
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

HOW DO WE RUN **CREATIVE ROBOTICS CLUB?**

WEEKS 2 - 5: Skill acquisition

We will learn new skills, try new ideas, grow our knowledge each week

WEEKS 7 - 10: Project support

Have the things you've learned in Weeks 2 -5 got you itching to make something? Do you have assignments that need electronics or programming support?
We are here to help.

WE ARE OPEN TO YOUR FEEDBACK!

Are there things you want us to talk about?

A different way of running you think will work?

Skills you want to share?

We are a club for students, and we welcome your suggestions and input

BUT FIRST LETS TALK ABOUT...

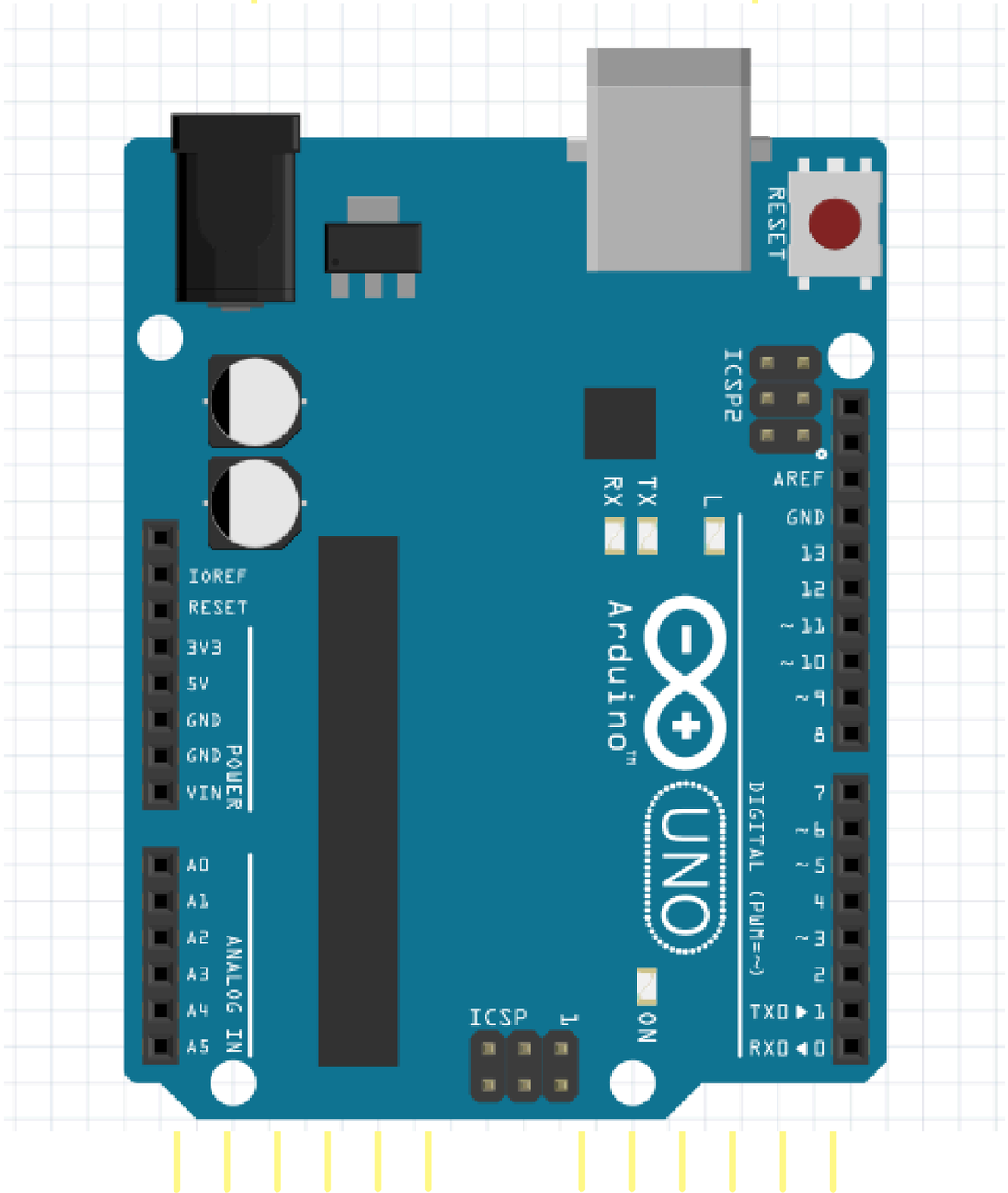
LAST WEEK

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



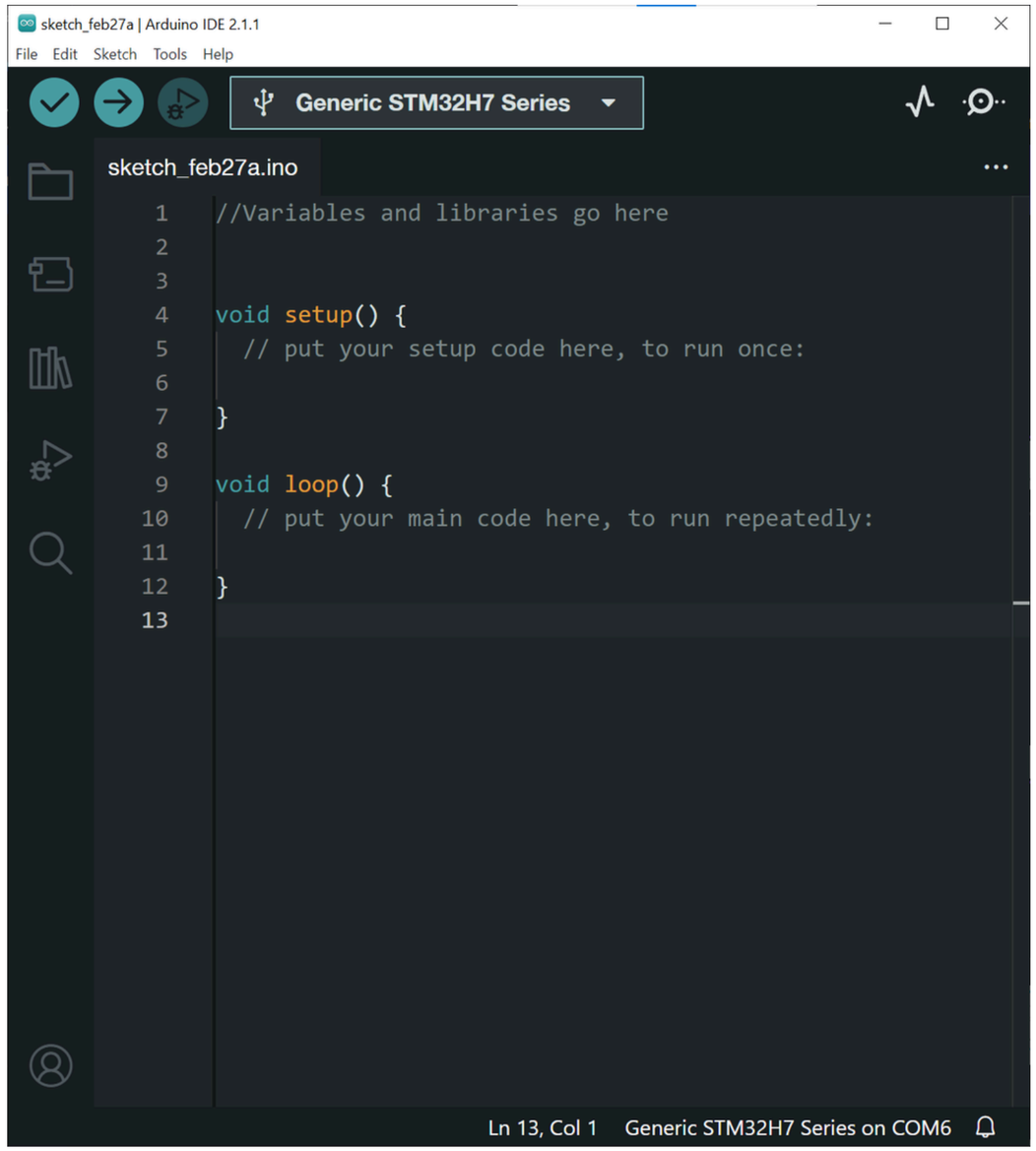

Coding is like
cooking

THINK OF IT LIKE A RECIPE

At the top we tell the program what ingredients we need. We call this declaring our 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.

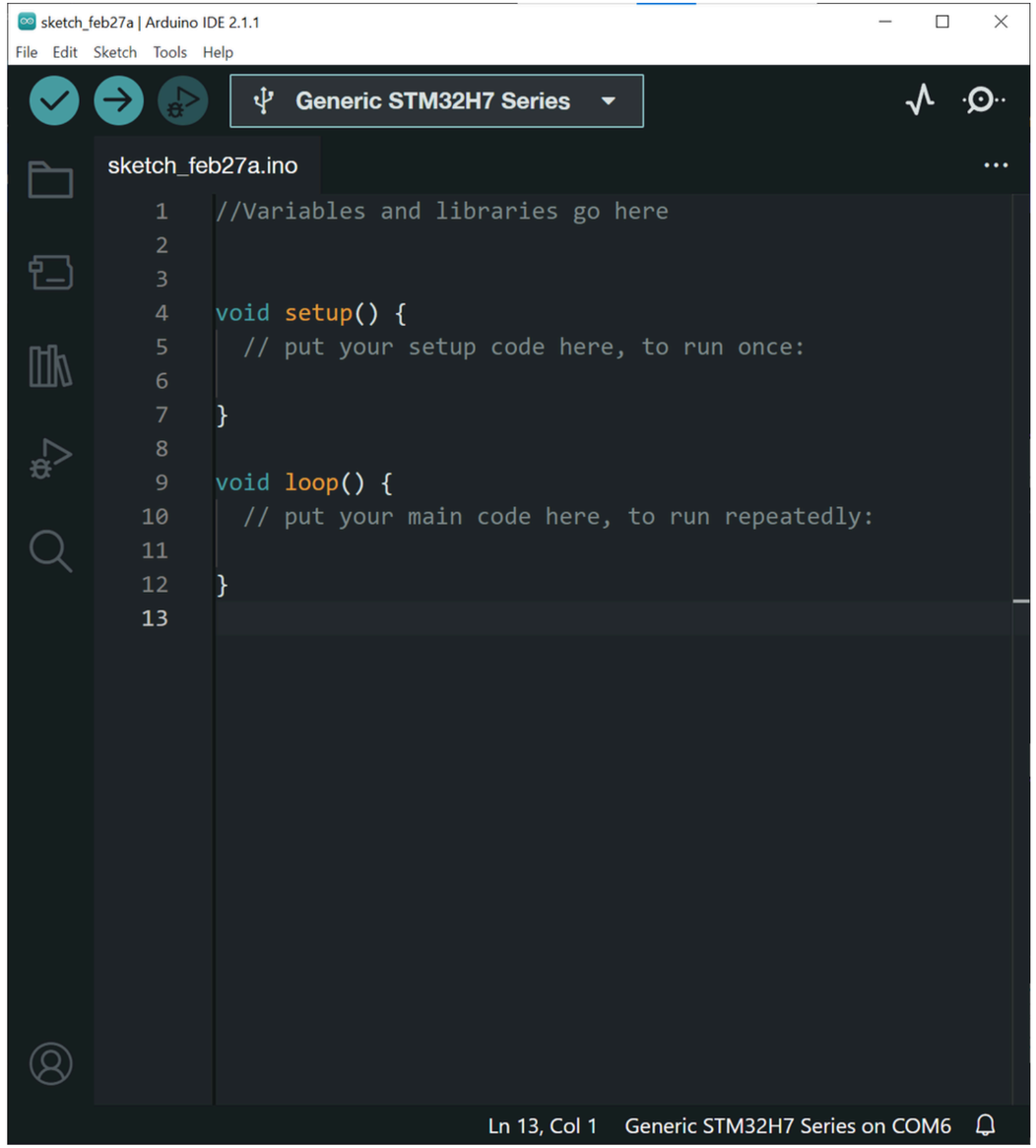


THINK OF IT LIKE A RECIPE

We declare our variables once.

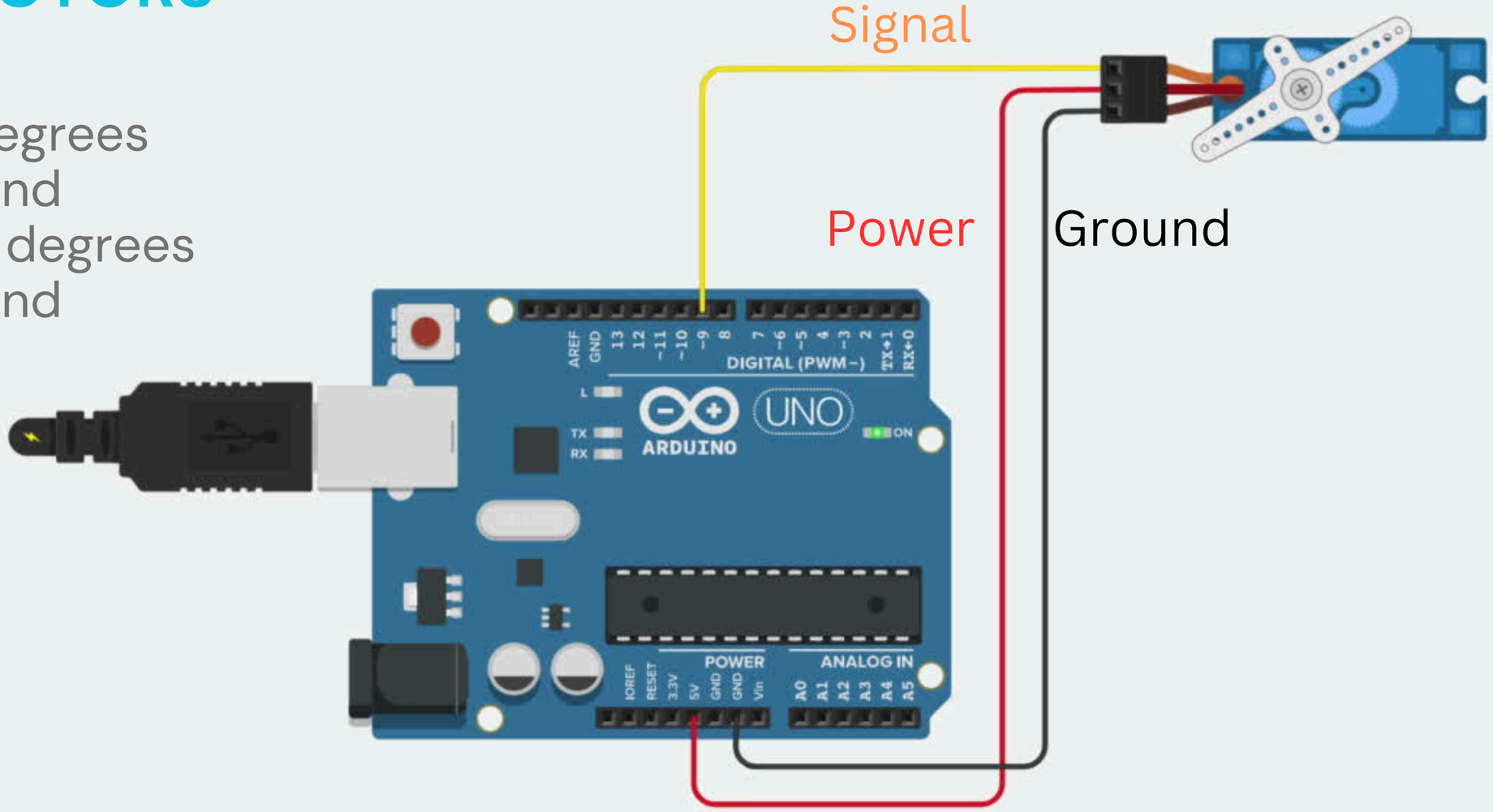
void setup() only runs at the start of our program – when the board powers on.

