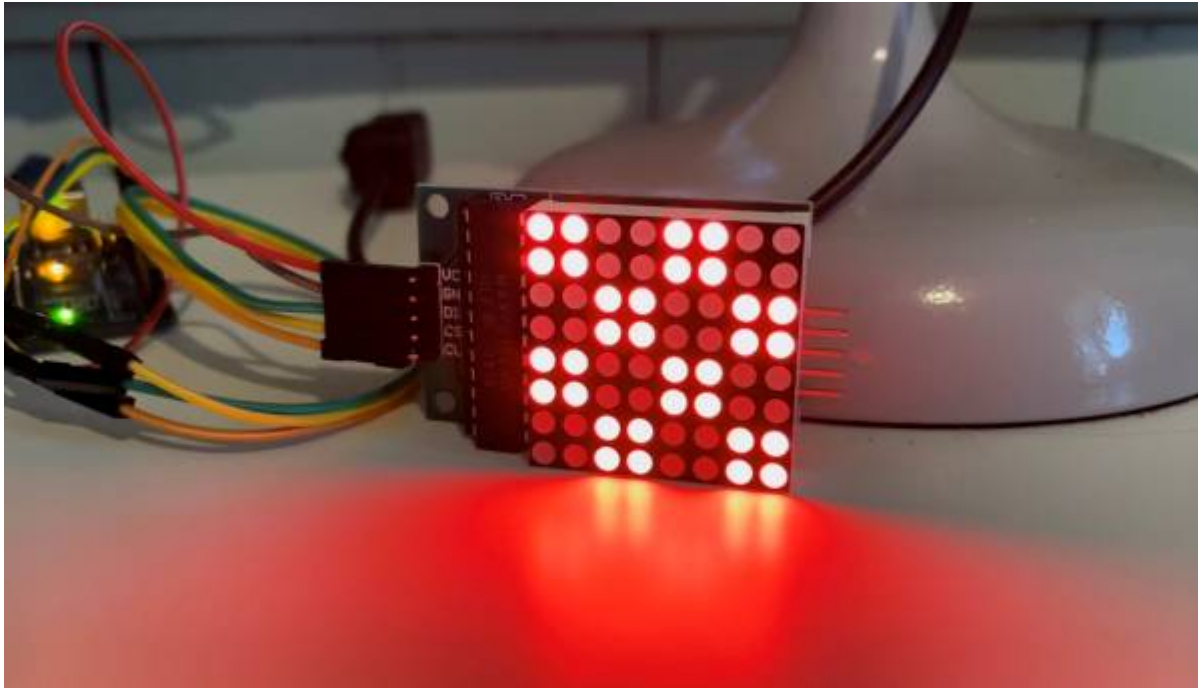




# 101 - Arduino

SLQ Wiki Fabrication Lab 2024/07/27 15:43

# 101 - Arduino



This intro to Arduino uses a LED matrix to show how to connect and use existing libraries to create fun projects without too much coding and wiring.

This is a redevelopment of previous Arduino LED matrix workshops, including [Deskduino](#) and [Badgeduino](#).

Michelle Brown and Peter Lin, September 2022.

## Acknowledgement

We acknowledge Aboriginal and Torres Strait Islander peoples and their continuing connection to land and as custodians of stories for millennia. We respectfully acknowledge the land on which we all meet today, and pay our respects to elders past, present and emerging.

## Summary

Participants will learn about the Arduino IDE program and connecting an Arduino Nano and a programmable 8x8 LED Matrix display.

## Skills Introduced

- Overview of circuit and components
- Assembling components
- Using the Arduino IDE and basic coding

## Materials

Material	Quantity	Cost
Arduino Nano V3.0 Board	10	\$13.48
USB cable (included with Nano)	10	\$0.00
MAX7219 Serial Dot Matrix Display Module	10	\$9.05
Solderless Breadboard	10	\$4.36
Solderless Breadboard Jumper Cable Wires (10 x 10)	50	\$0.80
	Total	\$27.69

## Requirements

- Computer with USB A port or adaptor
- Arduino IDE program installed

## Health & Safety

Running this workshop at The Edge?.. You should familiarise yourself and your participants with:

- DML Risk Assessment

## Workshop Walk through

### What is a microcontroller?

A microcontroller (or MCU for microcontroller unit) is a small computer on a single integrated circuit.

- one or more CPUs (processor cores)
- memory
- programmable input/output peripherals
- can be mixed signal devices interacting with
  - digital signals
  - analogue signals

## Why use an MCU?

Microcontrollers are small, low powered and robust, making them perfect for [embedded systems](#) such as:

- medical devices
- remote controls
- office machines
- appliances
- power tools
- toys
- wearable technology

