
CRC
CREATIVE
ROBOTICS
CLUB

WELCOME TO THE

CREATIVE ROBOTICS CLUB

WHAT DO WE DO AT THE **CREATIVE ROBOTICS CLUB?**

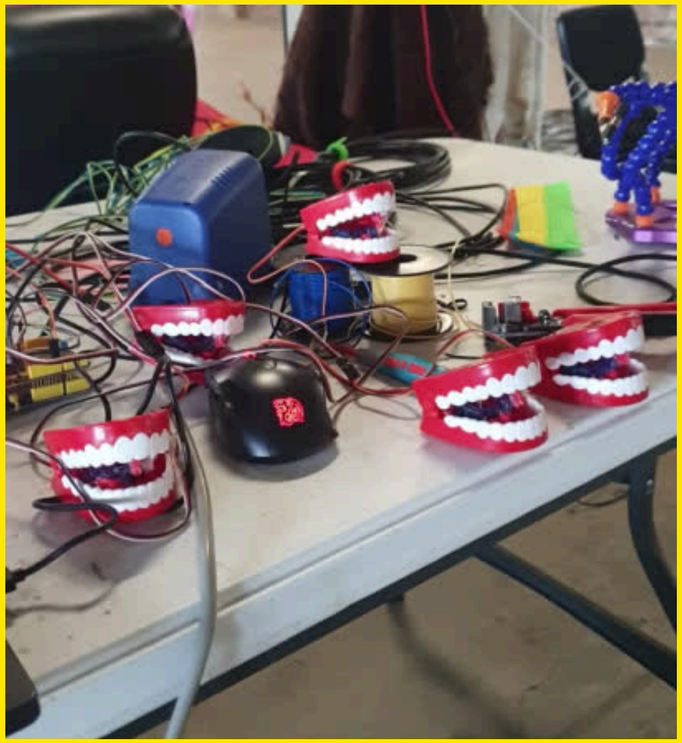
We learn how to use electricity,
robotics and code to make things

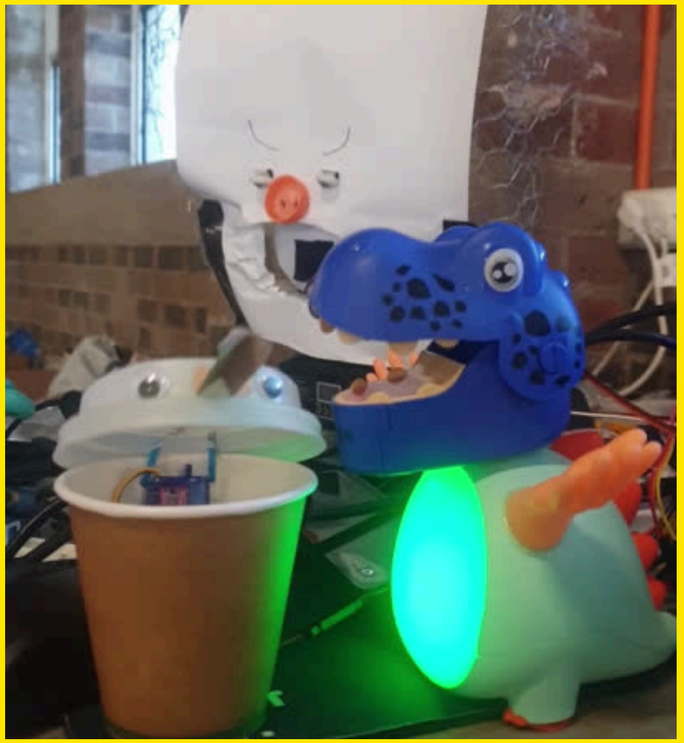
We make art, design, or social robotics
- we support all disciplines

We reuse and repurpose where we can

We have fun

WHAT ARE WE DOING TODAY AT THE **CREATIVE ROBOTICS CLUB?**





SERVO MOTORS

BUT FIRST LETS TALK ABOUT...

LAST WEEK

Last week:

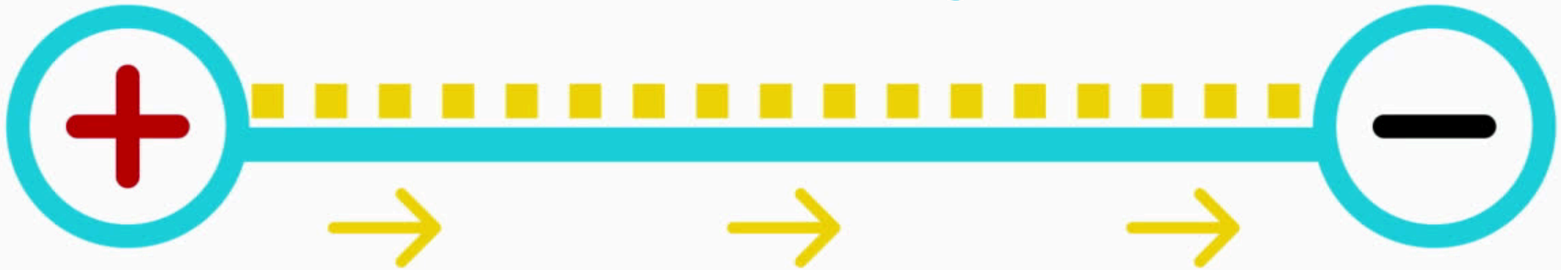
DC gear motor

AA Battery [1.5v]

AA Battery holder

HOW DOES ELECTRICITY WORK?

Current moves from
Positive to negative



Positive: 5v, 3.3v, +, Vin, etc
Negative: GND, Ground, -, ⏚

Positive

Negative

Positive and negative must be connected for electricty to flow

When the connection is
broken nothing will work

We can use this to our advantage to add switches, or know why our project isn’t working

WHAT IF?

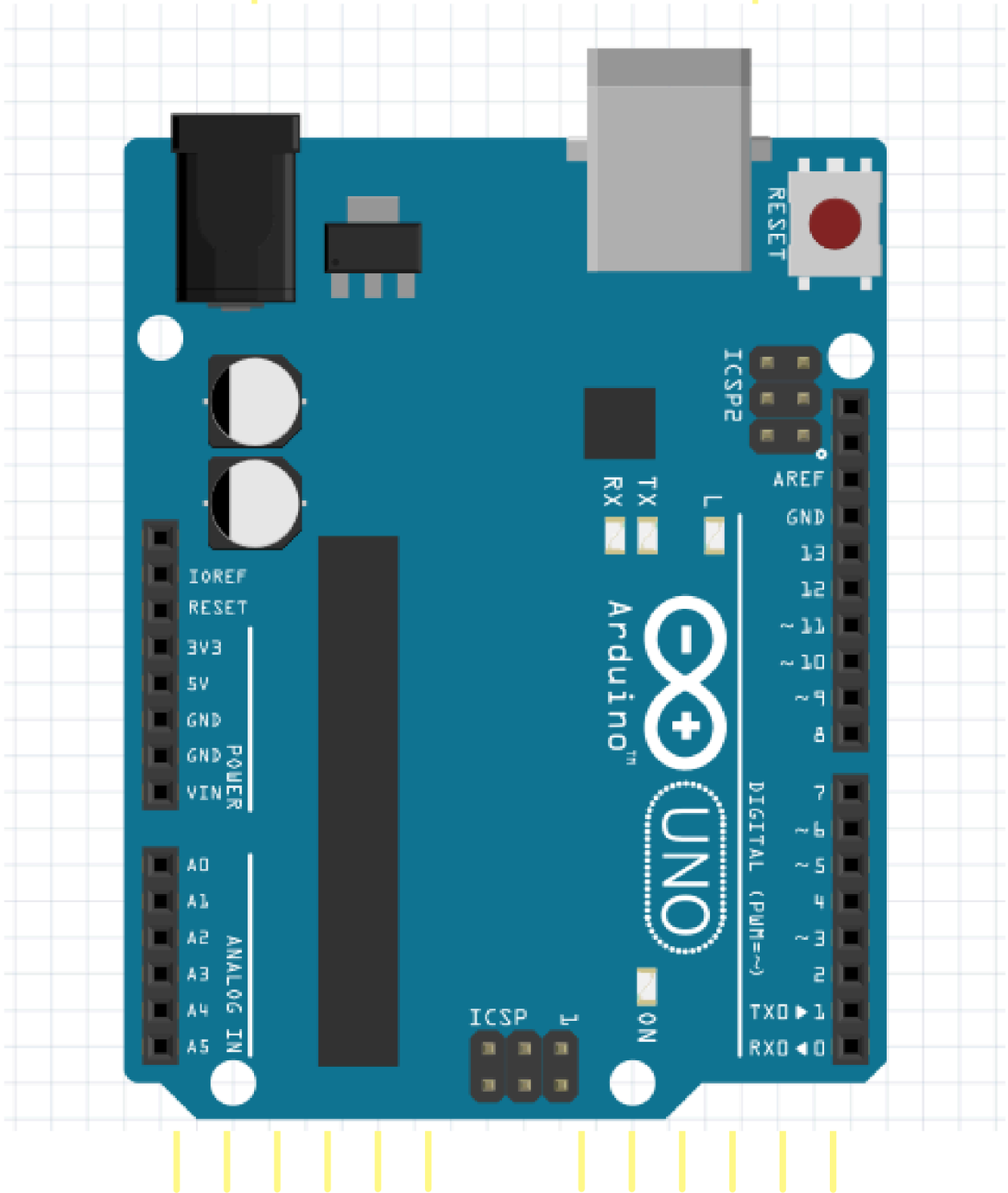
We want to flick 3 switches and turn a dimmer all at the same time in response to a single input?