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

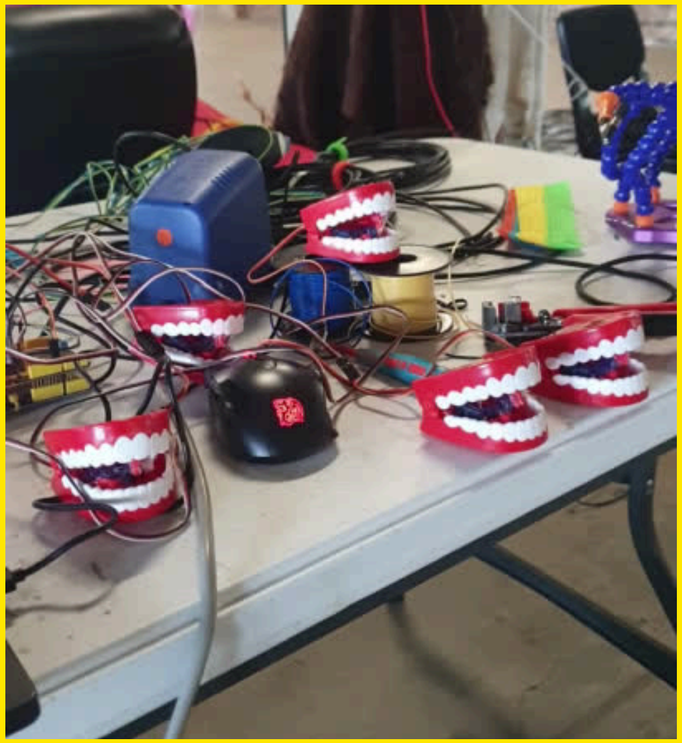


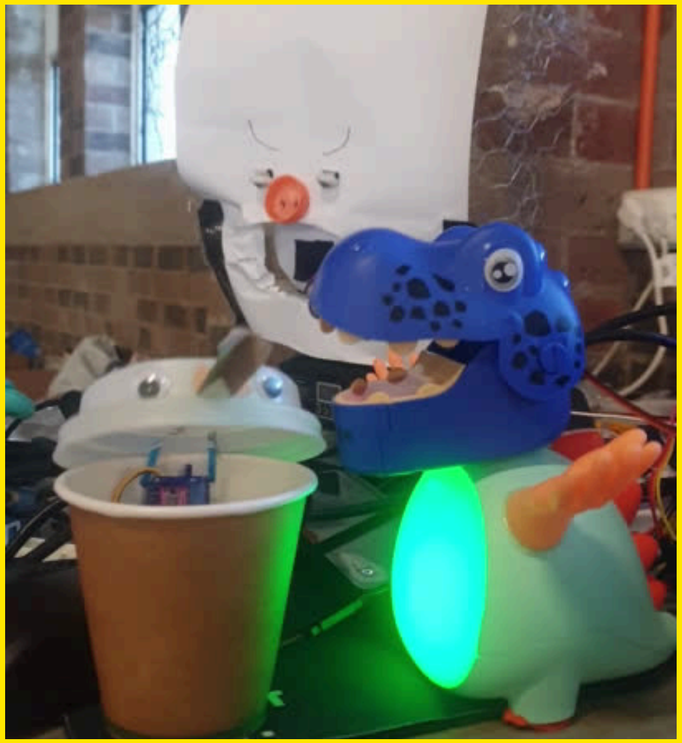
SERVO MOTORS

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



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





SENSORS + CONTROL

ARDUINO

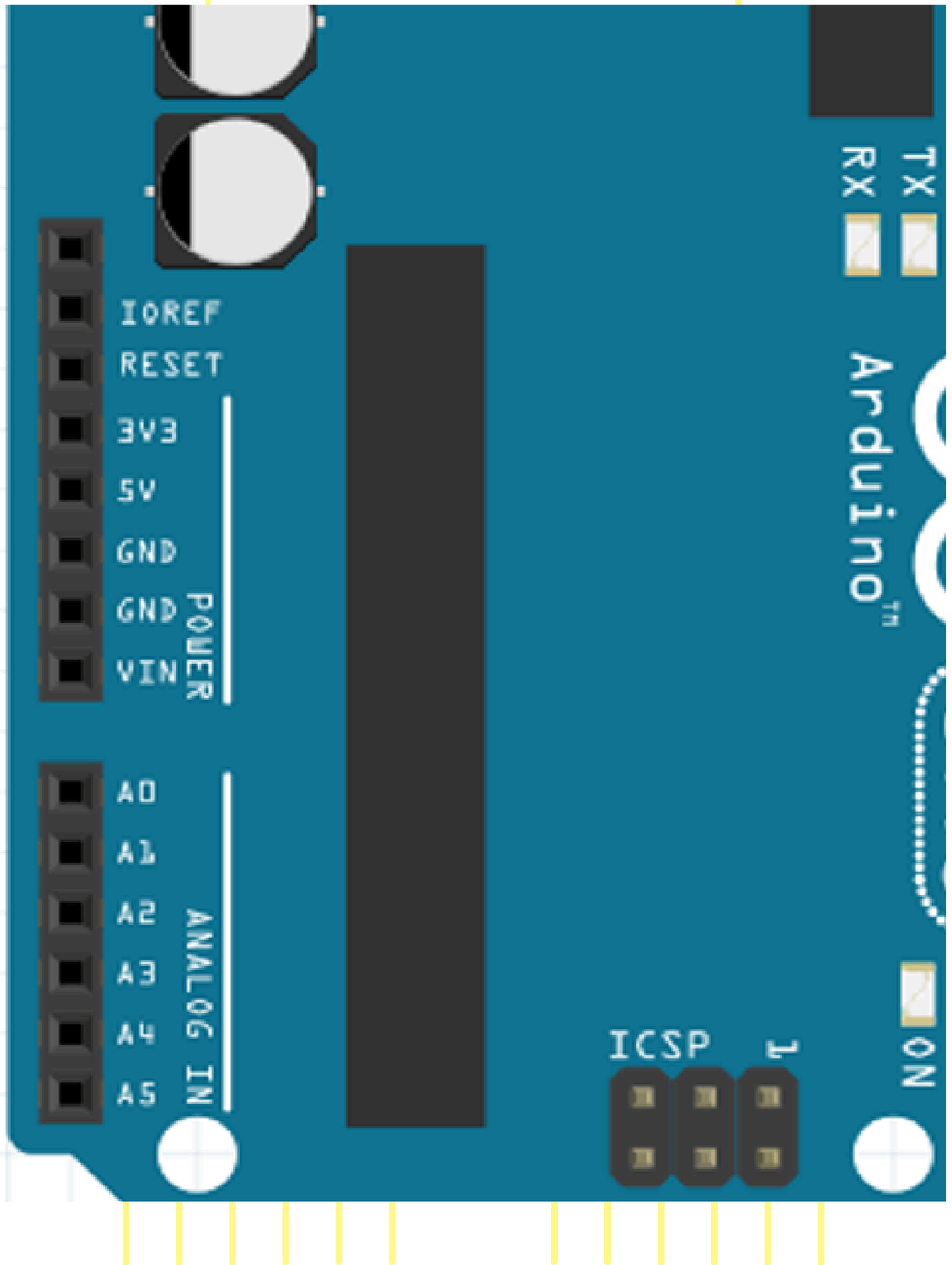
Analog In pins are located in the bottom left

