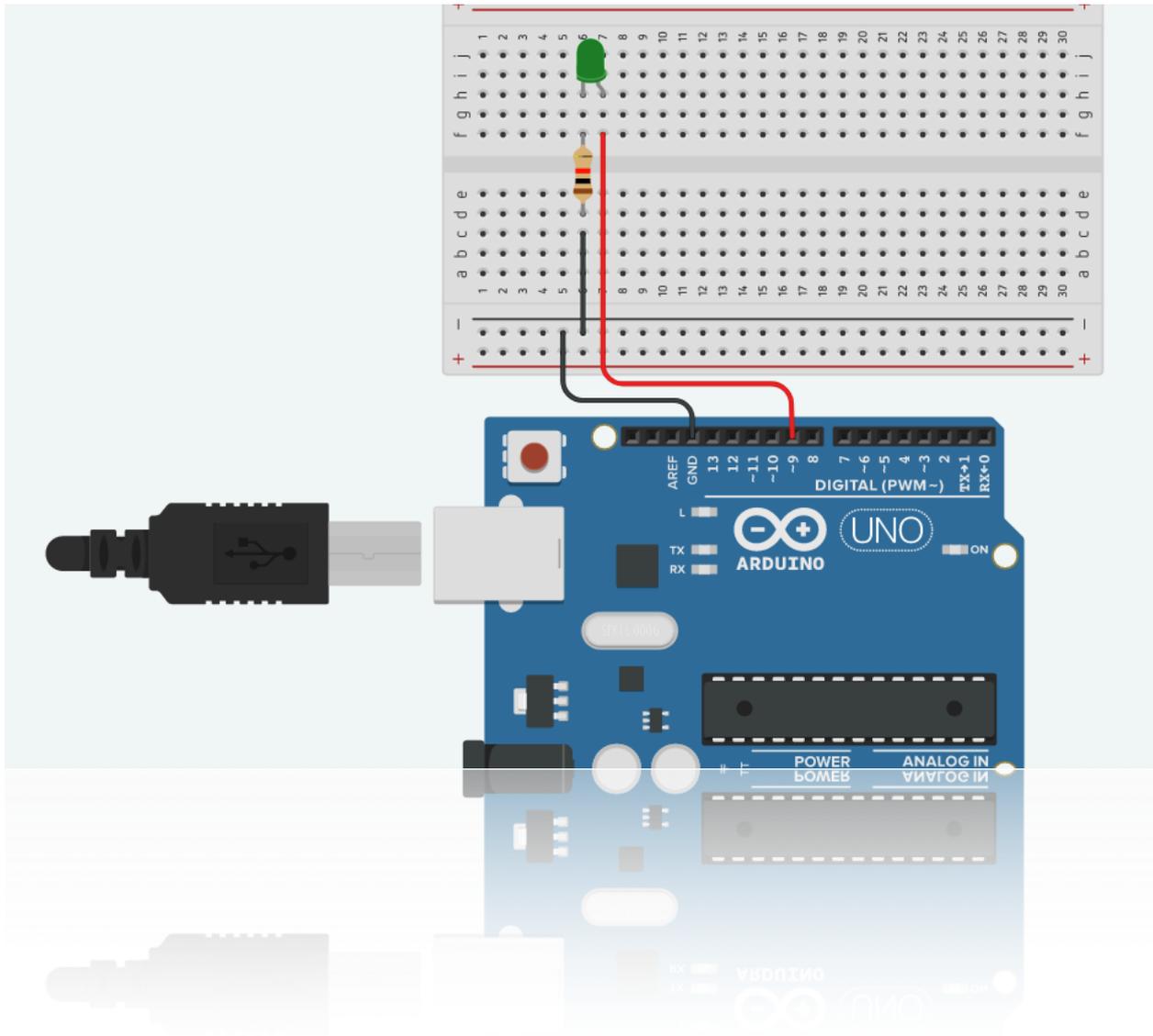


Hello World Project

SWIFT FOR ARDUINO



BIYIK

April 2020

Hello World

Project 1

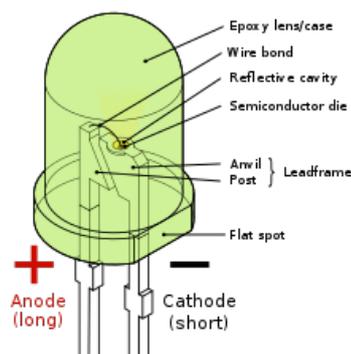
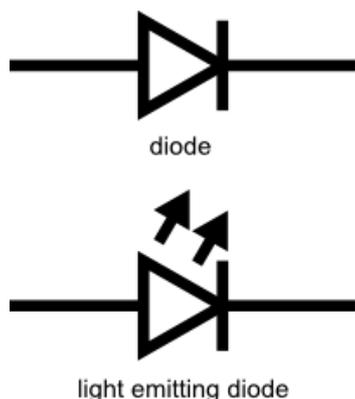
SWIFT FOR ARDUINO