ARDUINO

This is an Arduino Uno

The easiest way to think about it is as a box of dimmers and switches

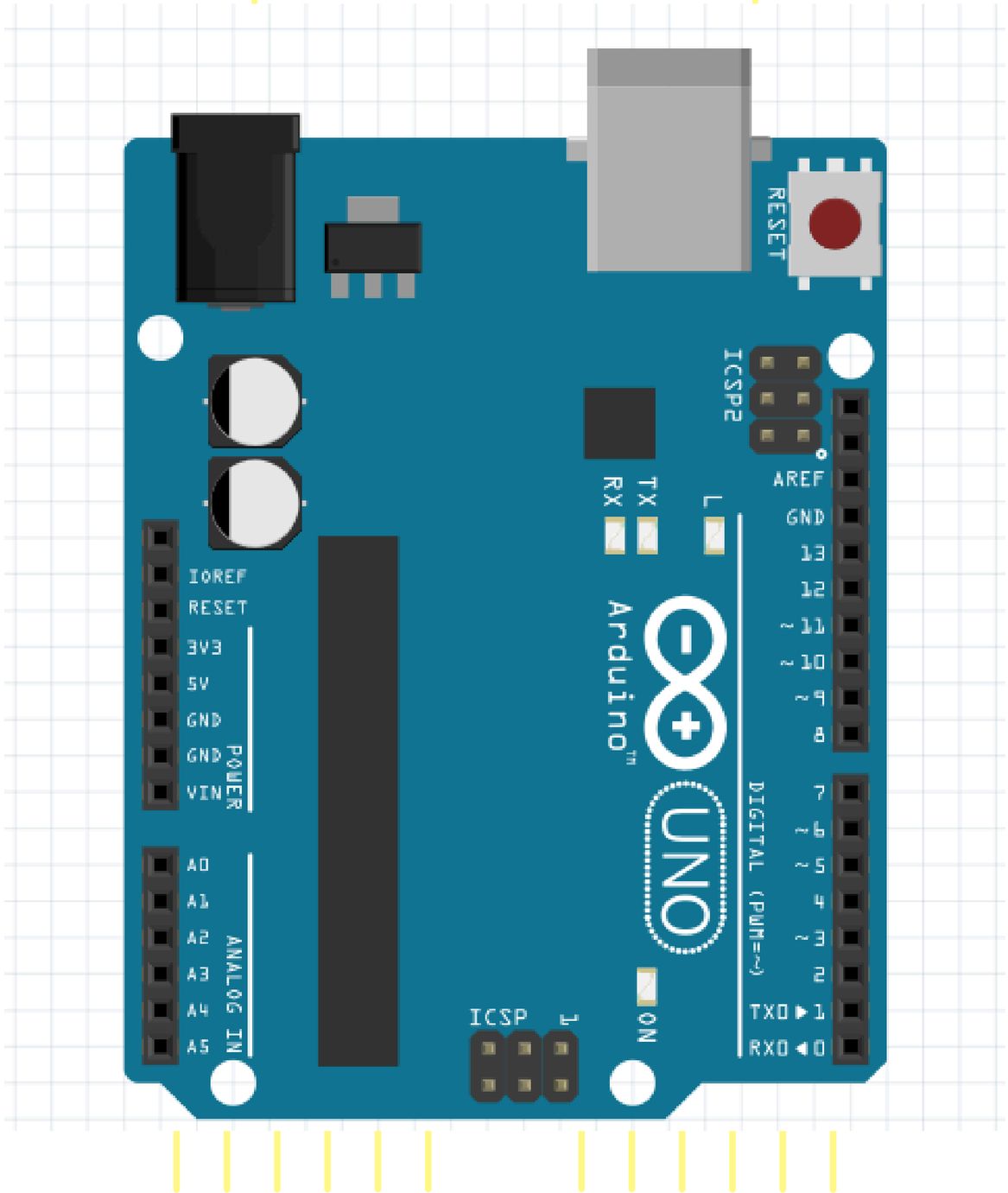
It can also read in information. We can use that information to drive things with electricity, we'll talk more about that next week



ARDUINO

It has 4 main sections:

Power
Analog in (Read sensors)
Digital I/O (Input / Output)
PWM~ (Fake analog out)



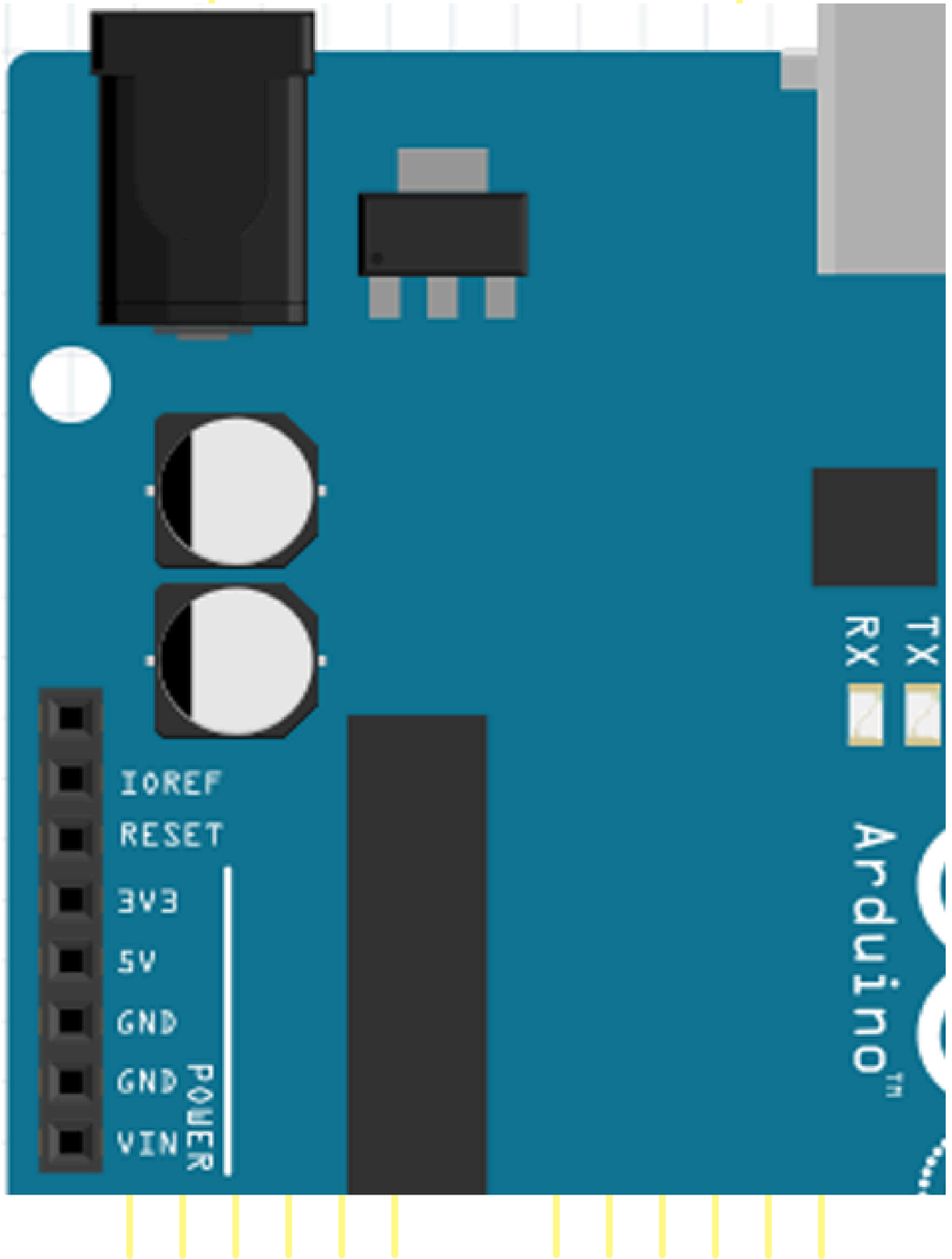
ARDUINO

Power pins are located in the top left

You will notice how they relate to basic electrical ideas we discussed earlier

There are 2-3 different voltage sources (5v, 3.3v, Vin) and two GND (Ground / -) pins