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

They turn the signals they recieve into numbers between 0 - 1023

Accessed in code with analogRead(#);

is the pin number (0 - 5)



ARDUINO

This code reads Analog In Pin 0, waits 15 milliseconds, and then reads it again

A0 will recieve signals between 0 - 1023 and save those to the variable called value

But what if we need that number to correspond to a different range of values like 0 - 180 for our servo motor?

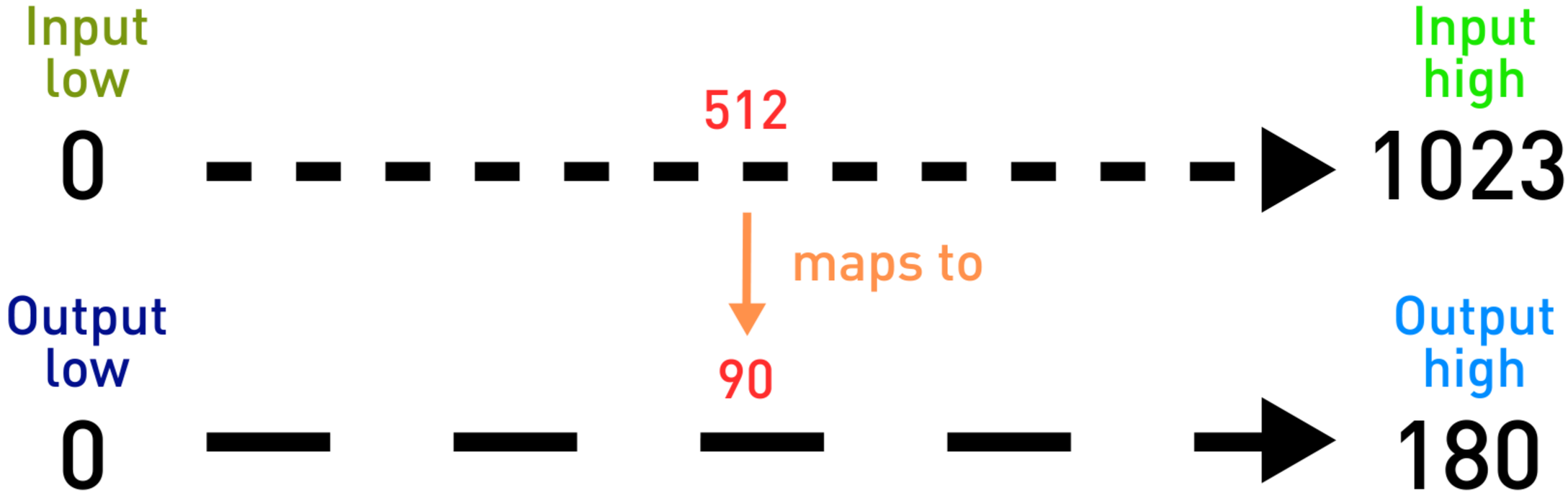
map(#, inputLow, inputHigh, outputLow, outputHigh);

sketch_mar2a.ino

```
1   void setup() {
2   }
3
4   void loop() {
5     //Read Analong In pin 0
6     int value = analogRead(A0);
7     //Map the reading to a number between 0-180
8     value = map(value, 0, 1023, 0, 180);
9     //Wait 15ms and do it again
10    delay(15);
11  }
12
```

Analog In pins read power between GND and 5v linearly

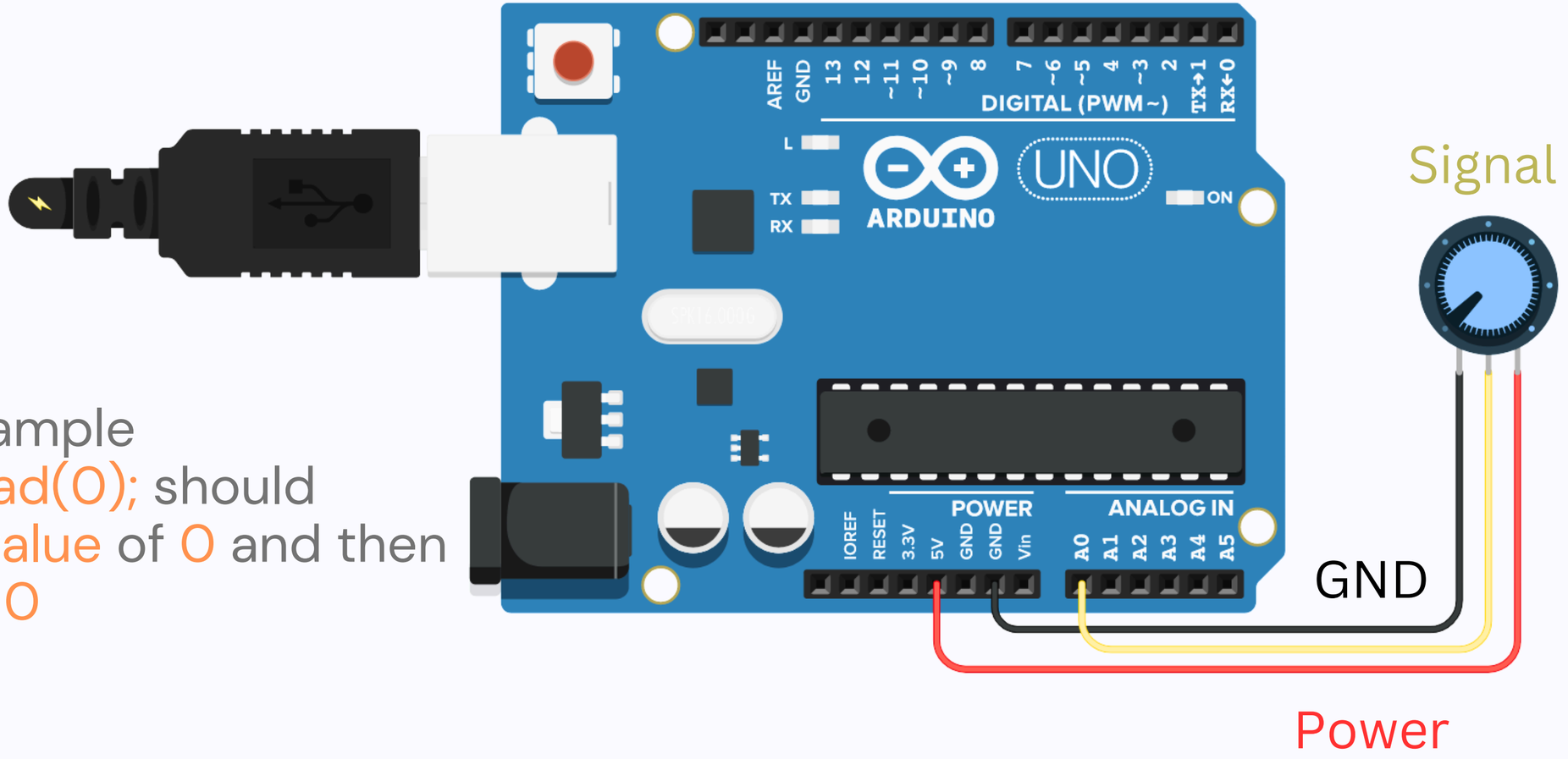
map( ) lets you take one range of values and scale them to match another



