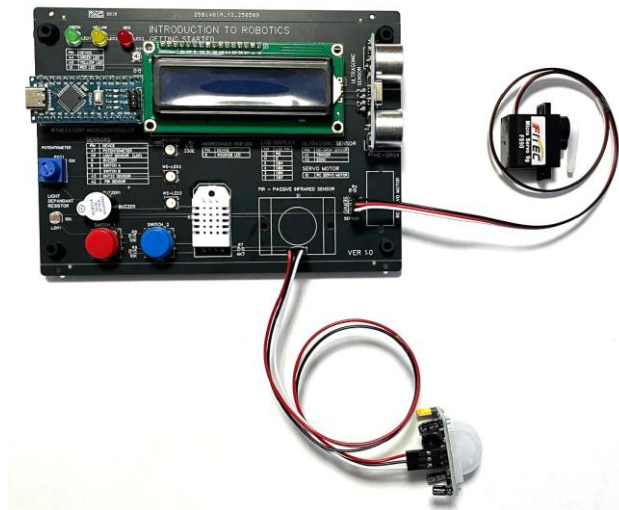# GETTING STARTERD WITH ROBOTICS

LED Control with the Arduino

Introduction to Programming

The Arduino language uses a simplified version of C/C++, a beginner-friendly way to program Arduino microcontrollers. The language lets you write instructions (called a sketch) to tell the Arduino what to do. It's designed to be easy to learn, even if you've never coded before.

Our first Code Example – Blink

```
void setup () {
  pinMode(13, OUTPUT);     // Set digital pin 13 as output
}

void loop() {
  digitalWrite(13, HIGH); // Turn LED on
  delay(500);              // Wait 500 milliseconds
  digitalWrite(13, LOW);  // Turn LED off
  delay(500);              // Wait 500 milliseconds
}
```
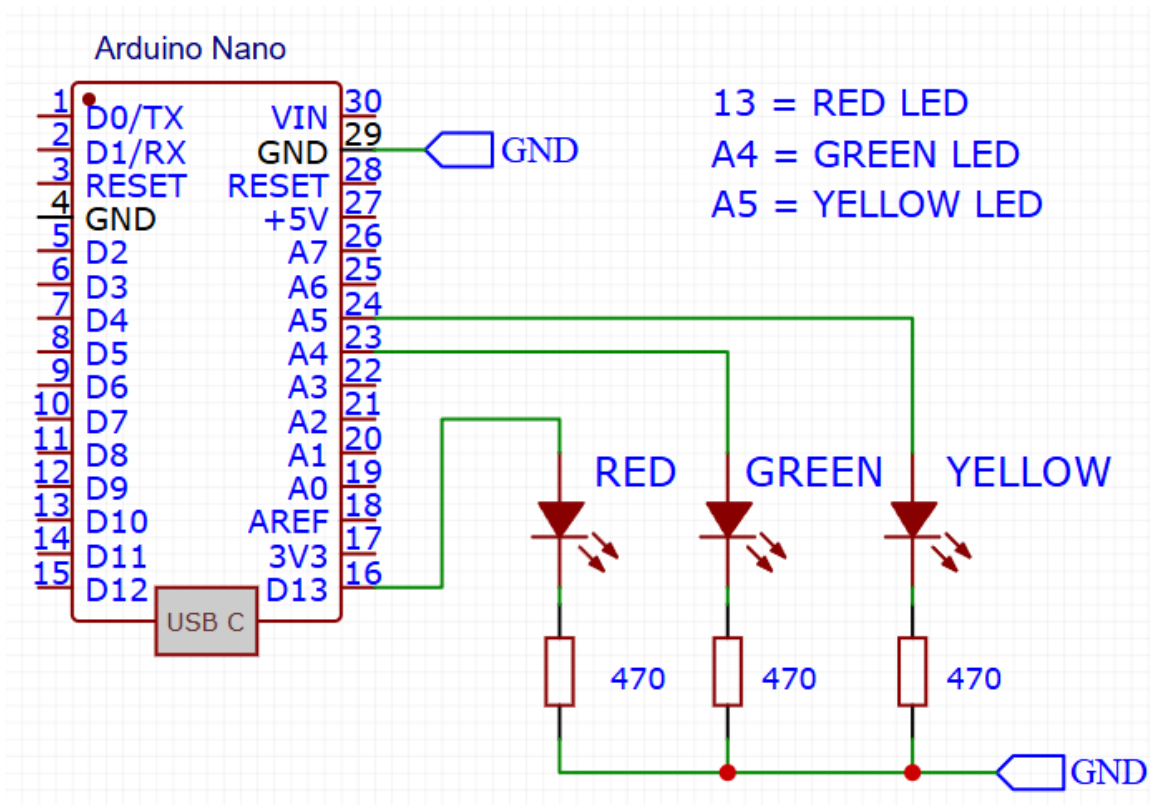
Switching other LED'S

The other LEDs are connected as follows

Below is a short Arduino demo program that uses #define directives to control three LEDs (Green, Yellow, Red) connected to pins A4, A5, and 13, respectively. The program will sequentially turn each LED on for 1 second, then off, in a repeating cycle.

