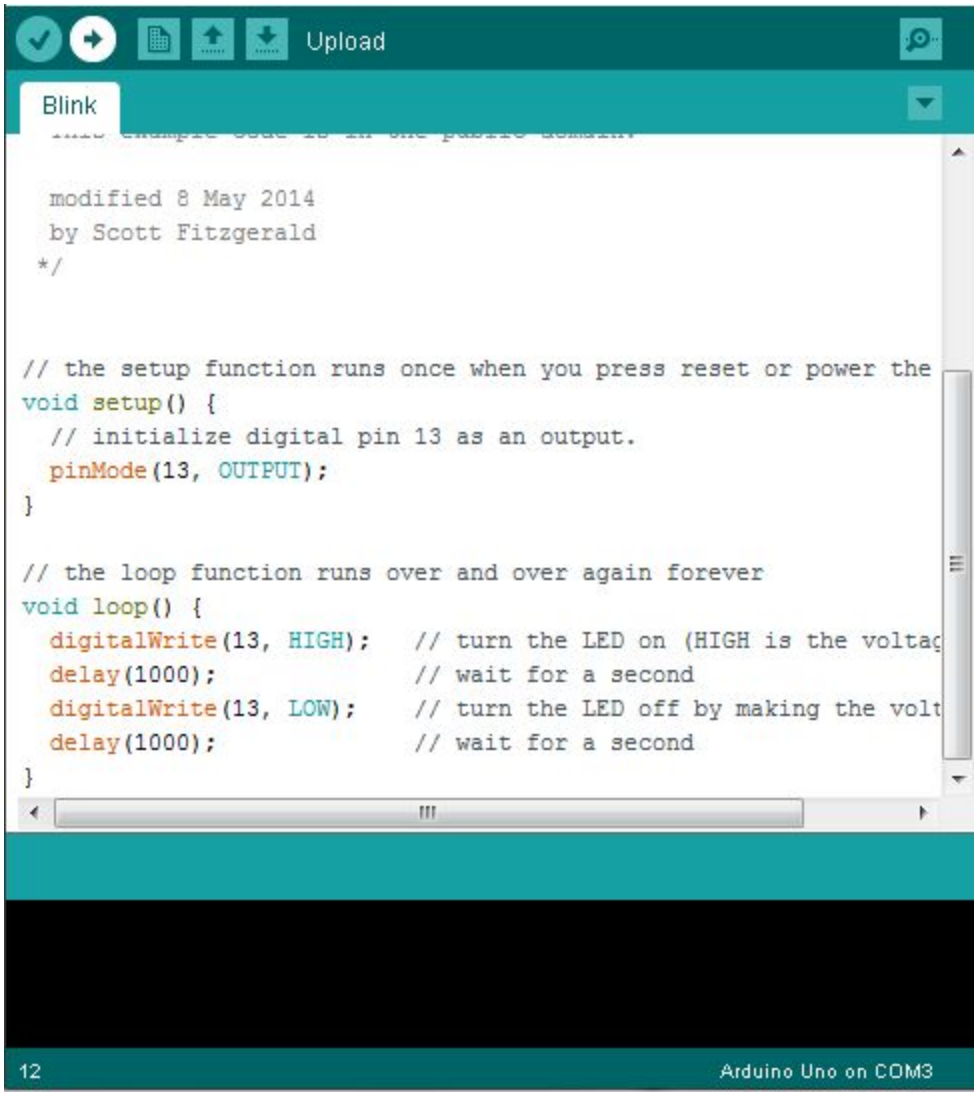
Testing Your Settings: Uploading Blink

One common procedure to test whether the board you are using is properly set up is to upload the “Blink” sketch. This sketch is included with all Arduino IDE releases and can be accessed by the **File** pull-down menu and going to **Examples, 01.Basics,** and then select **Blink**. Standard Arduino Boards include a surface-mounted LED labeled “L” or “LED” next to the “RX” and “TX” LEDs, that is connected to digital pin 13. This sketch will blink the LED at a regular interval, and is an easy way to confirm if your board is set up properly and you were successful in uploading code. Open the “Blink” sketch and press the “Upload” button in the upper-left corner to upload “Blink” to the board.

Upload Button: 



Arduino IDE: Loading Blink Sketch



Arduino IDE: Uploading Blink

Guide Summary:

1. Download and install Arduino IDE (https://www.arduino.cc/en/Main/Software)
2. Plug in your Arduino Board
3. Select the proper board in the IDE (**Tools>Boards>Arduino Uno**)
4. Select the proper COM port (**Tools>Port>COMx (Arduino Uno)**)
5. Open the “Blink” sketch (**File>Examples>Basics>01.Blink**)
6. Press the Upload button to upload the program to the board
7. Confirm that your board is working as expected by observing LED

Troubleshooting Uploading Errors:

Arduino has lots of community support and documentation. Your best bet when running into unexpected problems is to search online for help. You should be able to find a forum where someone had the same problem you are having, and someone helped them fix it. If you don't find results, try modifying your search, or post on the Arduino forums.

- **My board isn't listed under devices and is not recognized by IDE:**
  - Most likely, this means that the ATMega328p chip is not programmed with the Arduino firmware. If you have a separate working Uno available, you can program the unprogrammed chip using this guide and a few jumper cables: https://www.arduino.cc/en/Tutorial/ArduinoISP
  - If you don't have a separate Arduino available, let me know and I can use an Atmel Programmer to upload the firmware.
  - There may be hardware damage if you had the board plugged into USB and external power at the same time. You may have to replace the chip if this is the case.

- **Error Message: avrdude: stk500_recv(): programmer is not responding**
  - Double-check that you are using the correct COM port.
  - Make sure that your Arduino Board is plugged into the computer.

- **The IDE says "Uploading..." after pressing the upload button, but nothing is happening.**
  - Double-check that you have the correct board selected in the **Tools** menu.
  - Depending on the size of your program, it may take a few seconds to upload. If you feel like it is taking too long, it may be encountering an error and you can try unplugging and plugging in the Arduino board.