Use these to power sensors and low voltage components



ARDUINO

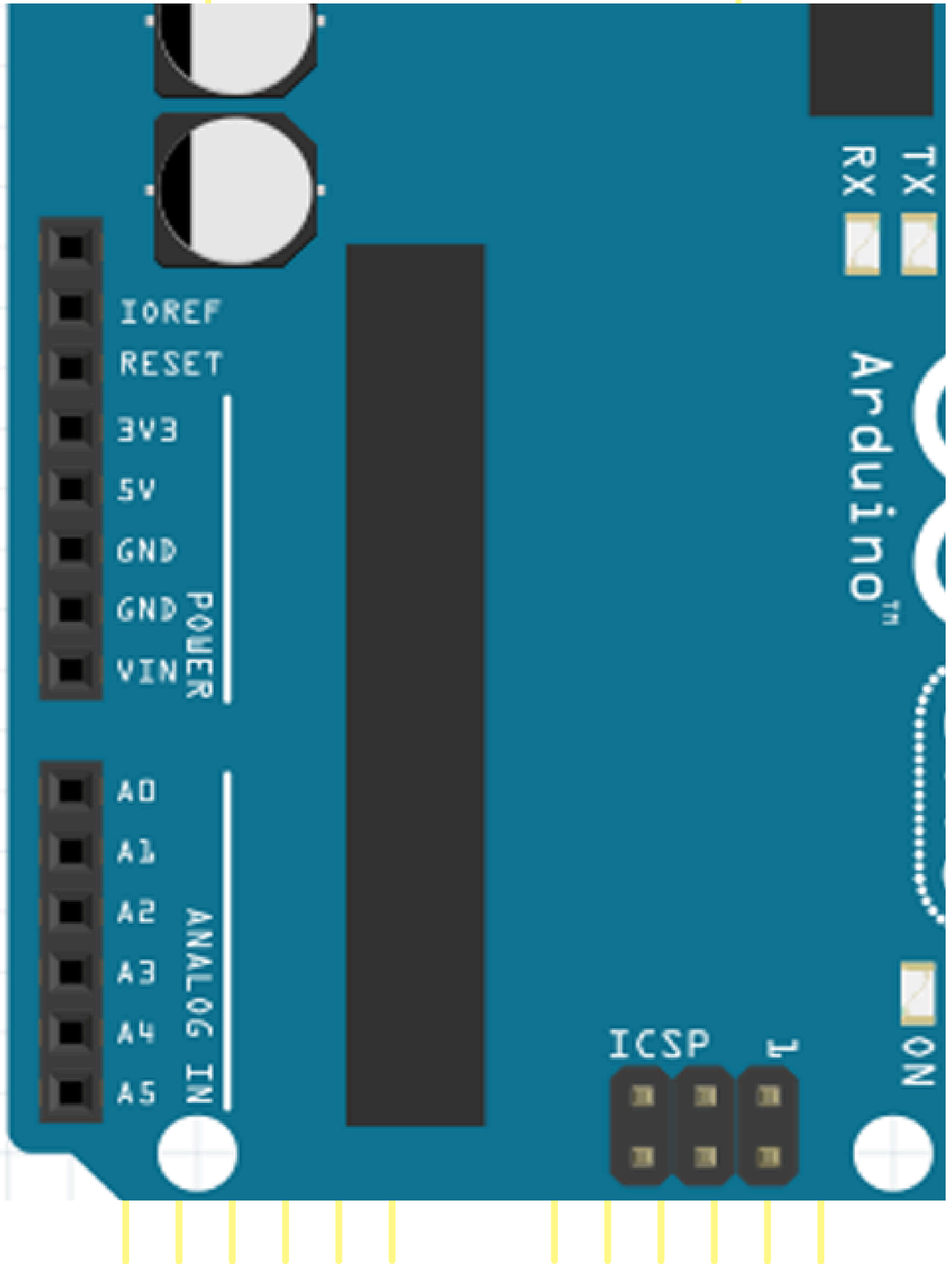
Analog In pins are located in the bottom left

This section can be thought of as being used for reading dimmer / volume knobs

They turn electrical signals into numbers between 0 - 1023

Accessed in code with analogRead(#);

is the pin number (0 - 5)

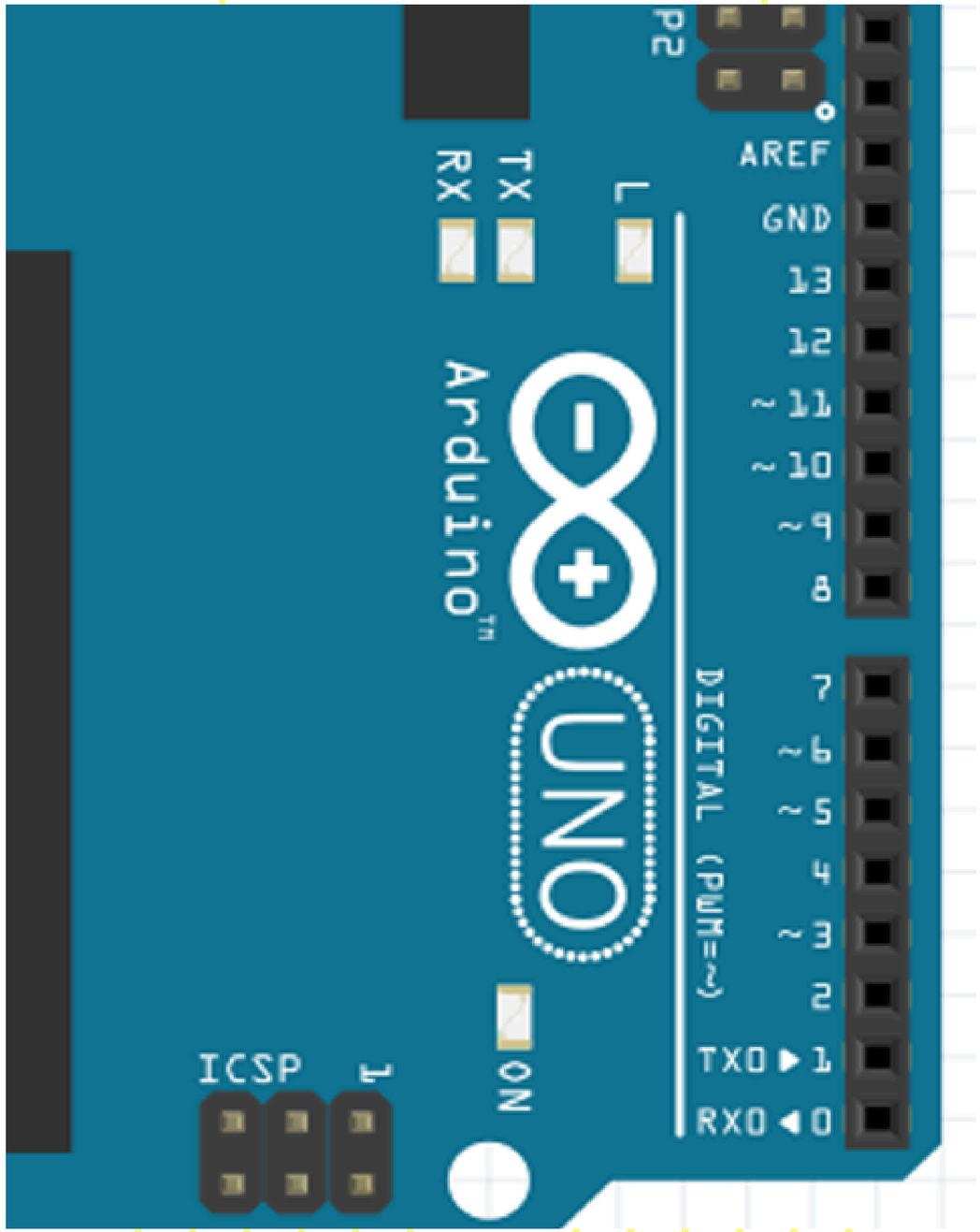


ARDUINO

Digital I/O pins are located on the right

They can read signals as 0 or 1 (LOW or HIGH, off or on)