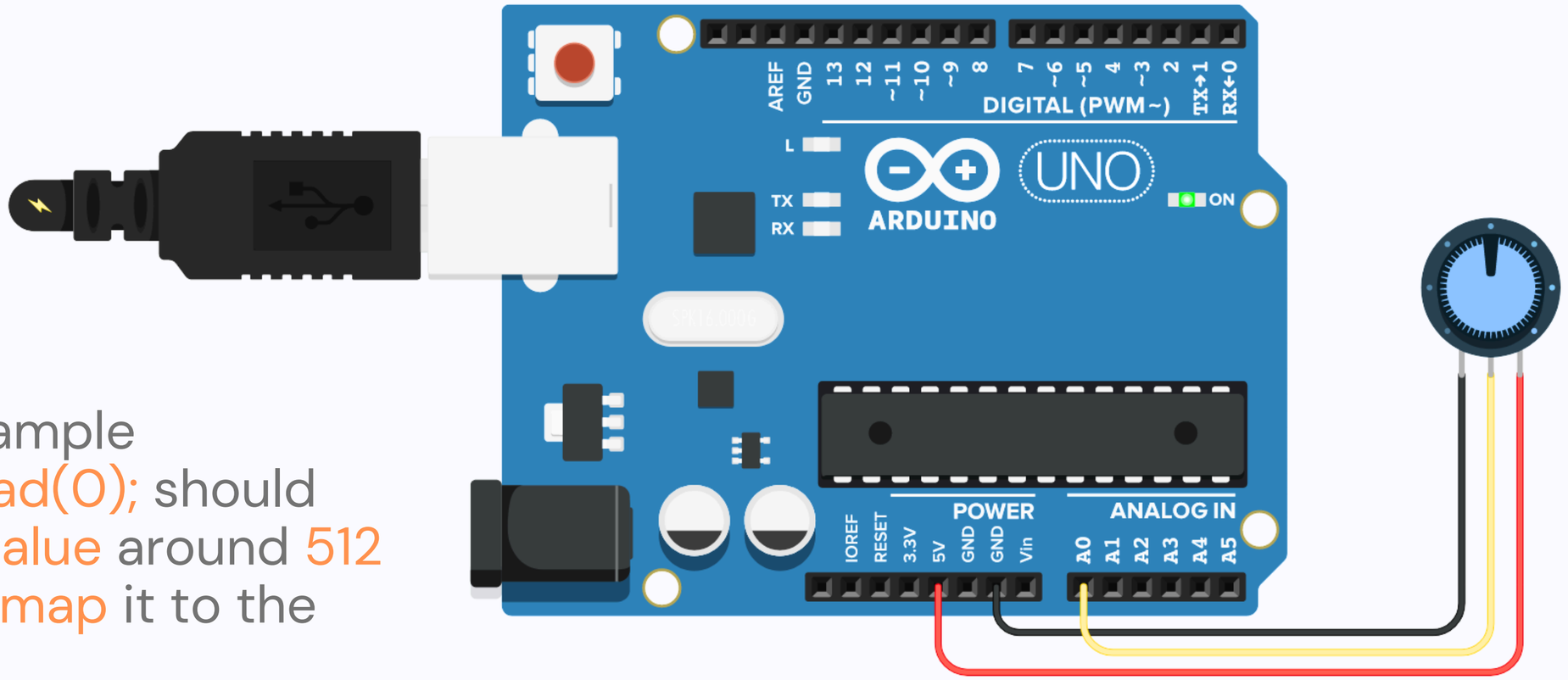

```
map(value, inputLow, inputHigh, outputLow, outputHigh);
```

ARDUINO

In this example analogRead(0); should return a value of 0 and then map it to 0



ARDUINO



In this example analogRead(0); should return a value around 512 and then map it to the value 90

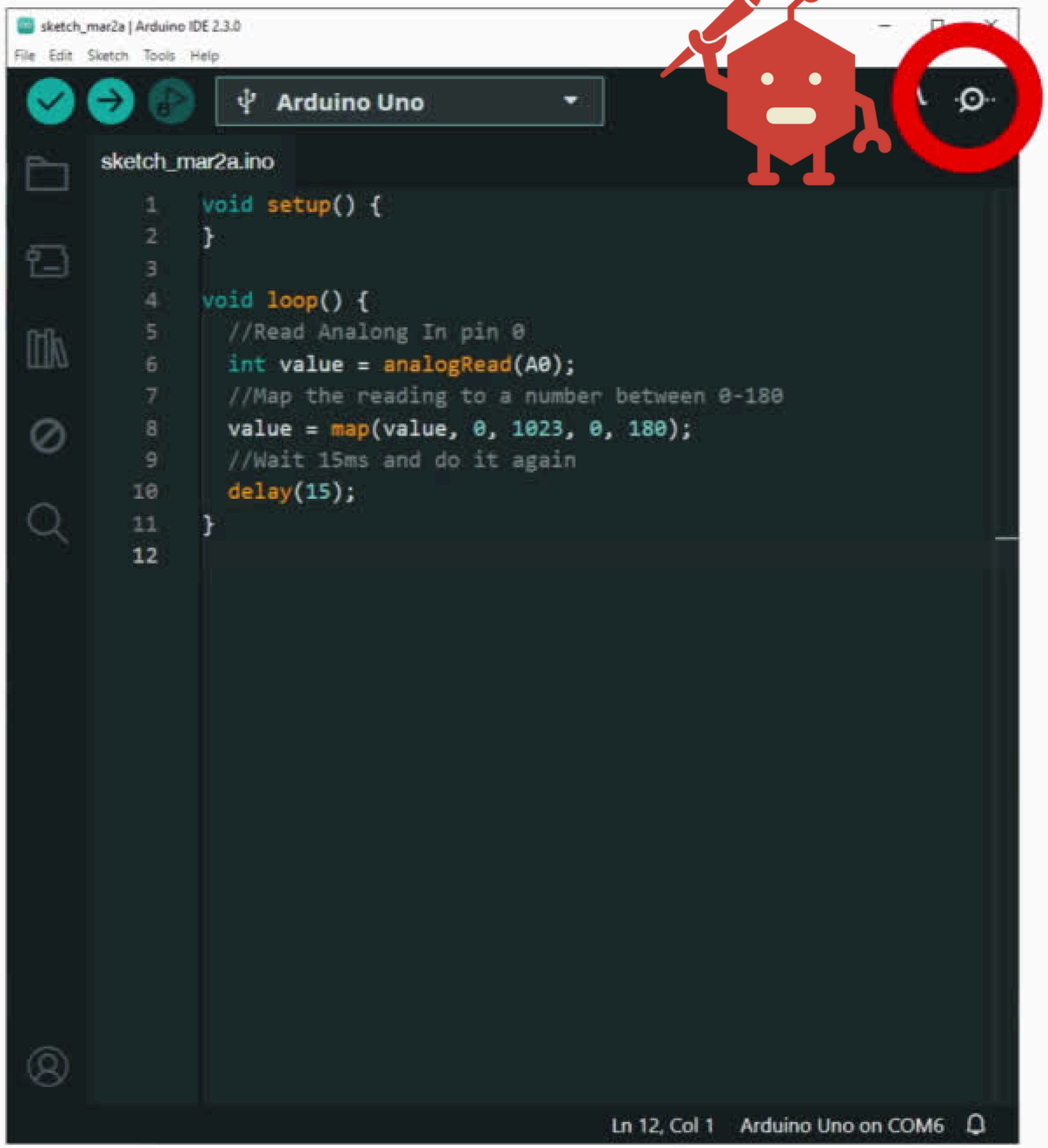
“HOW DO I KNOW WHAT THE HELL IT’S DOING?”