Hello for everyone . We are going to start a tutorial project series for Swift For Arduino. Our first project is a typical starting project for coding , it is “Hello World” for Arduino.

We are going to flash the LED which is very important component and we can see it almost in every electronic circuits . Before starting to flash our LED , we will learn some basic theoretical knowledge about LED's and basic electronics which is important for this project and other projects.

What is LED ?

LED is abbreviation of Light Emitting Diode . It is a special type of Diodes which is a semiconductor circuit element that allows current to flow in only one direction. There are different colors which is emitted by LED's like Red , Green , Blue etc.



Usage Areas of LED's :

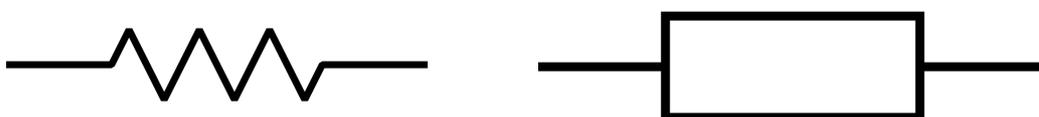
- Cell Phones
- Computers
- Traffic Lights
- Screens (Background Lighting)
- Cars, Trains, Planes etc.
- Everything in Lighting ...

LED's has two legs. One of them is shorter than the other. The short leg is **Cathode (-)** and the long one is **Anode (+)**. LED's are working between 2 - 3.3 V , but Arduino gives 5 V voltage so if we use LED's with Arduino , the LED will be burned. So in this situation , we must use another component for protect our LED which is called Resistor.

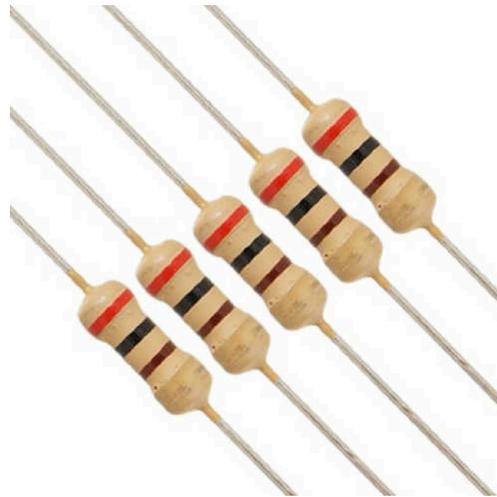
What is Resistor ?

Resistor is a passive component using almost in every electronic circuits. Resistance is the force faced by the current passing through a conductor. It's unit is called Ohm which is denoted by Greek letter called Omega (Ω). In circuits , denoted by letter **R**. We use resistors for many purposes, but mostly for :

- Limiting the Current passing through the circuit
- Dividing and reducing Voltage
- Protect sensitive circuit elements from high Current
- Using for heating with Resistance wires etc.



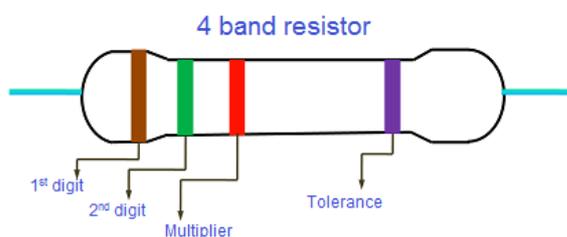
In our projects we are going to use Carbon Film Resistors because of they are cheap and easy to use.



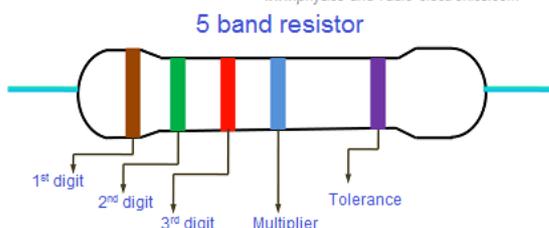
The resistors are so tiny components also the SMD ones. As you can see there are some color bands on the resistor. With these color bands , we can understand the resistors value. Let's learn how can we understand or calculate the value of resistor .