They can be used to turn devices on (HIGH / 5v) and off (LOW / GND), or check for button presses and more



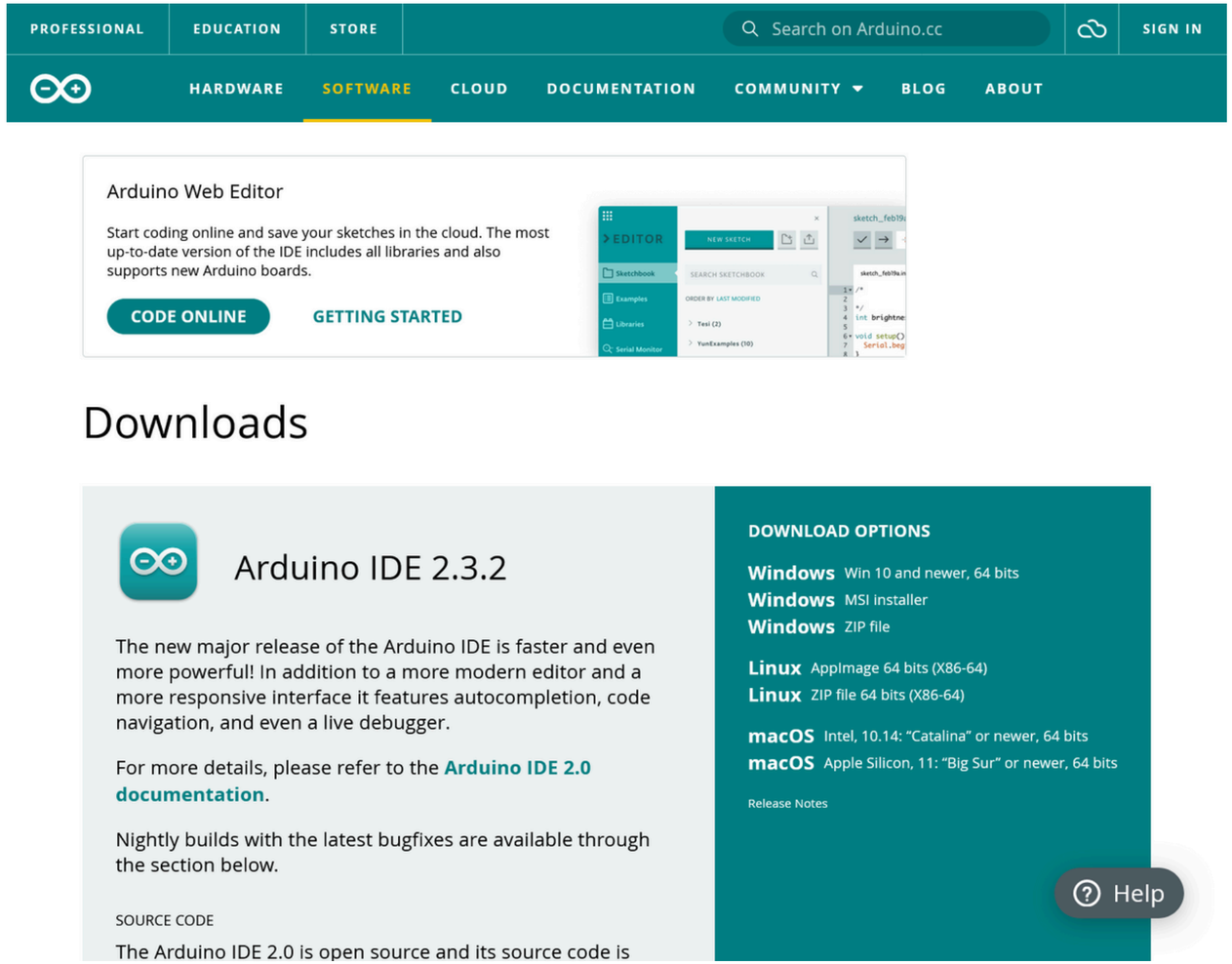
“Okay, but how do I use it??”

ARDUINO

First download the Arduino IDE

This is the easiest way to program the Arduino

You can get it from: arduino.cc/en/software

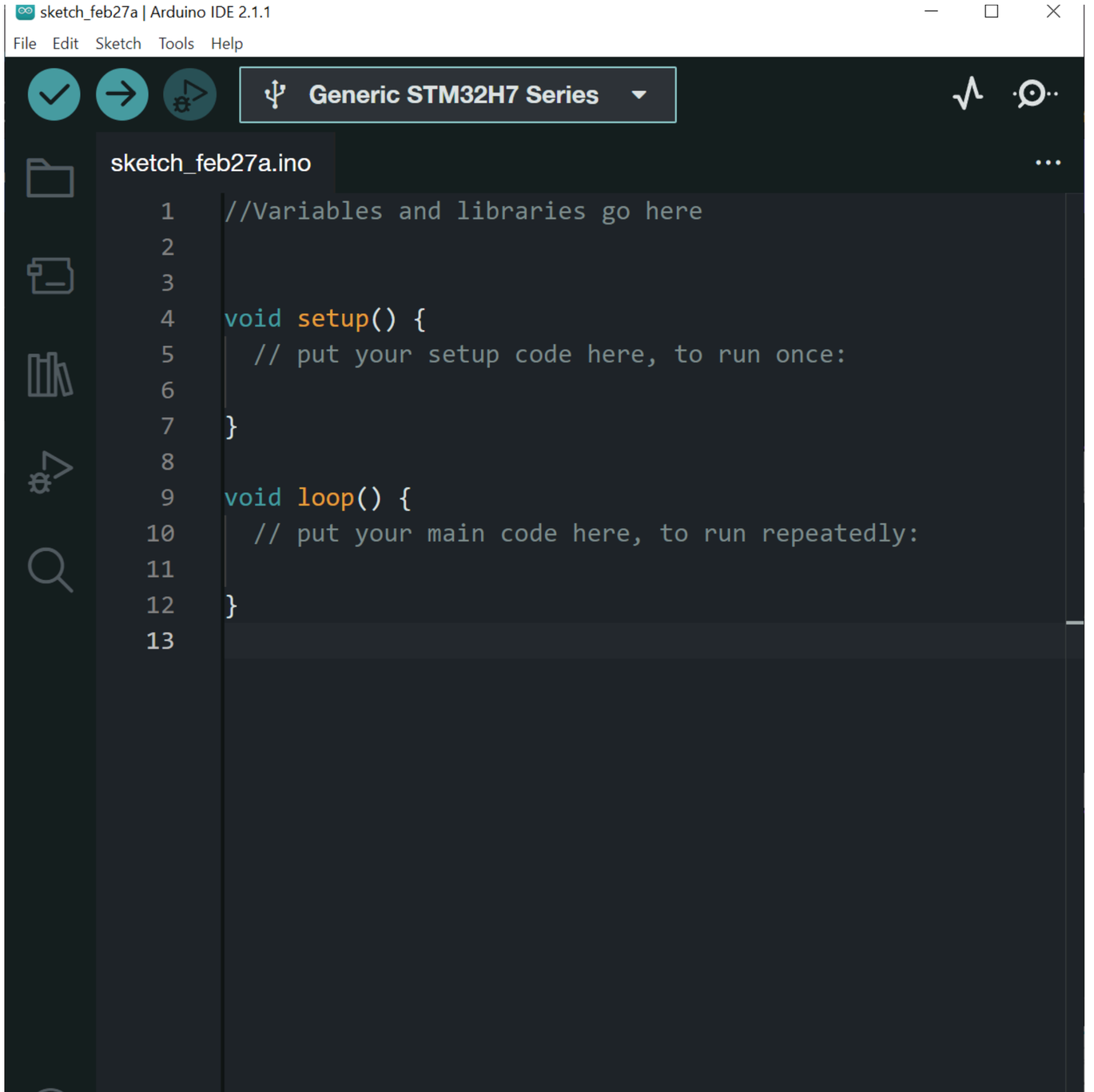


ARDUINO

Open the
Arduino IDE

You will see something that looks a lot like this.

Don’t be scared!




Coding is like
cooking

Pumpkin soup

2 servings 15 minutes

INGREDIENTS

100 ml milk
50 g butter
3 eggs
1 tbs cocoa
2 tsp baking soda
a pinch of salt
3 eggs

NOTES

Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo. Donec dictum lectus in ex accumsan sodales. Pellentesque habitant morbi tristique.