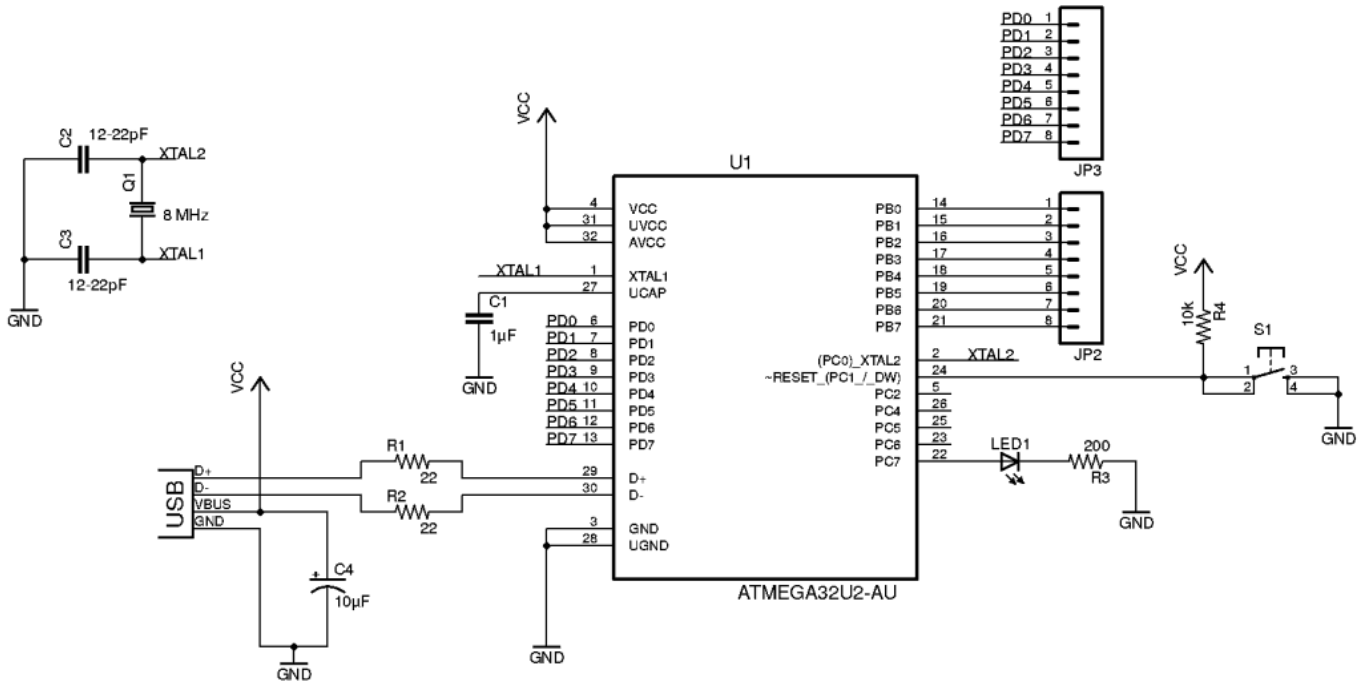
## What is Arduino?

Arduino is an open source computer hardware and software organisation, project, and user community <sup>1)</sup>

- The hardware is based on the Amtel 8-bit AVR MCU
- The software uses the Processing IDE, with a simplified version of the Java programming language
- Open source has led to the creation of a huge range of
  - clones
  - compatible devices
  - peripherals
- A strong community means
  - “Someone, Somewhere has solved the problem”
  - we can run this workshop using and adapting existing resources.