How to calculate the value of Resistors ?

As I said before we can calculate the value of the resistor with color bands. Every color has a meaning and value itself.



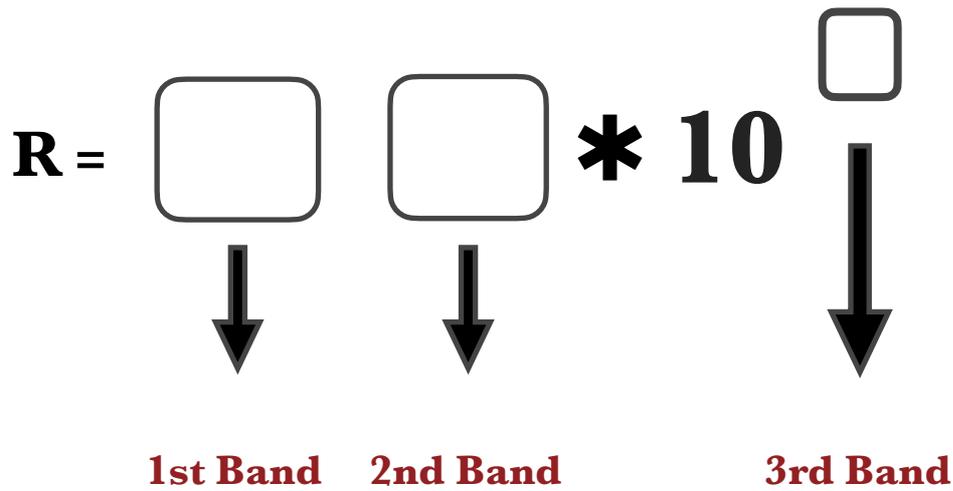
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Band Color	Digit	Multiplier	Tolerance
Black	0	1	---
Brown	1	10	±1%
Red	2	100	±2%
Orange	3	1,000	±3%
Yellow	4	10,000	±4%
Green	5	100,000	---
Blue	6	1,000,000	---
Violet	7	10,000,000	---
Gray	8	100,000,000	---
White	9	---	---
Gold	---	0.1	±5%
Silver	---	0.01	±10%
None	---	---	±20%

-For 4-band Resistors :



Example :

Let's calculate the 4-band 330 Ohm Resistor with using color codes.

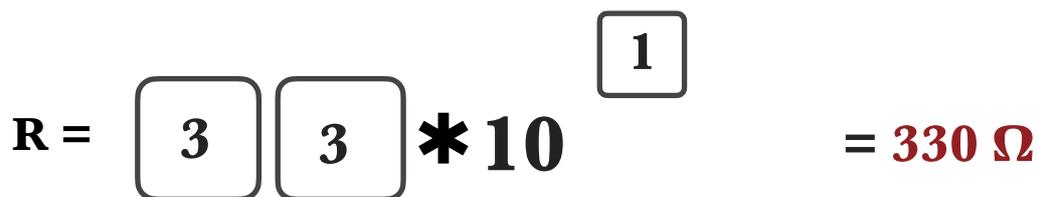
330 Ohm Resistor colors : (**Orange-Orange-Brown-Gold**)

Orange Value : 3

Brown Value : 1

Gold Value : %5

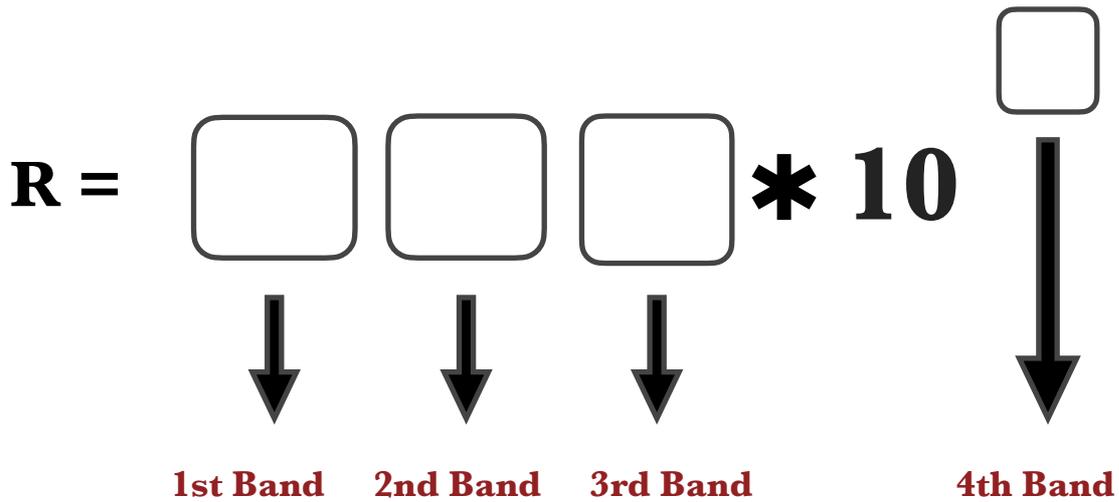
So ;