DIRECTIONS

1. Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo.
2. Donec dictum lectus in ex accumsan sodales. Pellentesque habitant morbi tristique.
3. Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo. Donec dictum lectus in ex. lentesque habitant morbi tristique. Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo. Donec dictum lectus in ex.
4. Habitant morbi tristique.Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo. Donec dictum lectu,
5. Donec dictum lectus in ex accumsan sodales. Pellentesque habitant morbi tristique.
6. Nunc nulla velit, feugiat vitae ex quis, lobortis porta leo. Donec dictum lectus in ex. lobortis porta leo.

RECIPES HAVE 3 SECTIONS

Ingredients

What are we cooking with?

Preperation

How do we prepare these ingredients before we cook them?

Cooking

What steps do we need to take to make the meal?

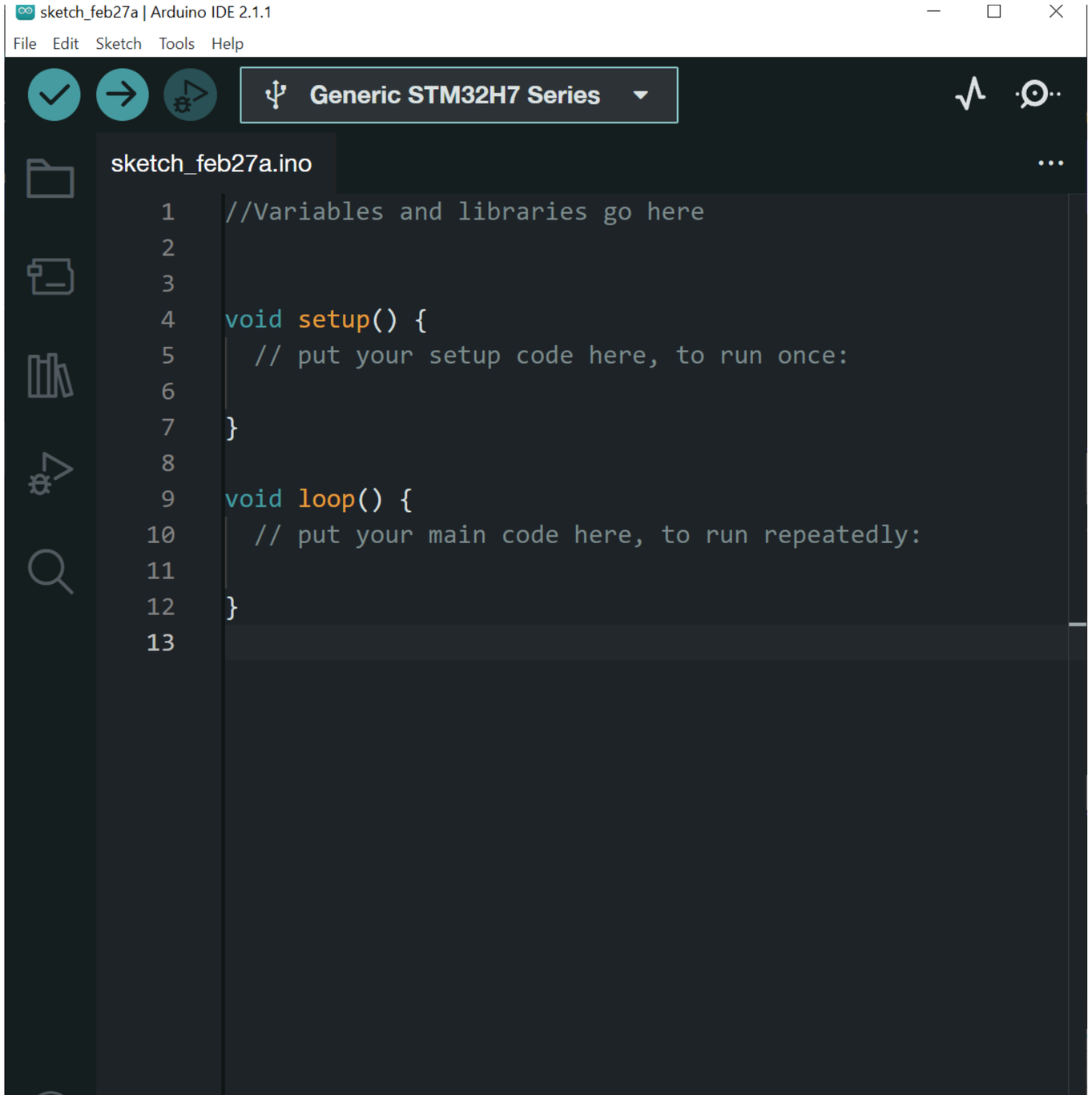
PROGRAMMING IS THE SAME!

THINK OF IT LIKE A RECIPE

At the top we tell the program what ingredients we need. We call this importing libraries and declaring variables.

In void setup() we tell it how to prepare those ingredients. What are the starting values for our variables?

And in void loop() we tell it what it is we're doing.

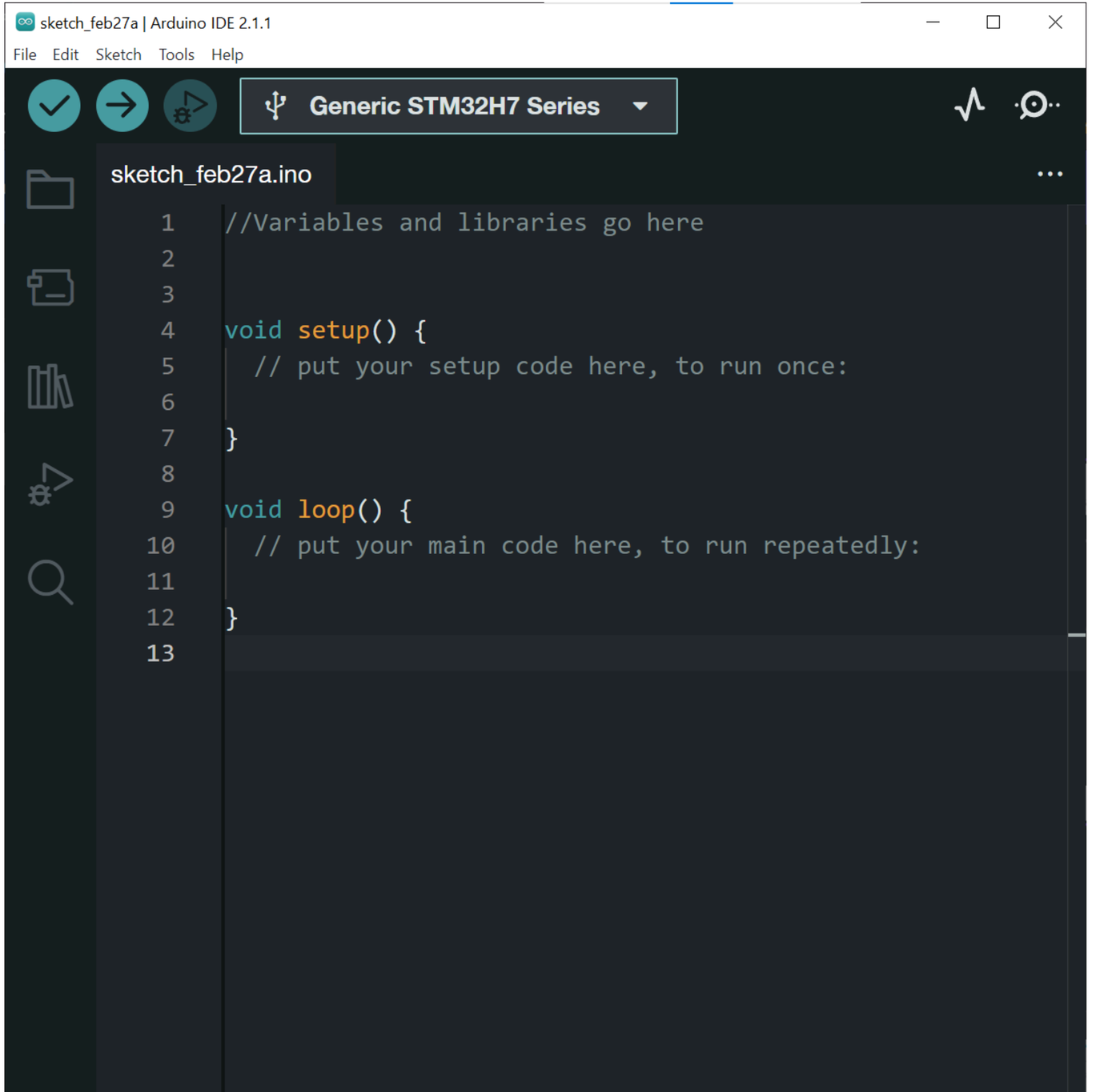


THINK OF IT LIKE A RECIPE

We declare our variables once.

void setup() only runs at the start of our program – when the board powers on. It prepares our variables

void loop() runs after void setup(), looping over and over again while the board is powered on.