## Basic circuitry

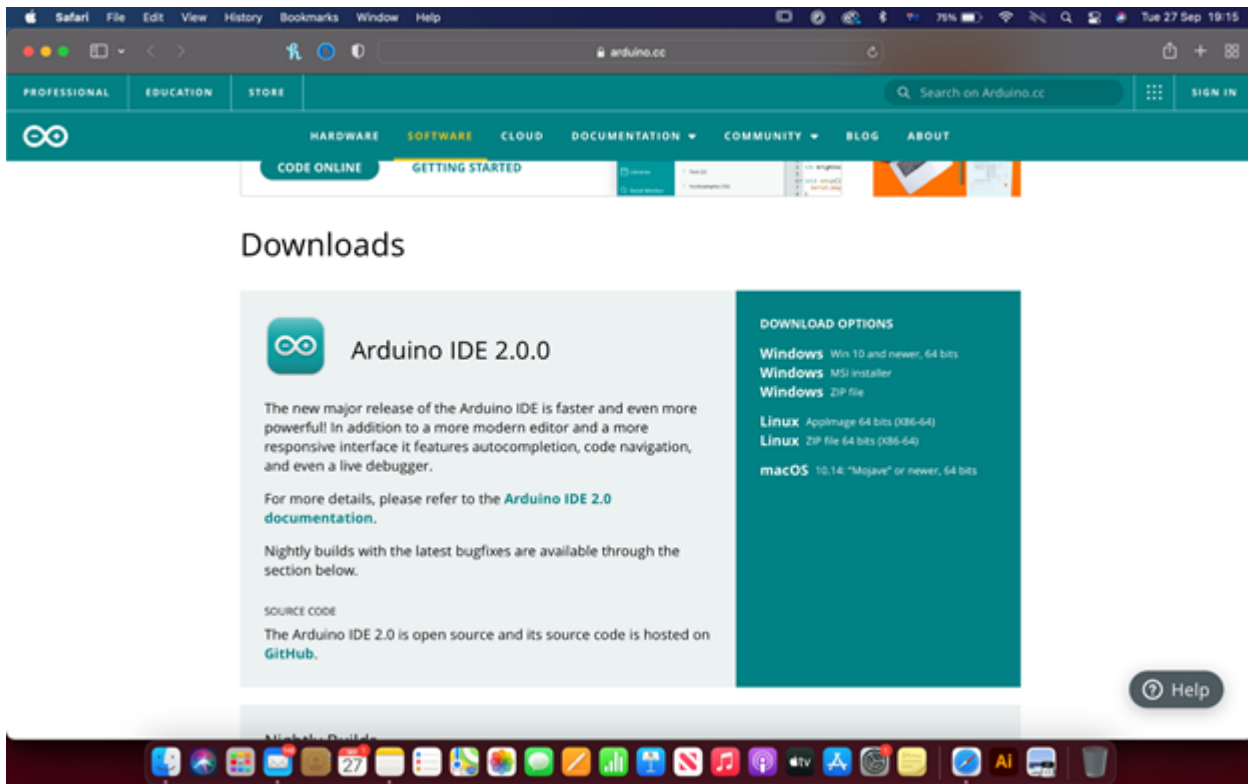
Example diagram



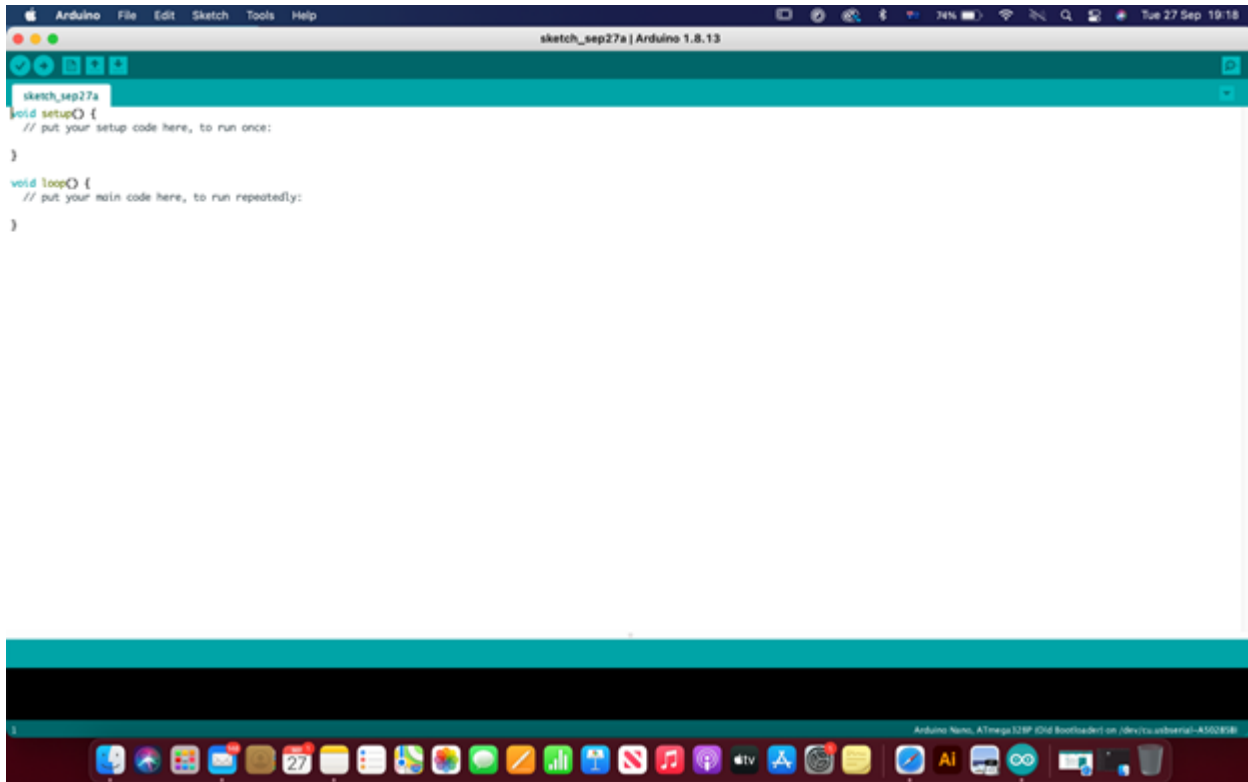
# Step 1

Downloading or checking our software is installed and up to date. We can install updates to our software on the DML (Digital Media Lab) computers, it just won't save the update when the computers are restarted.

## Arduino IDE



Open Arduino IDE, it will automatically open a blank code base document for you.