R = 

= 330 Ω

With %5 Tolerance

- For 5-band Resistors :



Example :

Let's calculate the 5-band 10 K Ohm Resistor with using color codes.

10 K Resistor Colors : (**Brown-Black-Black-Red-Gold**)

Brown Value : 1

Black Value : 0

Black Value : 0

Red Value : 2

Gold Value : %5

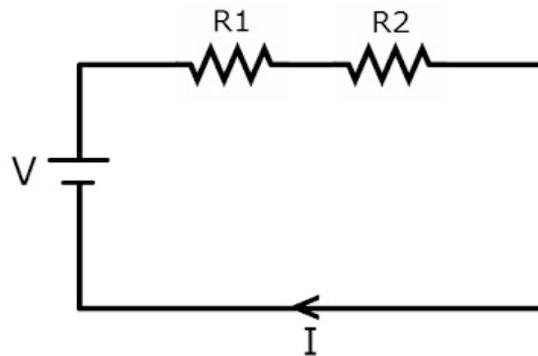
$$R = \boxed{1} \boxed{0} \boxed{0} * 10^{\boxed{2}} = 10 \text{ K } \Omega$$

With %5 Tolerance

Connection Types of Resistors :

There are two types of connection in resistance .

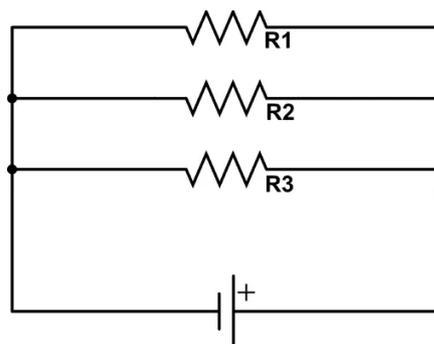
1-Resistors in Series



If we connect resistors in series , we can calculate the equivalent resistance with formula :

$$\text{Equivalent } R = R1 + R2 + R3 + R4 \dots$$

2- Resistors in Parallel



If we connect resistors in parallels , we can calculate the equivalent resistance with formula :

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} \dots$$

We learned what is LED and also what is Resistor and theoretical knowledge about them . But we are going to learn the most used formula of electronics, Ohm's Law , which is named after German physicist Georg Ohm . And learn how much resistance we are going to use to protect our LED from Arduino's 5V voltage.

Ohm's Law

Ohm's Law is a formula used to calculate the relationship between voltage, current and resistance in a circuit.

The Formula of Ohm's Law : $V = I * R$

V represents the Voltage ,

I represents the Current and

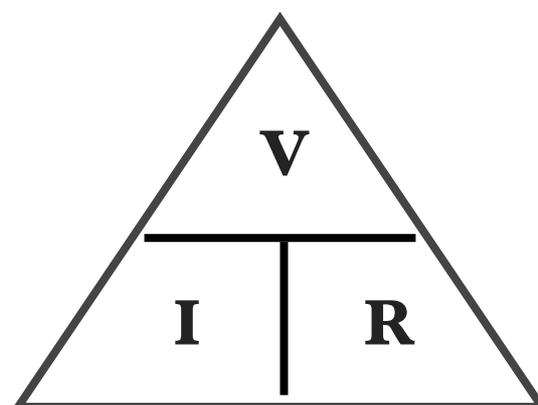
R represents the Resistance.