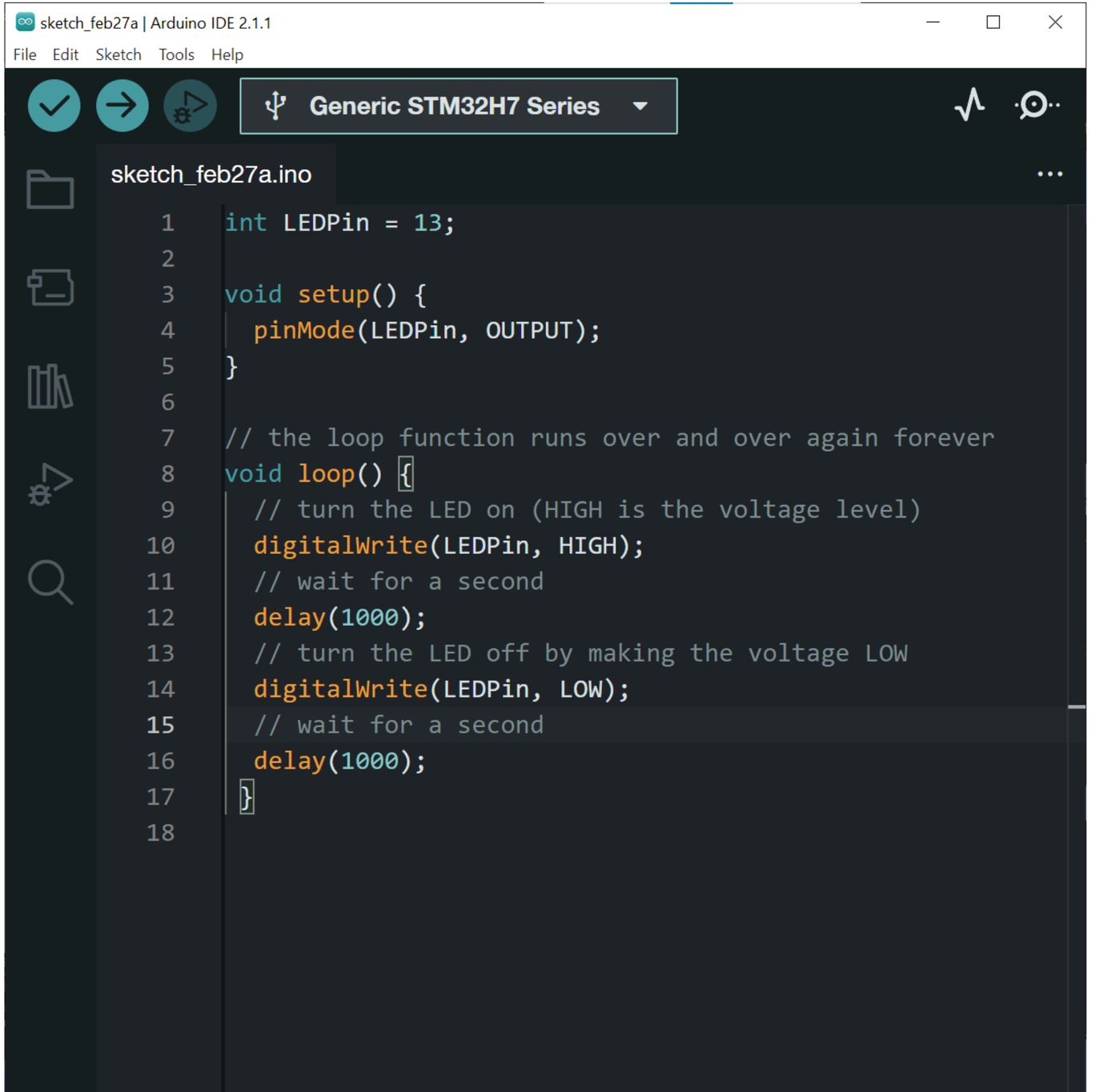


HERE'S AN EXAMPLE

At the top we define a variable called LEDPin. We will use this to tell the Arduino where the LED is.

In void setup() we use pinMode() tell the Arduino which pin we want to use, and what we want to use it for: INPUT or OUTPUT

The syntax is:
pinMode(pin number, INPUT or OUTPUT)

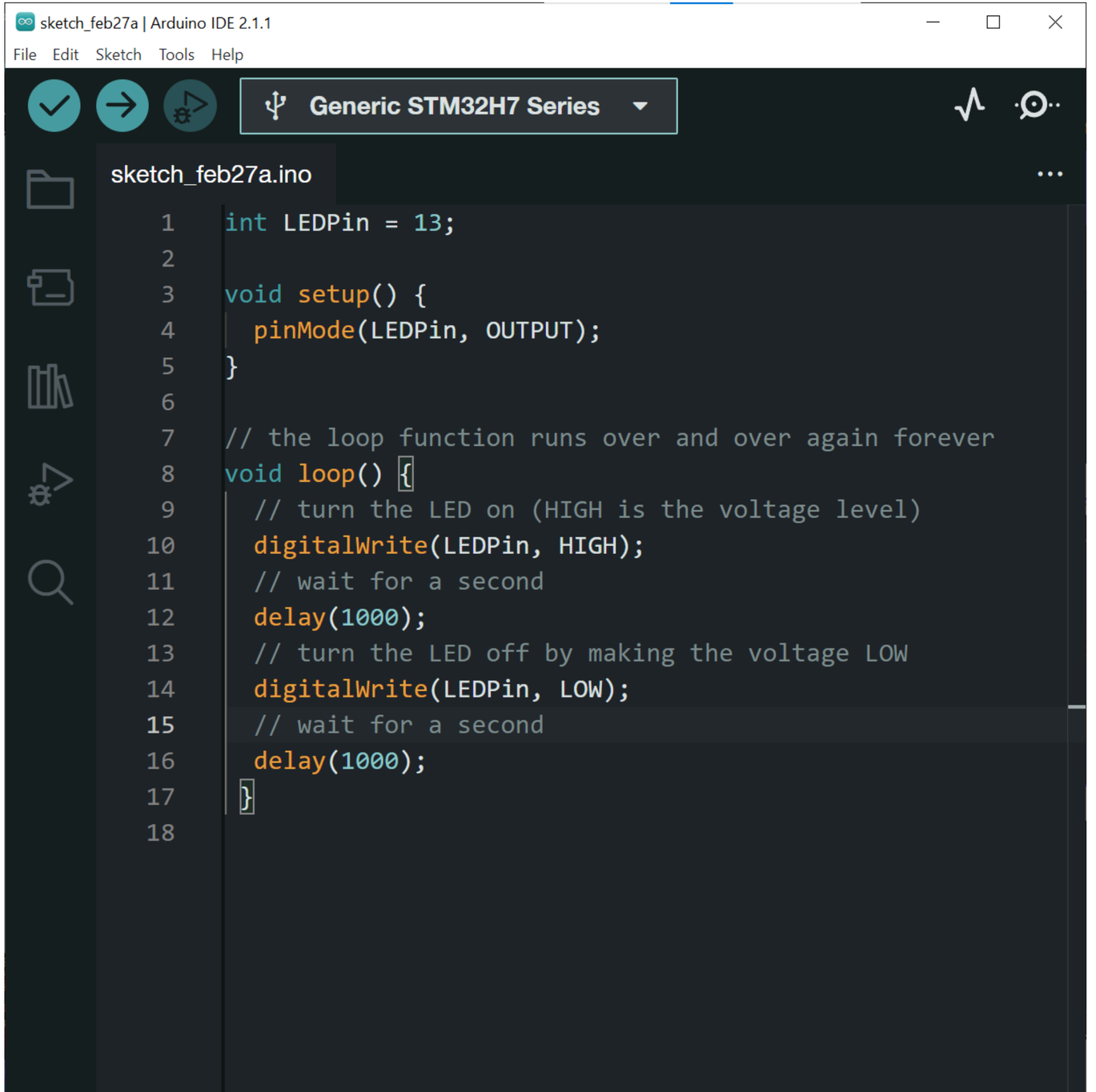


HERE'S AN EXAMPLE

In void loop() we use digitalWrite() tell the Arduino to send 5v or GND.