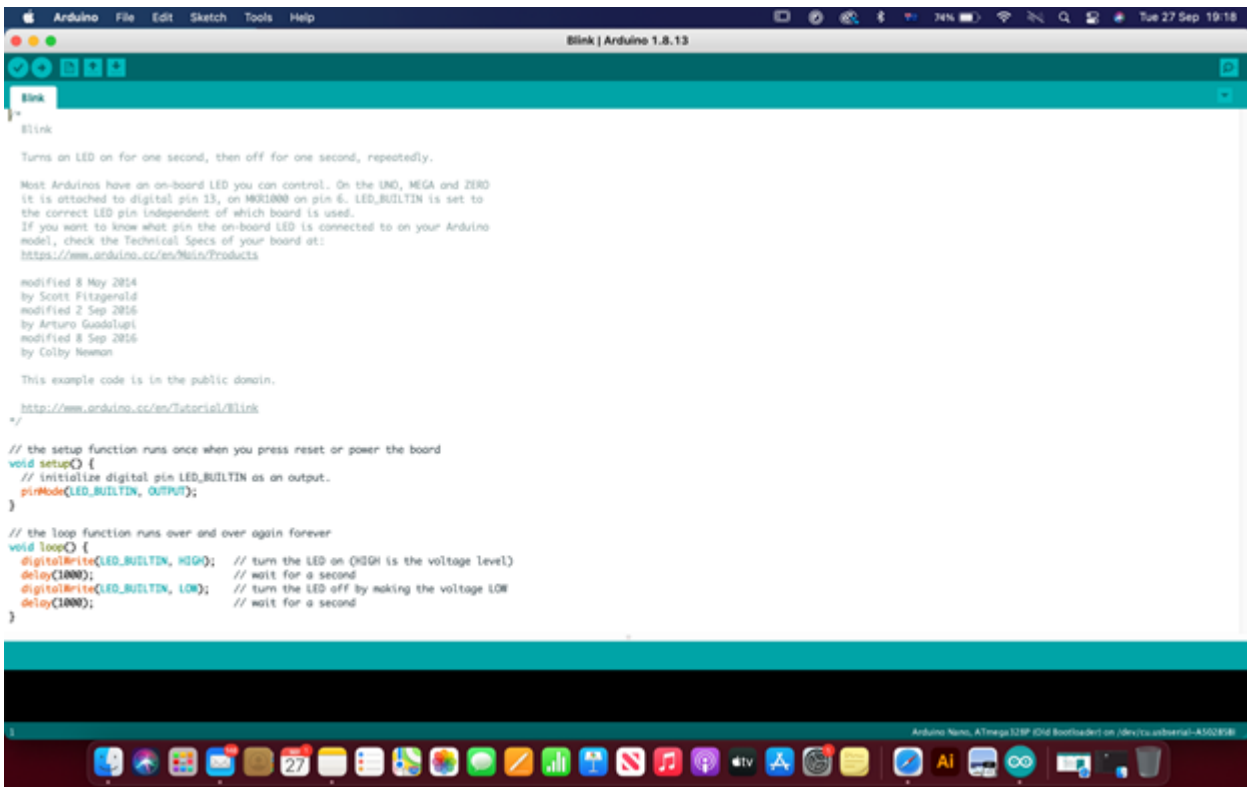
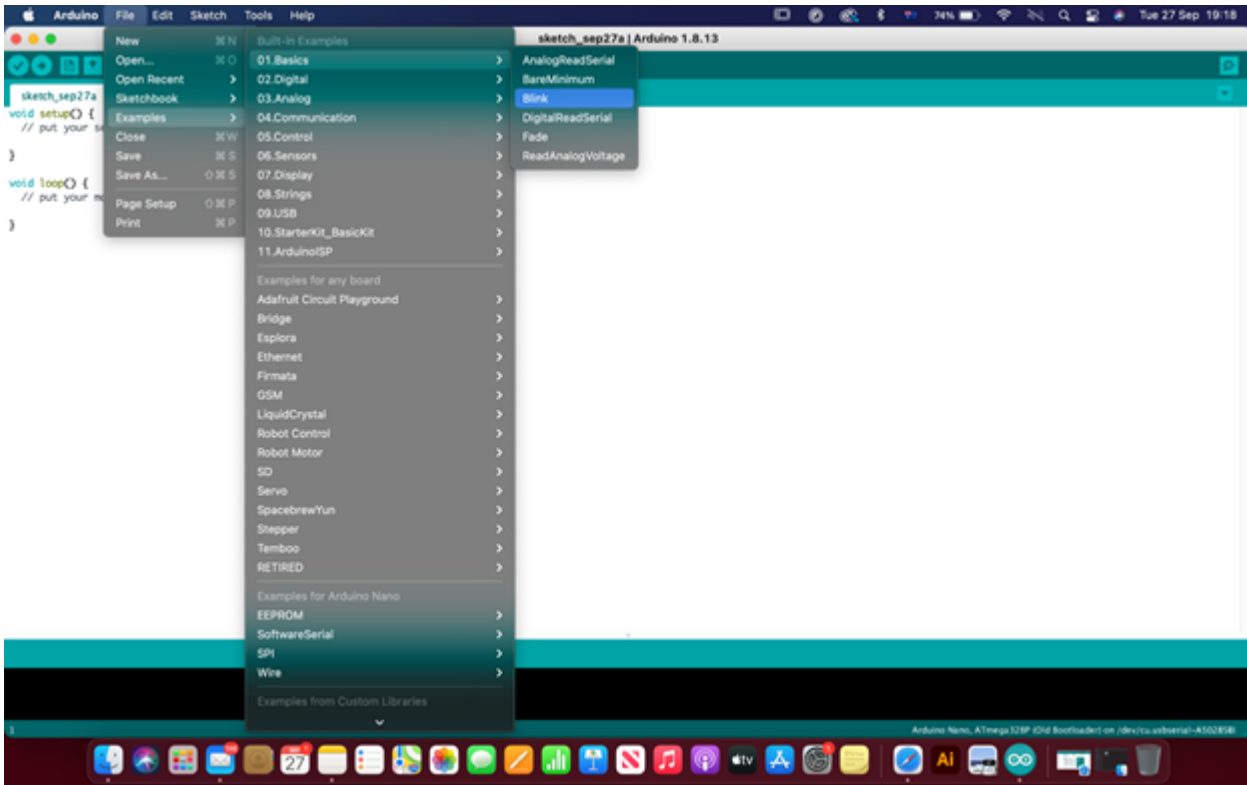


Connect the Arduino Nano with the blue USB cable provided.