With that formula and doing some mathematical calculations ;
We can determine the Current (I) and also Resistance (R).

$$I = V / R$$

and

$$R = V / I$$



Example :

As I told you before LED's are working between 2 - 3.3 V . But on the other hand Arduino supplies 5 V energy to LED. Also most of the LED's draw current maximum nearly 20 mA. If we connect our LED without resistor, it draws bigger than 20 mA so LED will be burned. So we need a resistor. Let's calculate value of the resistor.

$$\mathbf{V = I \times R}$$

$$\mathbf{5 V = 0.02 A \times R}$$

5V = Arduino's Voltage

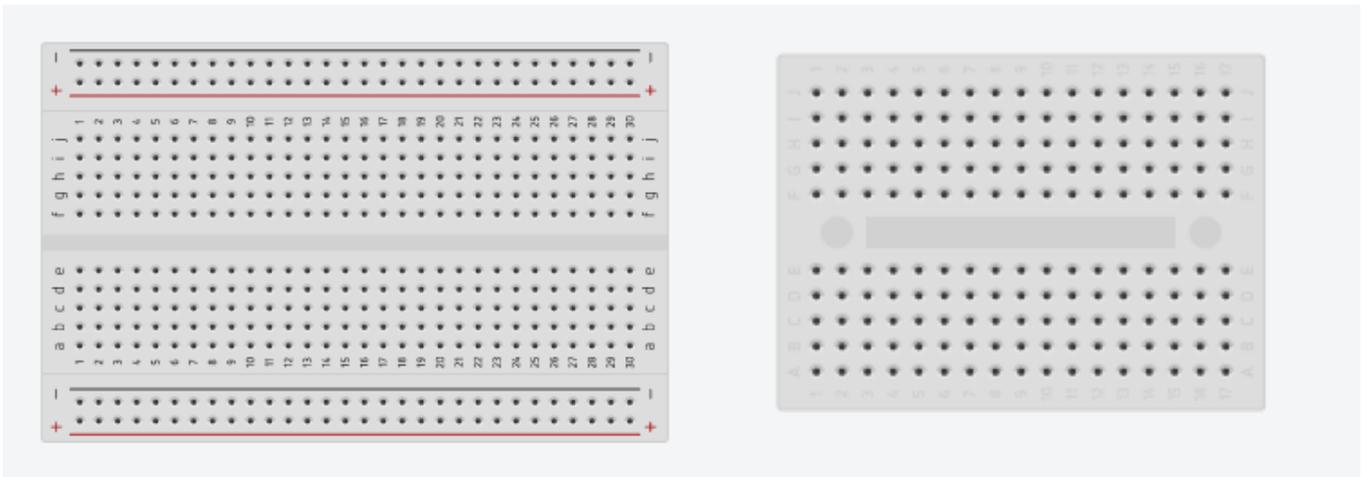
0.02 A = LED's max Current

After this calculation we will determine the **R** value is 250 Ω . But in real life , it is hard to find a 250 Ω value resistor , so we are going to use starting from 220 Ω value resistor.

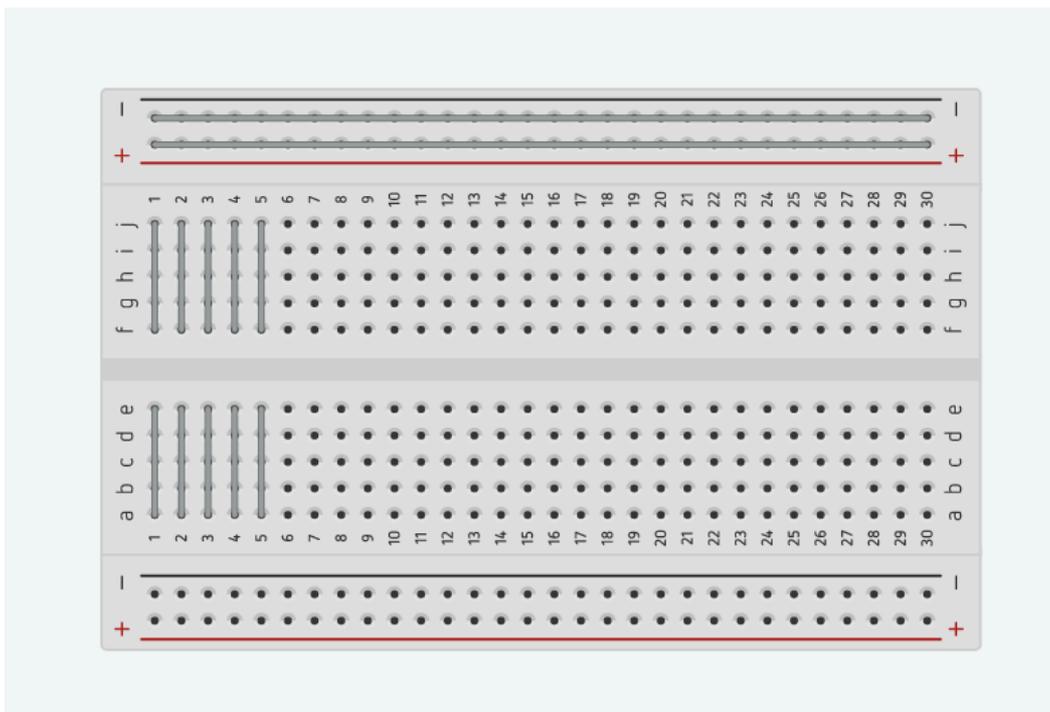
We learned our projects components and basic electronic rules which is so important for us . Also we are using a component for prototyping our circuit easily and without any soldering which is called **Breadboard**.