HIGH = 5v
LOW = GND

delay() uses milliseconds. So delay(1000); means "Wait 1 second."



SOME MORE TALK ABOUT VARIABLES

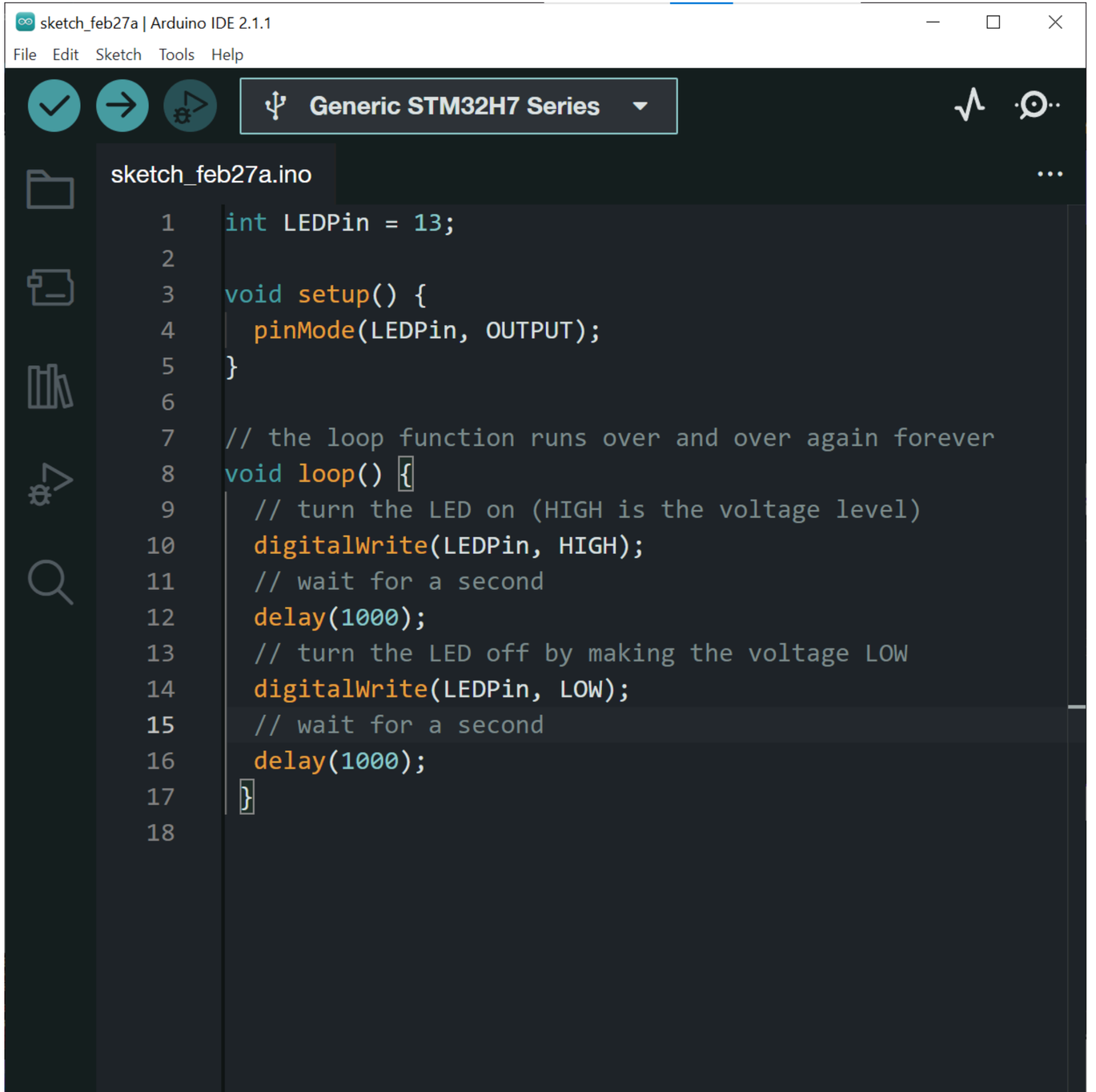
Variables tell the Arduino what to expect. Here are the two most common:

int

Short for interger. A whole number, no decimal points allowed! e.g. 1, 256, 1025, 9, etc

float

A number with a decimal place. e.g. 0.25; 12.6, 1033.444, etc

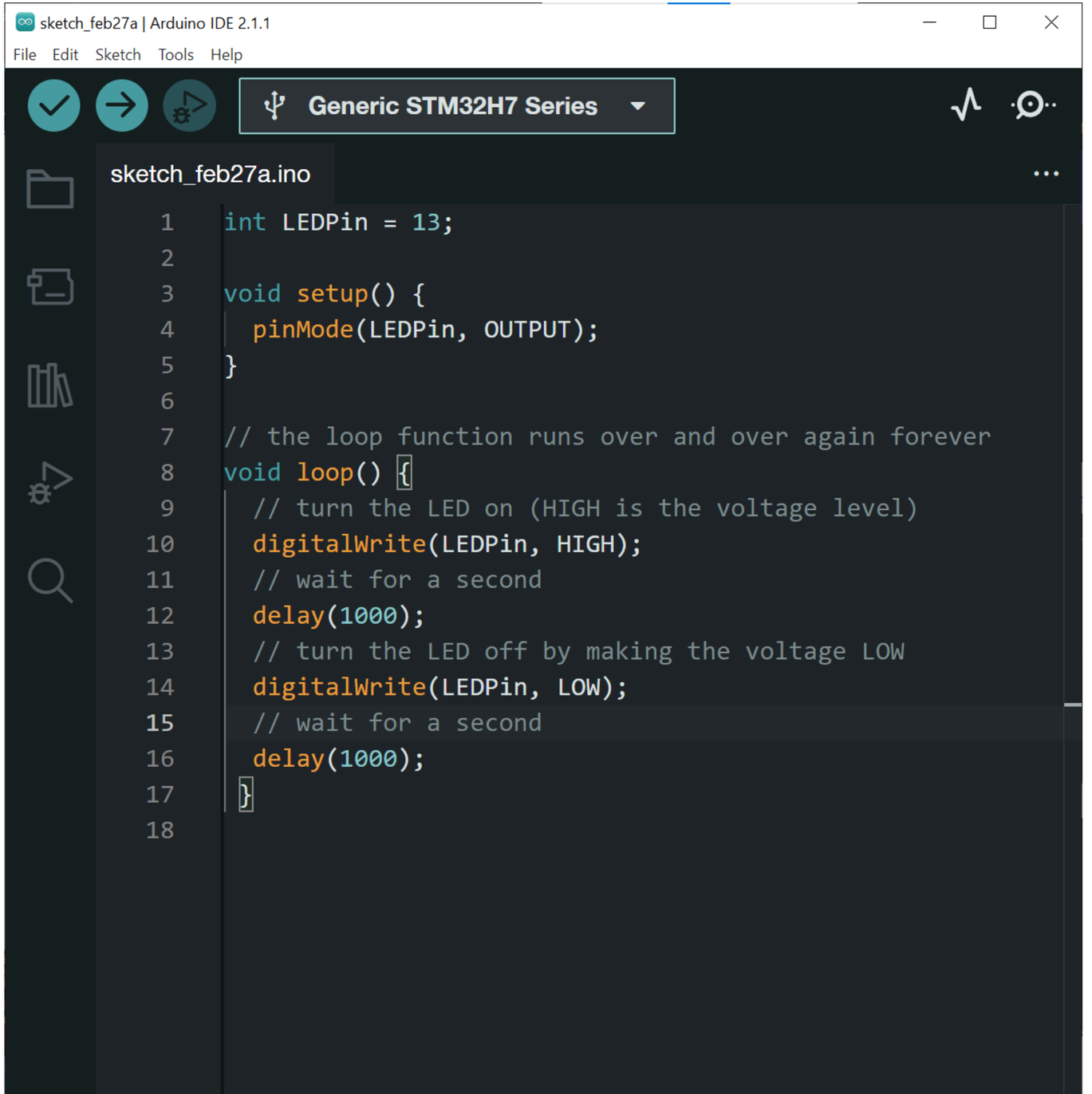


LET'S TRY IT OUT!

Type in the code and get it to upload.

Try changing the delay times.

Try adding more lines of code to change the pattern.