Do a Blink test by navigating to the File menu>Examples>0.1 Basics>Blink



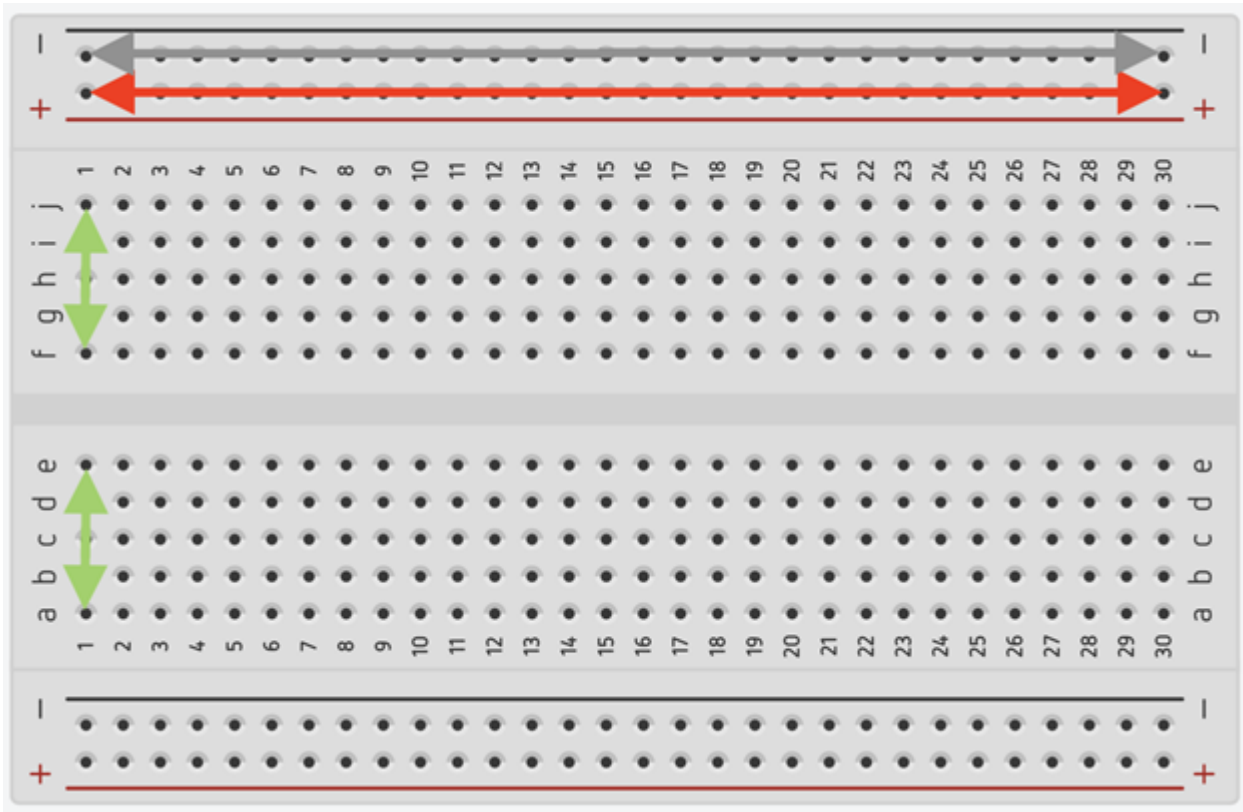
## Step 2

### Components



## What are breadboards?

A breadboard (sometimes called a plugblock) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily.