Breadboards :

There are breadboards of different types and sizes. It has vertical and horizontal canals which is soldered each other and points for connecting wires and components .



The horizontal lines which we are using for + and - are soldered along the entire line. And the vertical lines are soldered from below too like as you can see in the next figure.



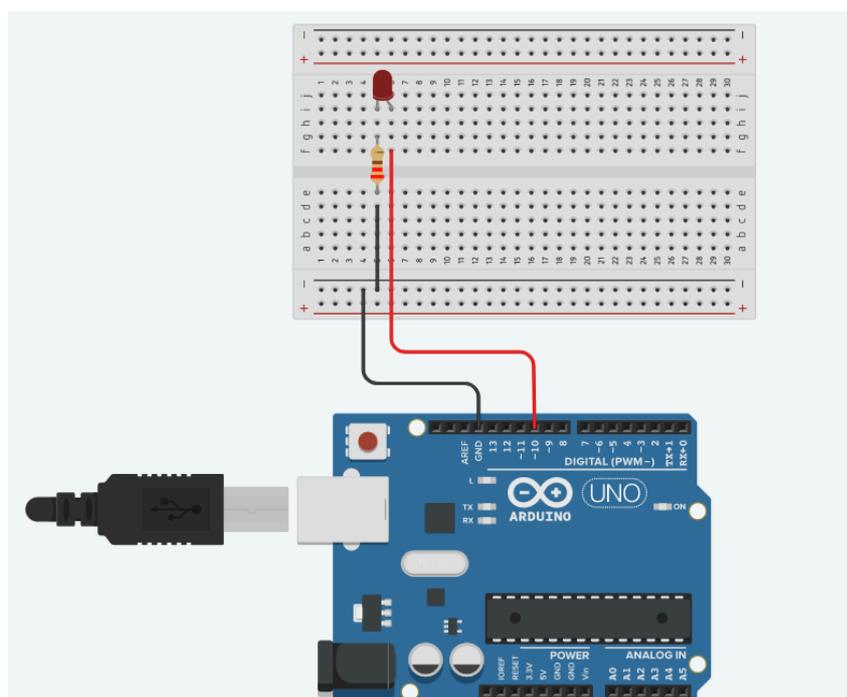
Now we are ready for doing our first project in Arduino world. Let's say Hi ! to the world of imagination ...

In this “Hello World” project we are going to use :

- An **Arduino UNO**
- A **LED** (may be in every color)
- A **Breadboard** is so useful for prototyping
- A **220 Ω Resistor**
- **Jumper wires** or any wire to build circuit
- A **Power source** for Arduino (It can be battery or adapter)

First of all , we must create our circuit. In this circuit LED's long leg which is **+** is connected to Arduino's any Digital Pin. In our project we connected **+** to the 10th pin. As we know we must use resistor for protect our LED . So that we are going to connect the resistor in series with LED's short leg which is **-** and then we will connect it to the Arduino's GND pin which is Ground.

Circuit Diagram of this Project



After creating the circuit let's go to the our computer and code the Arduino UNO.