GOOD QUESTION!

The Arduino can output messages to the computer using a method called Serial [or serial bus, serial port, serial comms – like everything it can have a lot of names. Serial is easiest]

The Arduino IDE has a Serial Monitor – a window where you can display the Serial messages the Arduino is sending.

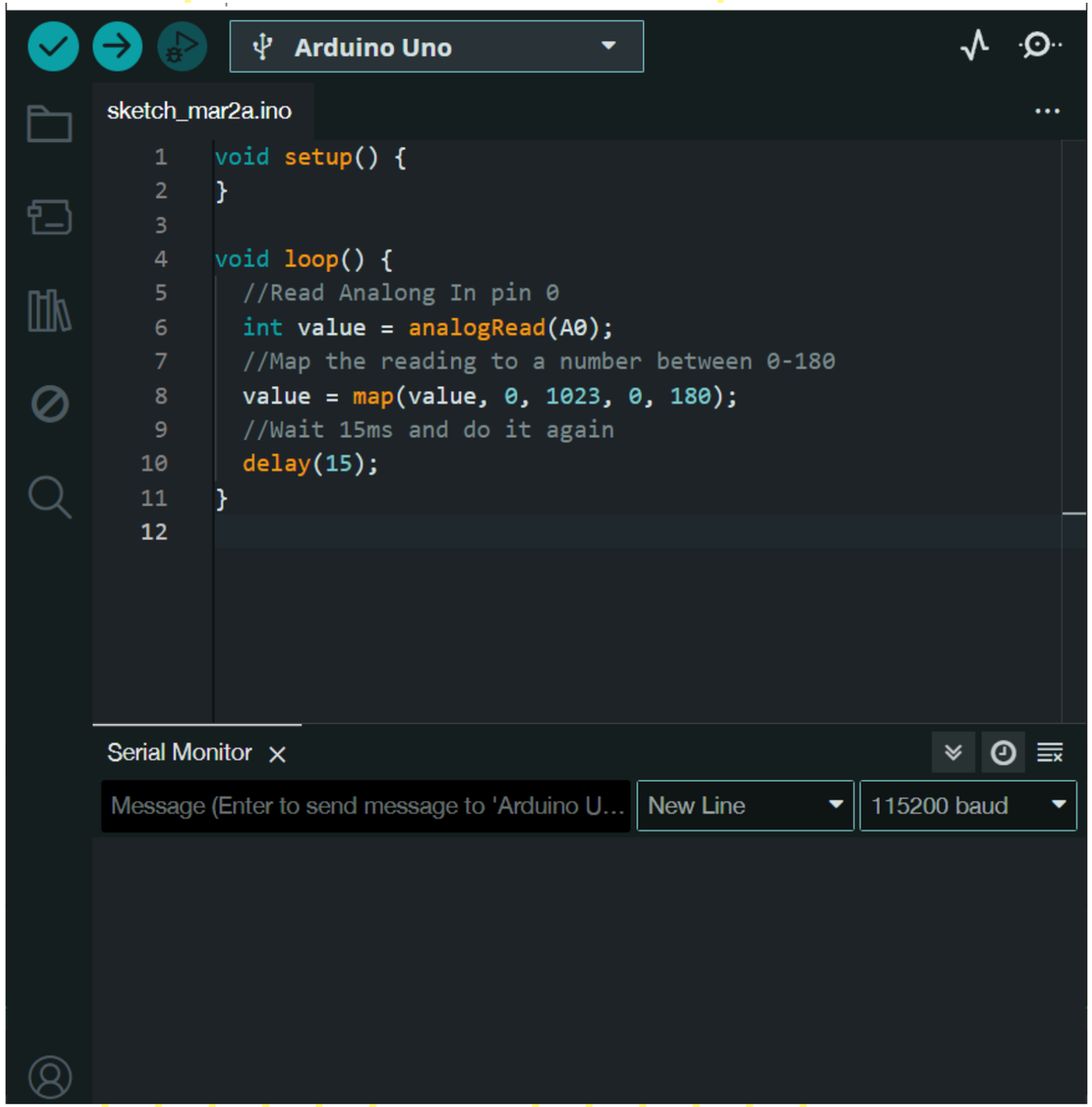
You will find it by pressing the magnifying glass icon in the top right of your IDE



AH, THERE IT IS!

Once you press the magnifying glass you will see a window appear at the bottom of your code like the one pictured here.

It doesn’t have any data yet though.



“HOW DO I MAKE IT SHOW THE NUMBERS?!?!?!?”

CALM DOWN!

Like all our code, we have to let the Arduino know that we want to use the Serial functionality.

Serial.begin(#); tells the Arduino we want to use the serial port.

The numbers we can use here are based on old communications technology. They will make no sense to you, and you never need to understand them. You need to use one that will work, however.

I recommend sticking to 115200 it is fast and reliable.

sketch_mar2a.ino

```
1   void setup() {
2     Serial.begin(115200); //Start the Serial monitor
3   }
4
5   void loop() {
6     //Read Analong In pin 0
7     int value = analogRead(A0);
8     //Map the reading to a number between 0-180
9     value = map(value, 0, 1023, 0, 180);
10    //Add text so we know what we're looking at
11    Serial.print("Value = ");
12    //Write the value
13    Serial.println(value);
14    //Wait 15ms and do it again
15    delay(15);
16  }
17
```

NOW WHEN YOU RUN THIS CODE...

A list of values will start appearing in the Serial Monitor.

Now we know what's going on!