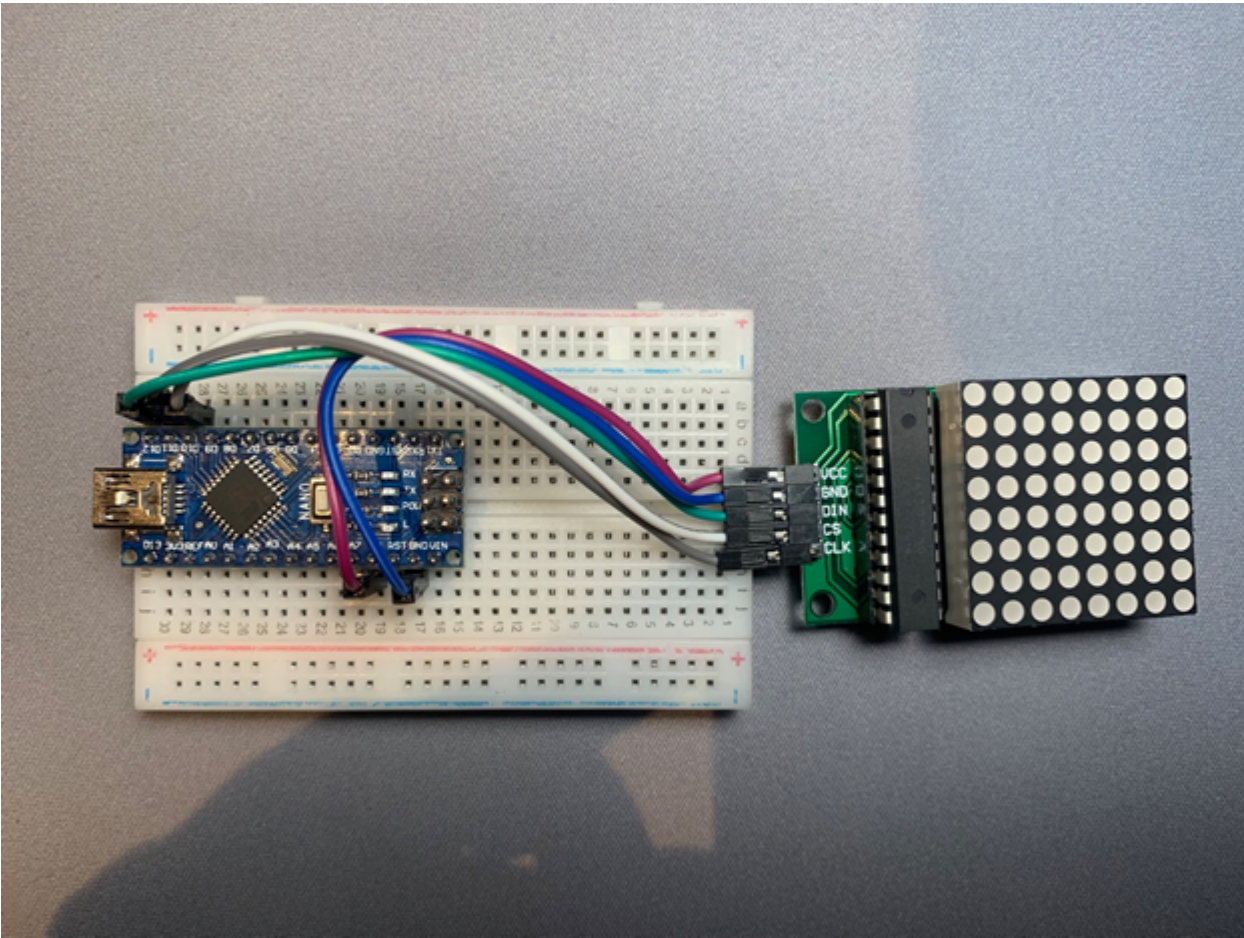


## What connectors and cables do we use for basic electronics?

In this workshop we are using Solderless Breadboard Jumper Cable Wires so we don't have to do any soldering.

Connecting cables, what you need to know (pins, ground etc).

Let's put our kit together (explaining which cable goes where and why we need to know this for the programming)



**Nano Pin**

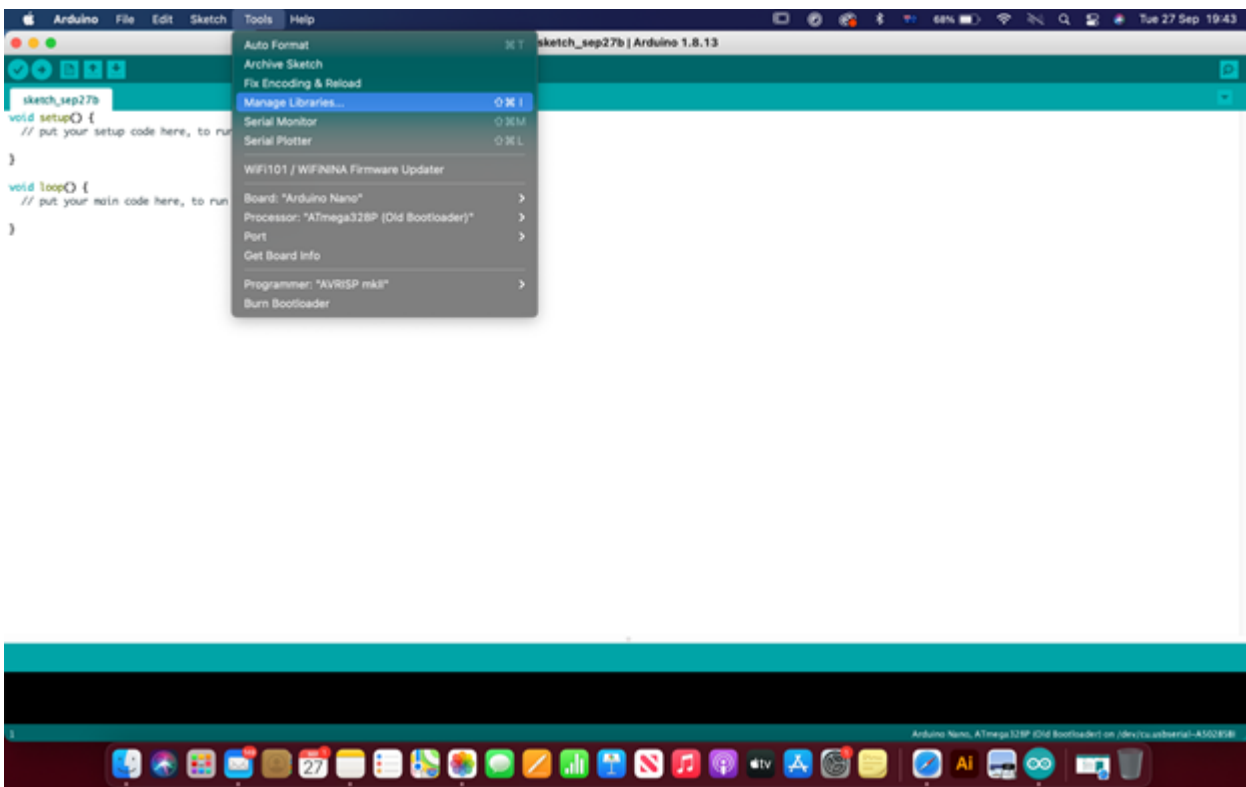
TX1.		
RX0		
RST		
GND		
D2		
D3		
D4		
D5		
D6		
D7		
D8		
D9		
D10	CS	Load
D11	CLK	
D12	DIN	Data in
-	-	-
D13		
303		
REF		
AV		