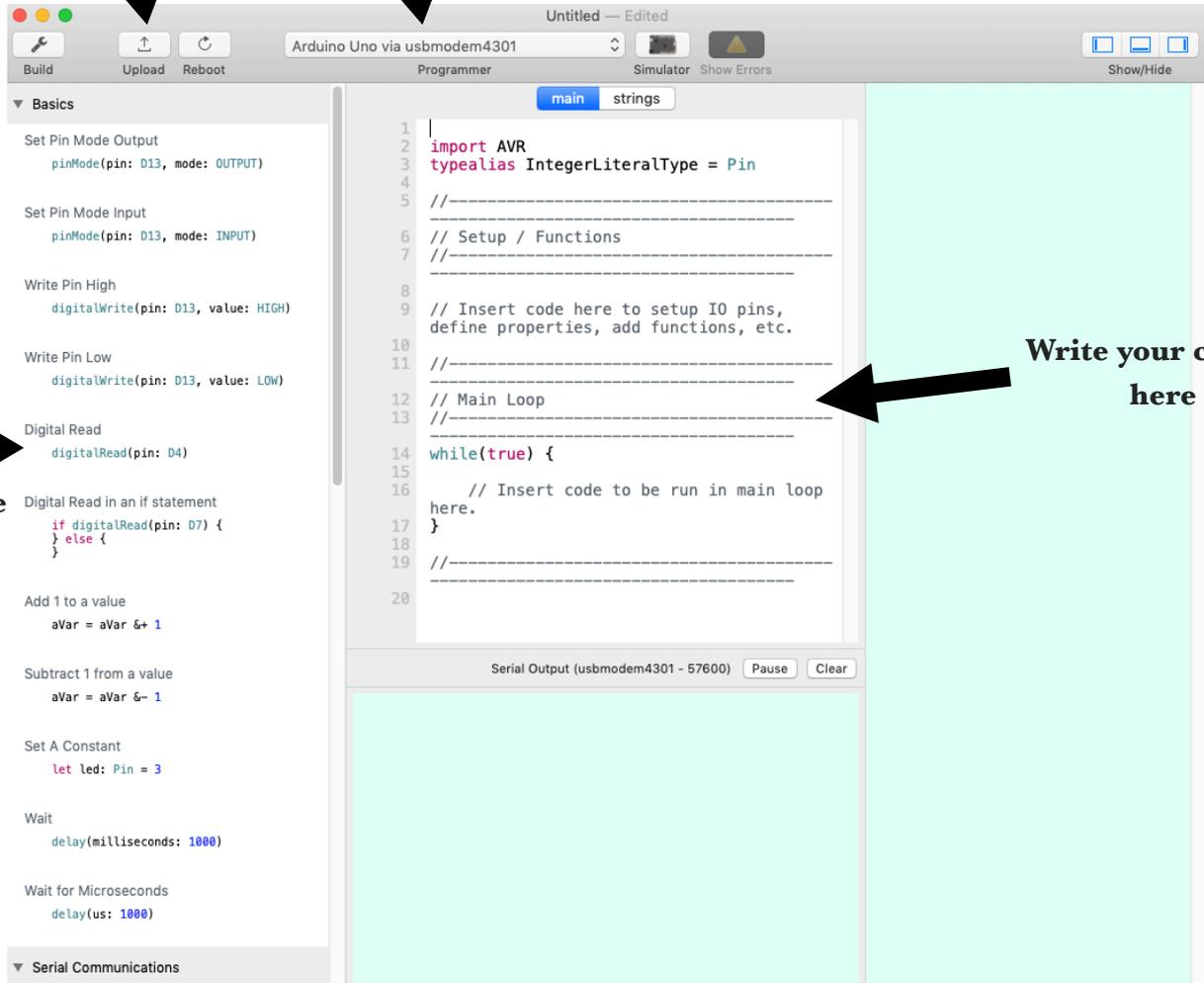
In this project and our next projects we are going to use **Swift For Arduino** IDE which is based on Apple's Swift language and its implementation to micro controllers is called micro Swift for coding Arduino instead of C/C++ language. In this project we want to our LED flashes like a blink . So we need to implement this situation into code.

Here is the implementation and explanation of our code :

```
1 // We are using this double slash ("//")
  // lines for writing commands and it doesn't
  // read by compiler.
2
3 // First of all we are going to import our
  // libraries.
4 import AVR
5 typealias IntegerLiteralType = Pin
6
7 pinMode(pin: D10, mode: OUTPUT)
8 // We defined our LED pin and it's mode
  // which is OUTPUT.
9
10 while(true) {
11 // Here is the main loop of our code.
12 // We write what we want to do basically.
13
14 digitalWrite(pin: D10, value: HIGH)
15 // We identified the LED on.
16 delay(milliseconds: 1000)
17 // We identified a delay for 1 second.
18 digitalWrite(pin: D10, value: LOW)
19 // We identified the LED off.
20 delay(milliseconds: 1000)
21 //We identified a delay for 1 second again
22
23 }
24
```