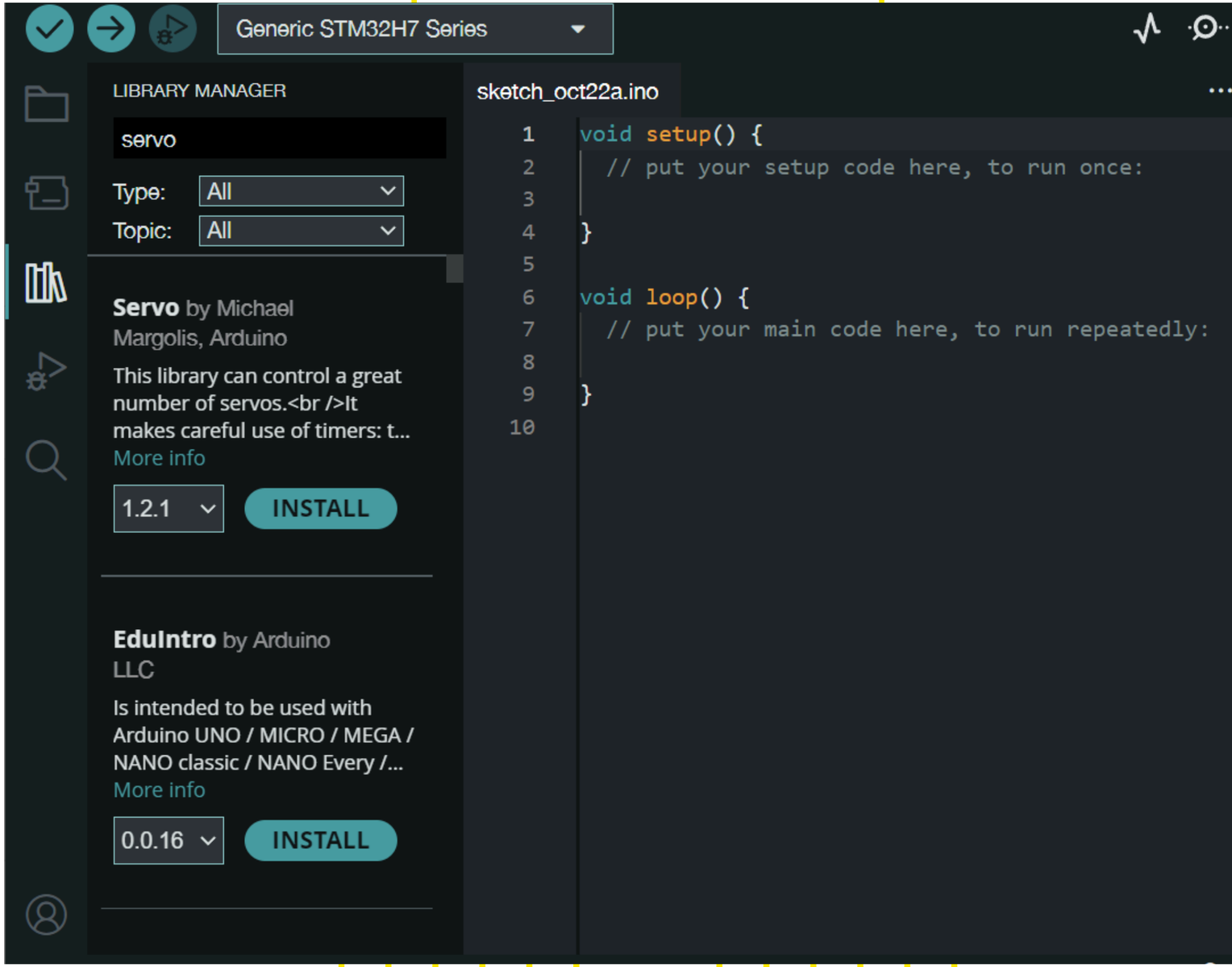
“GREAT, NOW WHAT ABOUT MOVING A SERVO MOTOR?”

SERVO MOTORS

Use Tools > Manage Libraries or the books icon to install the servo library

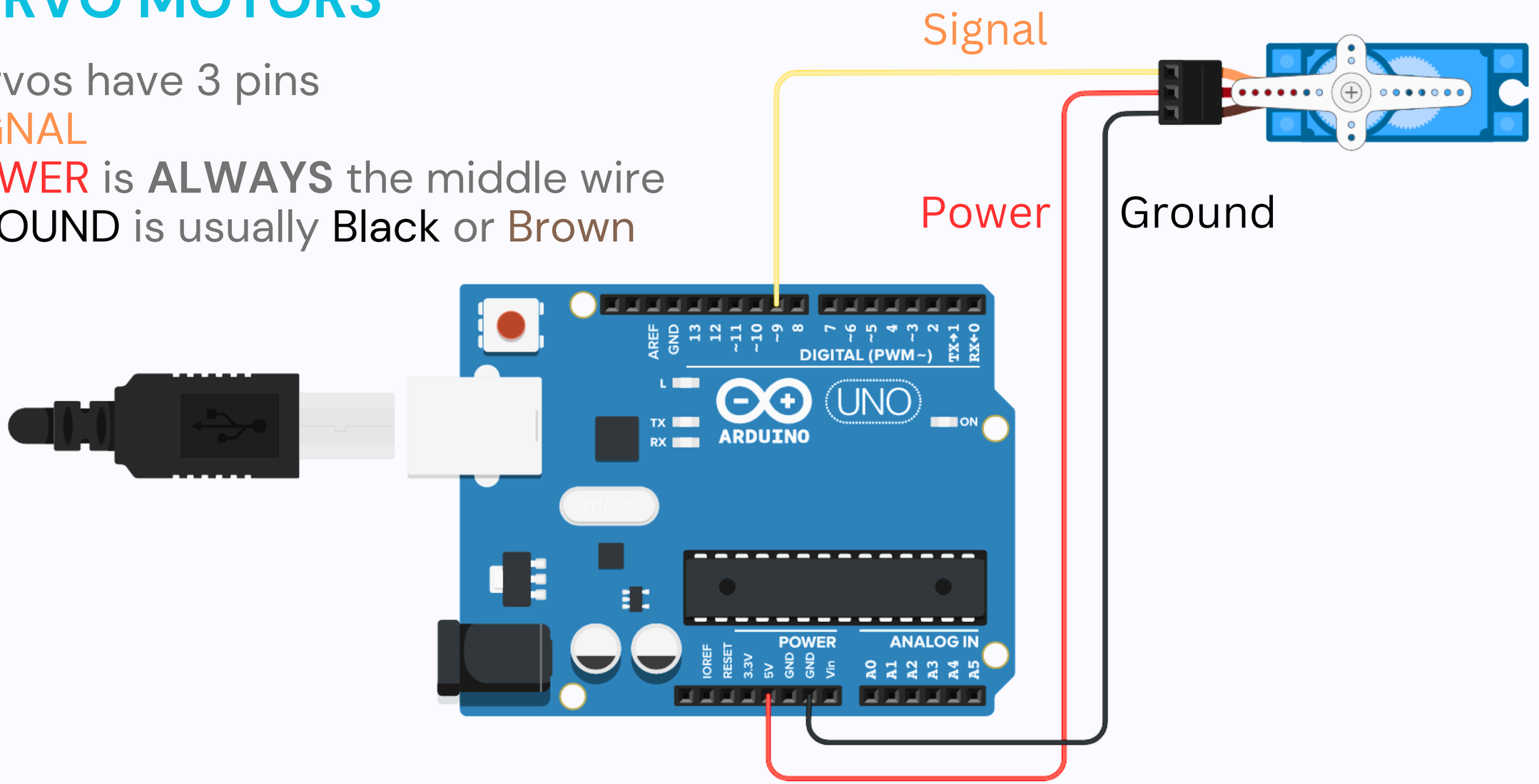
Libraries are blocks of code that are written by people with more experience than us to make complex tasks easier.

Search for the Servo library and make sure it is installed and up to date.



SERVO MOTORS

Servos have 3 pins
SIGNAL
POWER is **ALWAYS** the middle wire
GROUND is usually Black or Brown



SERVO MOTORS

Add the line
#include <Servo.h>
BEFORE void setup() to use it

Define your servo object using Servo <name>; names are case sensitive! Lowercase servo is different from uppercase Servo.

Servos can be attached to any Digital I/O pin using the code servo.attach(#); in the void setup function

Then we use servo.write(#);
to move them. # is between 0-180

A_Servo.ino

```
1   #include <Servo.h>
2
3   Servo servo;
4
5   int pos = 0;
6
7   void setup() {
8     servo.attach(9);
9     servo.write(90);
10  }
11
12  void loop() {
13    servo.write(0);
14    delay(1000);
15    servo.write(180);
16    delay(1000);
17  }
18
```

SERVO MOTORS

Servo will:
Move to 0 degrees
Pause 1 second
Move to 180 degrees
Pause 1 second
Repeat