A1		
A2		
A3		
A4		
A5		
A6		
A/		
5V	VCC	5 volts
RST		
GND	GND	Ground
VIN		

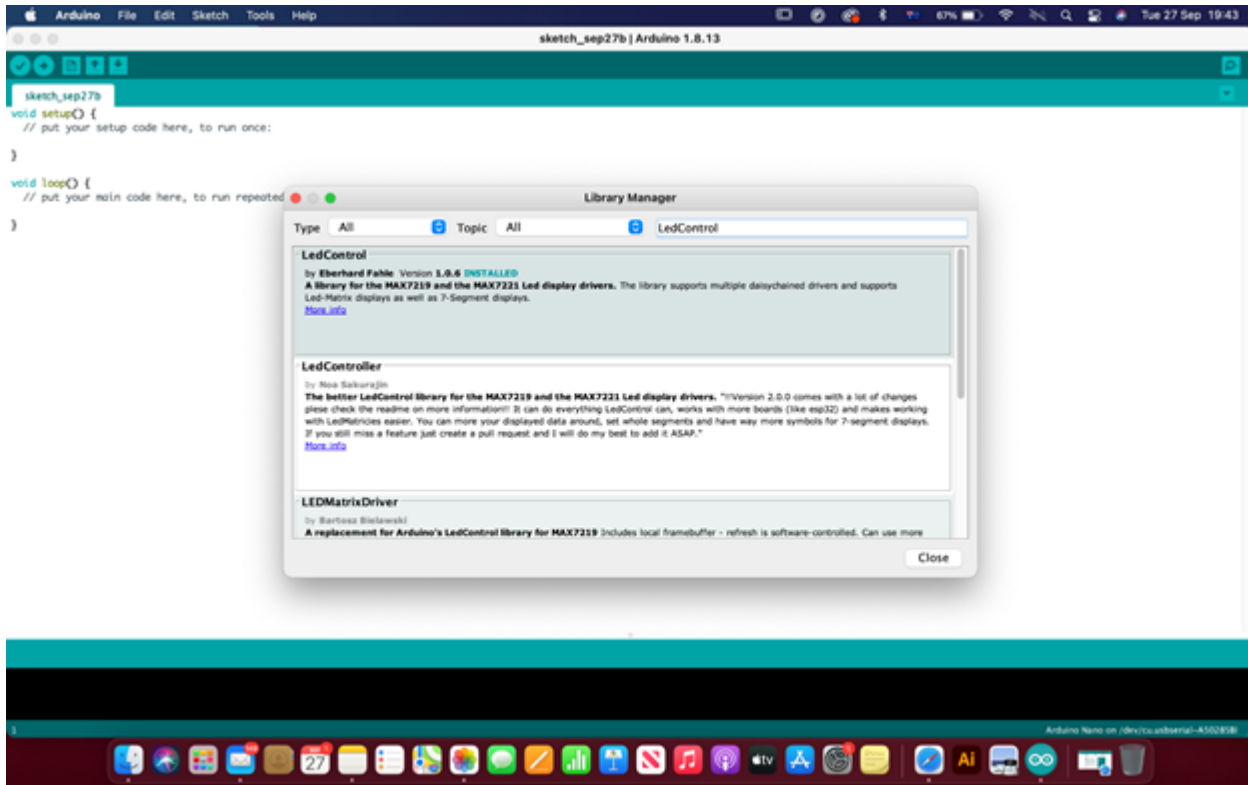
## Step 3

### Downloading and adding libraries

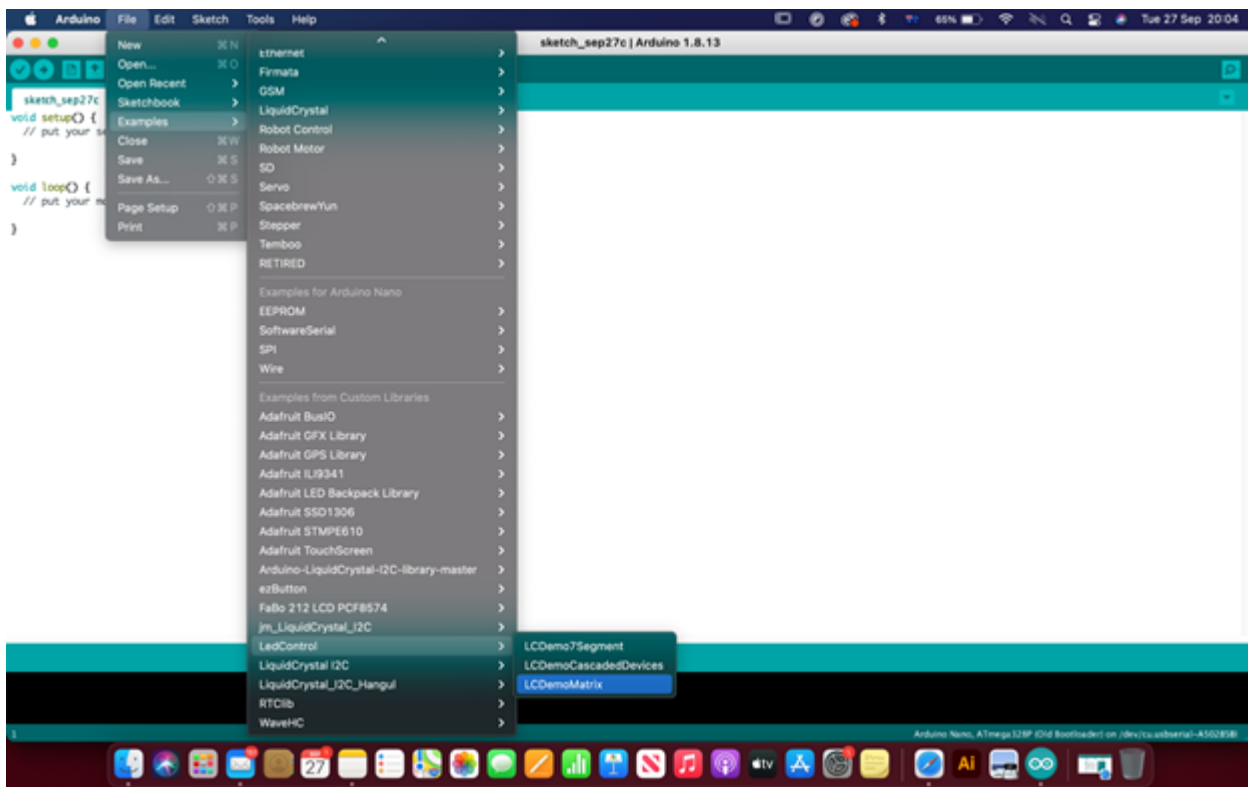
For this we need LedControl library, so let's learn how to add a library.