We can use this information to drive interaction in our system.

sketch_mar2a.ino

```
1   void setup() {
2     Serial.begin(115200); //Start the Serial monitor
3   }
4
5   void loop() {
6     //Read Analong In pin 0
7     int value = analogRead(A0);
8     //Map the reading to a number between 0-180
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13    Serial.println(value);
14    //Wait 15ms and do it again
15    delay(15);
16  }
```
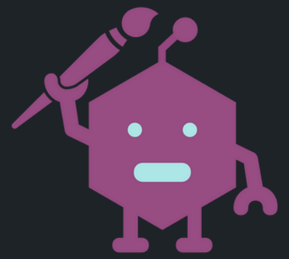

Serial Monitor ×

Message (Enter to send message to 'Arduino U... | New Line | 115200 baud



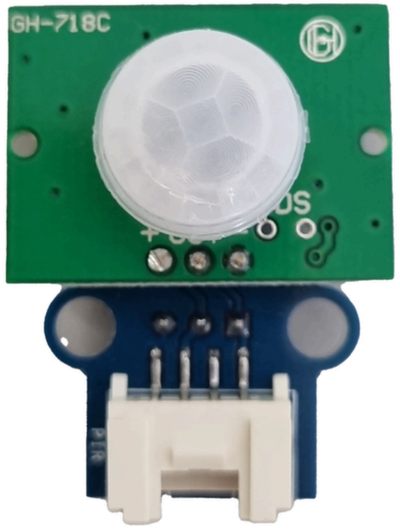
“OKAY, BUT WHAT ABOUT SENSORS”

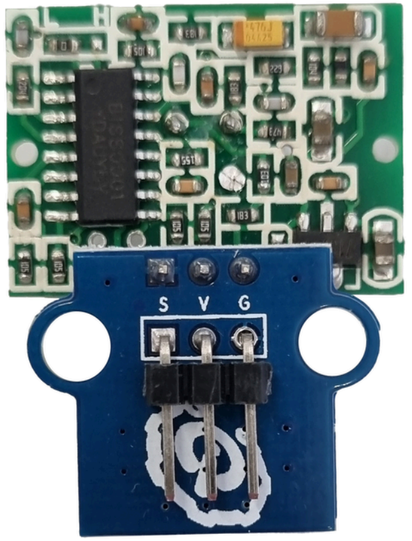
SENSOR TIME!

Not all sensors use the Analog In pins. The PIR sensor (passive infrared) detects motion and sends a digital signal.

Take a look at the markings on the sensor. You can attach wires to S, V, and G. Looking back over the things we've done over the last few weeks can you guess what S, V and G stand for?

If not how do you think you might find out?



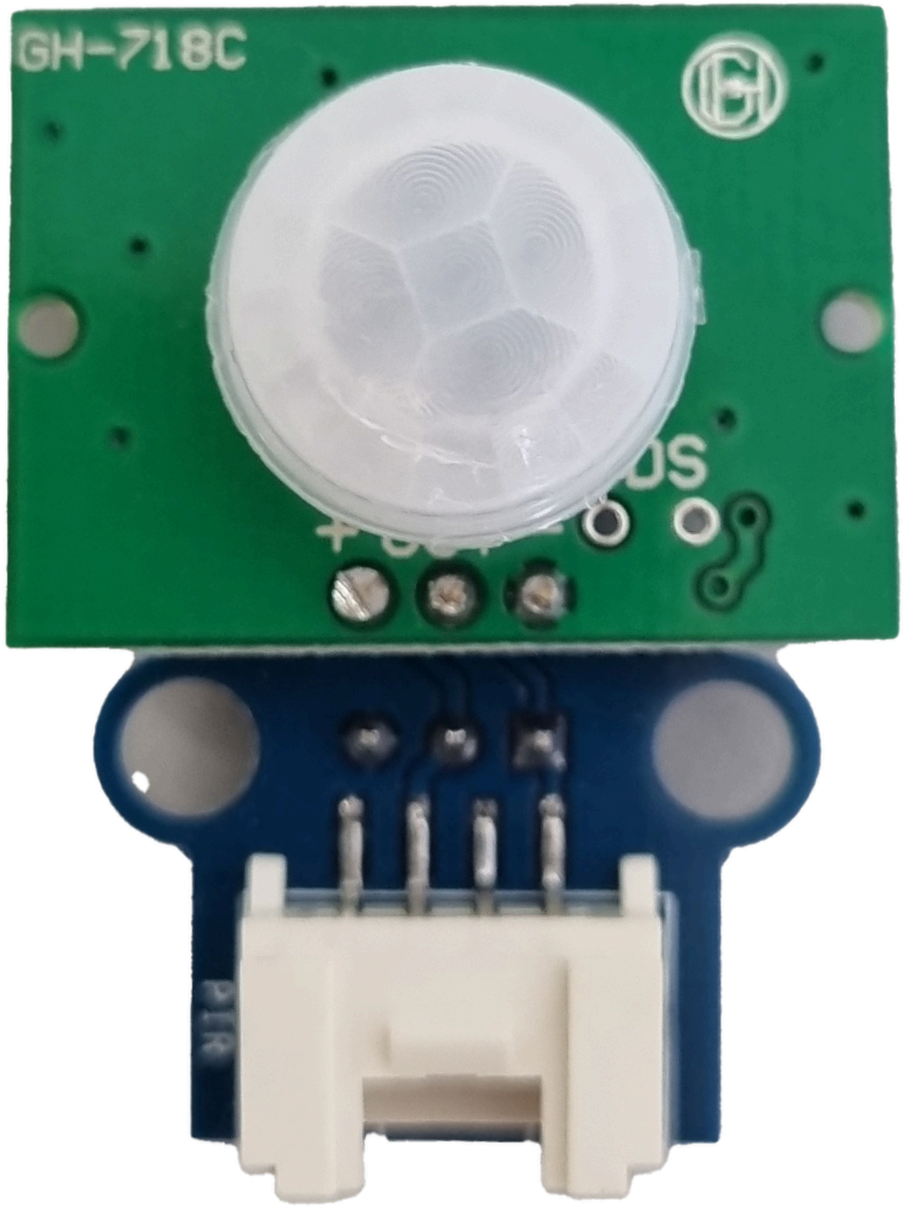


IT'S GOOGLE TIME!

The first thing we can do is use Google. Searching for PIR sensor and (or even just) the part number we can see on the device GH-718C will give us a lot of information.