**Upload Button
which you can
upload your code**

**You can see or
choose your
Arduino board
in here**



**You can see
examples
of using
Swift for
Arduino**

**Write your code in
here**

Serial Output Screen

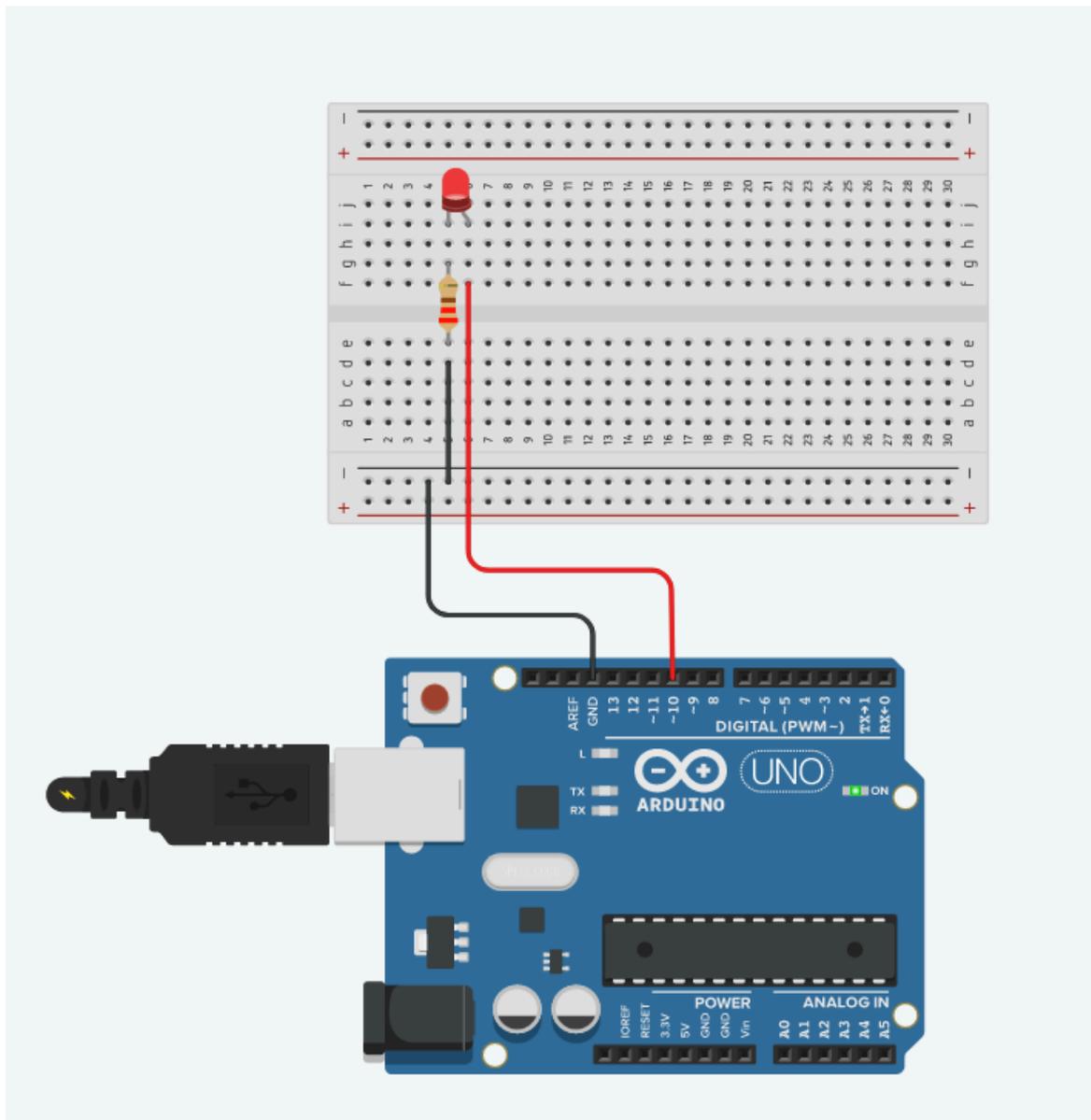
Build Results Screen



**You can see your board
after you connect it in
here**

Then connect your Arduino UNO to your Mac . If the IDE automatically identified your Arduino you can **Run** and **Upload** the code into your Arduino.

If not , try manual Arduino Uno with serial port and control the drivers .



Congratulations your First Project is finished ⚡

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