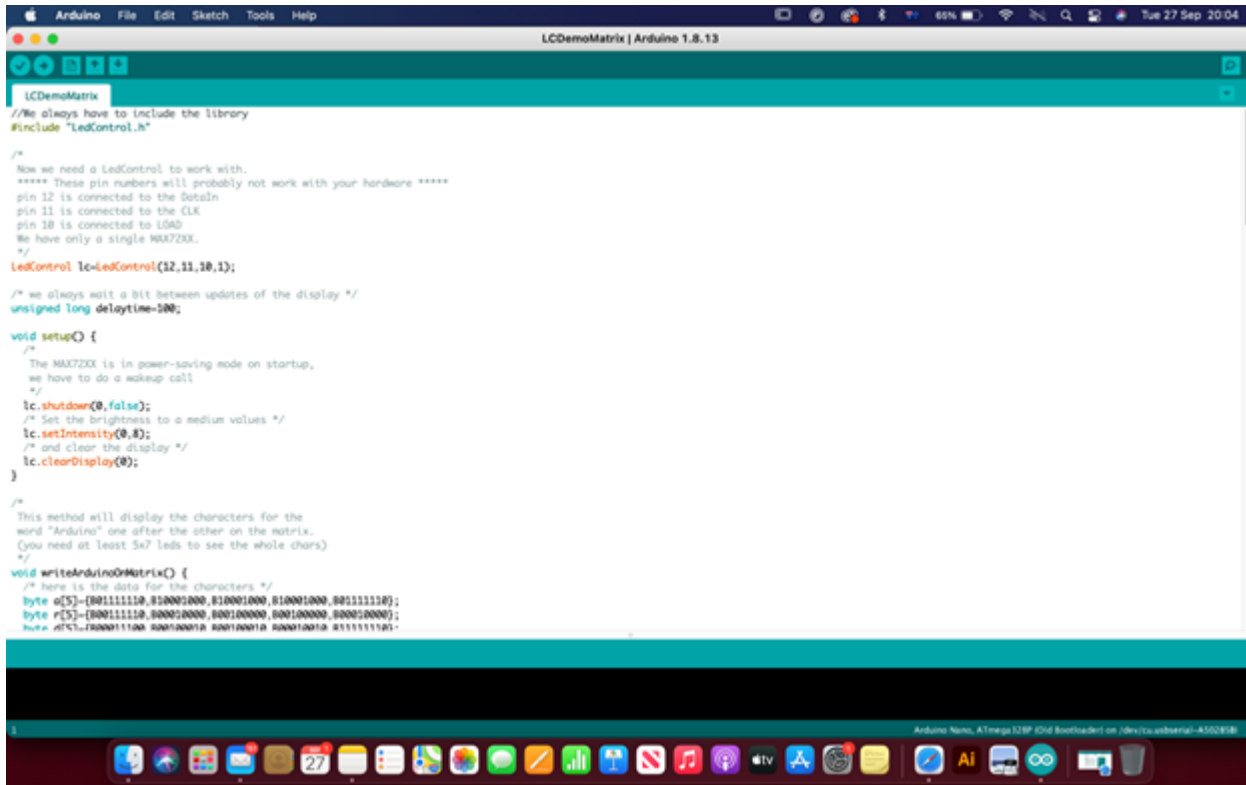
Install LedControl Library



and can use the example “LCDemoMatrix.ino” to test our devices are working



Run Example Code



```
Arduino File Edit Sketch Tools Help
LCDemoMatrix | Arduino 1.8.13

LCDemoMatrix
//We always have to include the library
#include "LedControl.h"

/*
 Now we need a LedControl to work with.
 ***** These pin numbers will probably not work with your hardware *****
 pin 12 is connected to the DataIn
 pin 11 is connected to the CLK
 pin 18 is connected to LOAD
 We have only a single MAX72XX.
 */
LedControl lc=LedControl(12,11,18,1);

/* we always wait a bit between updates of the display */
unsigned long delaytime=500;

void setup() {
  /*
   The MAX72XX is in power-saving mode on startup,
   we have to do a wakeup call
   */
  lc.shutdown(0,false);
  /* Set the brightness to a medium value */
  lc.setIntensity(0,8);
  /* and clear the display */
  lc.clearDisplay(0);
}

/*
 This method will display the characters for the
 word "Arduino" one after the other on the matrix.
 (You need at least 5x7 leds to see the whole chars)
 */
void writeArduinoMatrix() {
  /* here is the data for the characters */
  byte a[5]={'0':{0b1111110,010001000,010001000,010001000,001111110};
  byte r[5]={'0':{0b0111110,000010000,000100000,000100000,000010000};
  byte n[5]={'0':{0b0011100,000100010,000100010,000010010,011111100};
```

This should have our matrix working! If not, let's troubleshoot.

If you did get it working, try some of the other example library code.

## References

<https://xantorohara.github.io/led-matrix-editor/>

## Downloads

<https://www.arduino.cc/en/software>

## Additional Learning

Take a look at our [Arduino 101 - Coding workshop](#)

1)

<https://en.wikipedia.org/wiki/Arduino>