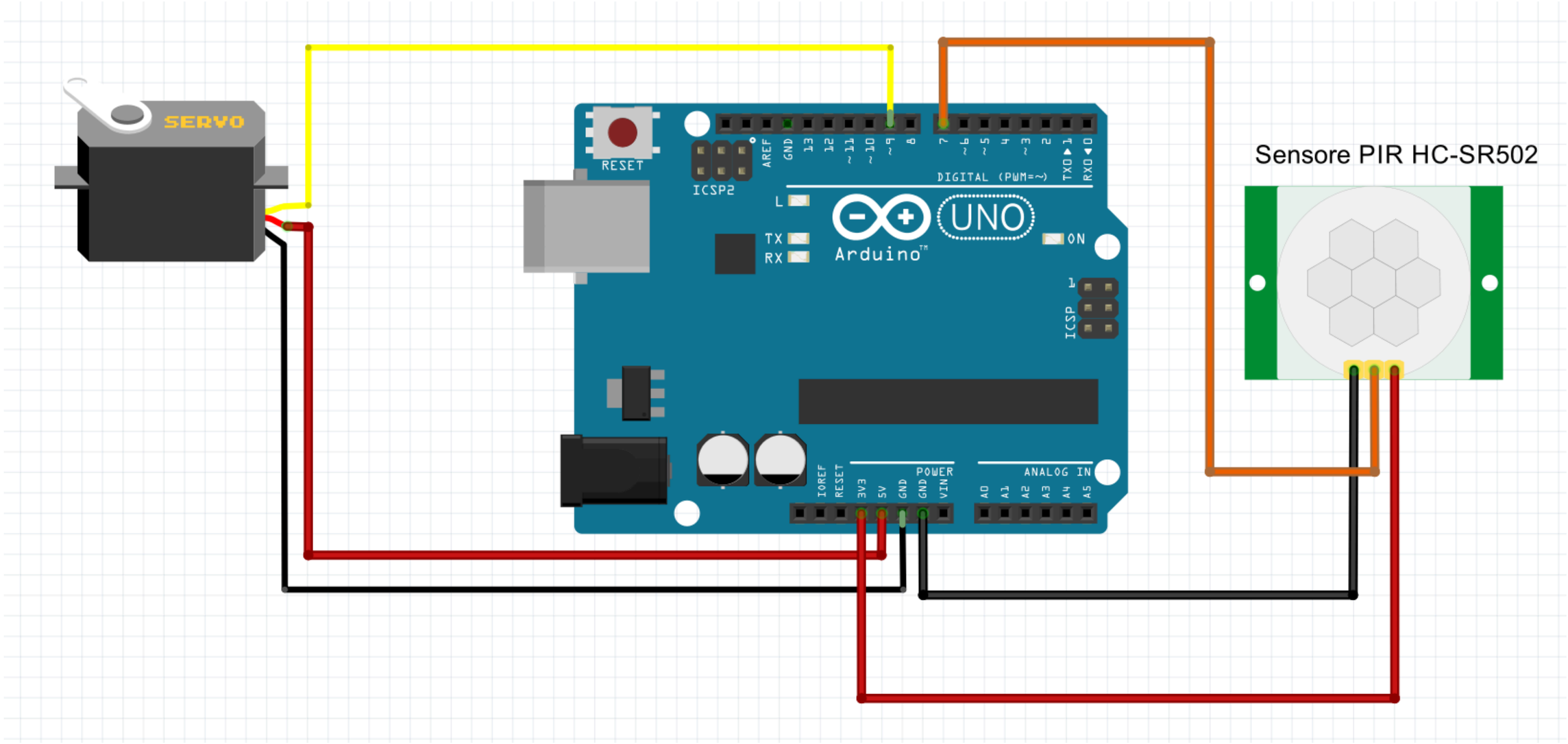
Almost every part you will use will have some information about it on the internet. It is always worth checking to see if somone else has run into the same problems, and solved them, before you.

Chat GPT is also useful, but not perfect, or this.



S = SIGNAL V = VOLTAGE and G = GND

So, now we know how to wire this sensor up!

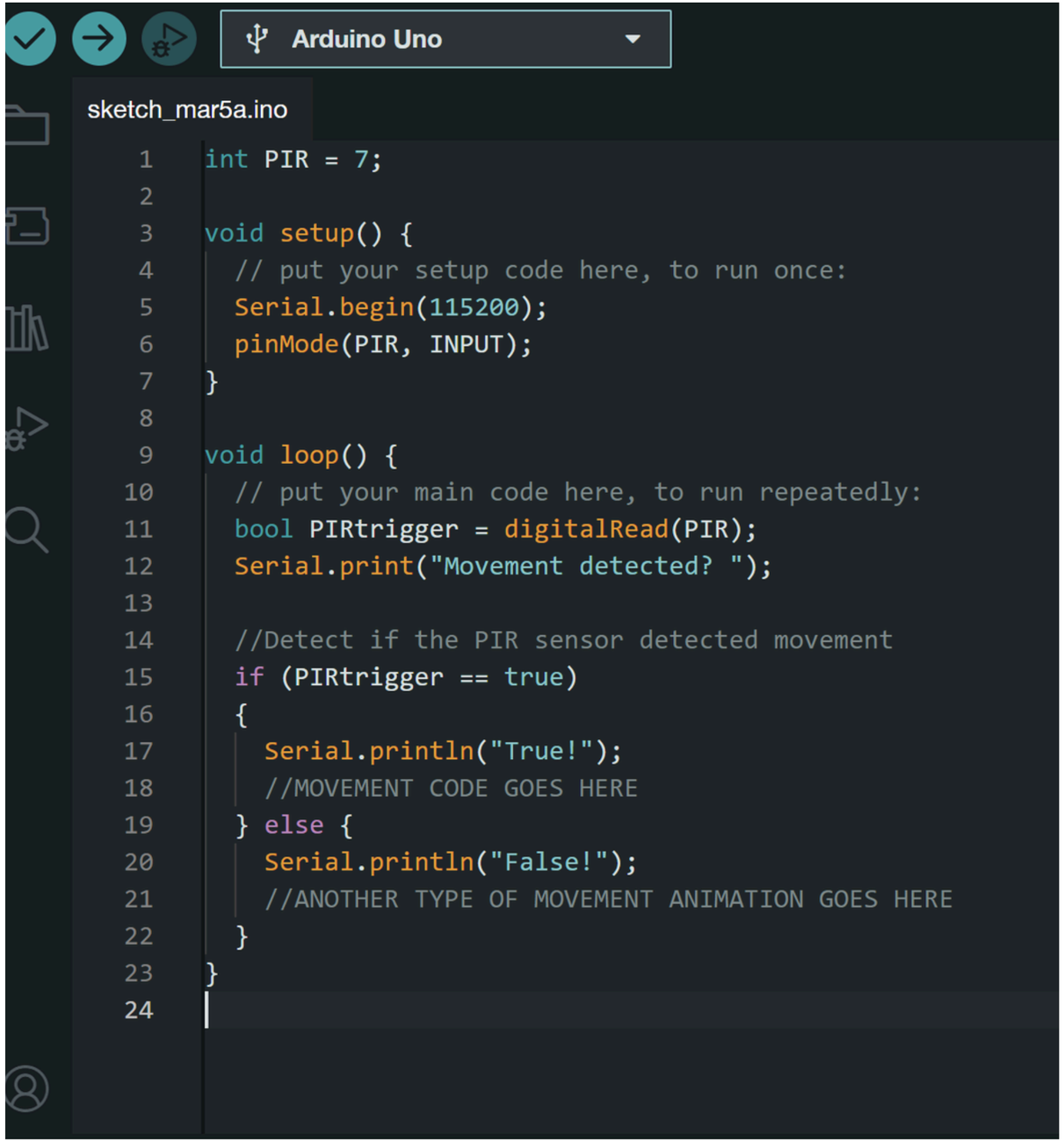


LETS GET IT WORKING!

There's some new code in here, lets check it out.

A new variable: bool
Bools are either
TRUE or FALSE / 1 or 0

digitalRead(#);
Checks the digital pin # to see what voltage is present there.
0 = GND
1 = > 3.3v



LETS GET IT WORKING!

How do we make decisions in code?
The IF statement. It works with maths, but really simple maths

```
if (maths statement is true)
{
 do this stuff
}
```

Here we are checking if the PIR sensor is working.
Is it reading 1 or 0, TRUE or FALSE?

One = sets the value of a variable.
Two == checks that it mataches right hand side,