Circuit Diagram

The schematic below illustrates the connection of three LEDs to the Arduino. The onboard LED and an external red LED are both connected to digital pin 13. Each LED is connected in series with a 470 Ω current-limiting resistor to prevent excessive current and ensure safe operation.

Arduino Nano

1 D0/TX	VIN 30	
2 D1/RX	GND 29	
3 RESET	RESET 28	
4 GND	+5V 27	
5 D2	A7 26	
6 D3	A6 25	
7 D4	A5 24	
8 D5	A4 23	
9 D6	A3 22	
10 D7	A2 21	
11 D8	A1 20	
12 D9	A0 19	
13 D10	AREF 18	
14 D11	3V3 17	
15 D12	D13 16	

USB C

GND

13 = RED LED
A4 = GREEN LED
A5 = YELLOW LED

RED   GREEN   YELLOW

470   470   470

GND

Connections
Red LED connected to **Pin 13**
Green LED connected to **Pin A4**
Yellow LED connected to **Pin A5**

Code Example

```
// Define LED pins

#define GREEN_LED A4                    // Green LED connected to pin A4
#define YELLOW_LED A5                   // Yellow LED connected to pin A5
#define RED_LED 13                      // Red LED connected to pin 13


void setup() {

pinMode(GREEN_LED, OUTPUT);            // Set pins to Output
pinMode(YELLOW_LED, OUTPUT);
pinMode(RED_LED, OUTPUT);
}


void loop () {

digitalWrite(GREEN_LED, HIGH);        // Turn on Green LED, others off
digitalWrite(YELLOW_LED, LOW);
digitalWrite(RED_LED, LOW);
delay (1000);                         // Wait 1 second


// Turn on Yellow LED, others off

digitalWrite(GREEN_LED, LOW);
digitalWrite(YELLOW_LED, HIGH);
digitalWrite(RED_LED, LOW);
delay(1000);                                  // Wait 1 second


// Turn on Red LED, others off

digitalWrite(GREEN_LED, LOW);
digitalWrite(YELLOW_LED, LOW);
digitalWrite(RED_LED, HIGH);
delay (1000);                                 // Wait 1 second

}
```

important!

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1. An Arduino program is called a **sketch** and uses the **.ino** file extension.
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2. An Arduino sketch consists of two main functions: **setup()** and **loop()**. The setup() function runs once at startup, typically used to initialize settings. The loop() function runs repeatedly, forming the core of the program's execution cycle.
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3.   **pinMode** configures a specified pin as either an INPUT, OUTPUT, or INPUT_PULLUP. It prepares the pin for reading (input) or writing (output) digital signals.

pinMode(pin, mode)

Example
pinMode(13, OUTPUT);   // Set digital pin 13 as output
----
4. digitalWrite() is a function that sets a digital pin **HIGH** (on) or **LOW** (off).

digitalWrite(13, HIGH); // Turns pin 13 ON
digitalWrite(13, LOW); // Turns pin 13 OFF
----

5. **#Define**

In Arduino, #define creates a constant or shortcut before the program runs

Example
#define LED_PIN 13

Exercise 1
Write Arduino code to make a knight rider simulation with the 3 LED's

```
#define GREEN_LED A5
#define YELLOW_LED A4
#define RED_LED 13
#define DELAY_TIME 200

void setup() {
  pinMode(GREEN_LED, OUTPUT);
  pinMode(YELLOW_LED, OUTPUT);
  pinMode(RED_LED, OUTPUT);
}

void loop() {
  knightRider();
}

void knightRider() {
  turnOn(GREEN_LED);
  delay(DELAY_TIME);
  turnOn(YELLOW_LED);
  delay(DELAY_TIME);
  turnOn(RED_LED);
  delay(DELAY_TIME);
  turnOn(YELLOW_LED);
  delay(DELAY_TIME);
}

void turnOn(int pin) {
  digitalWrite(GREEN_LED, LOW);
  digitalWrite(YELLOW_LED, LOW);
  digitalWrite(RED_LED, LOW);
  digitalWrite(pin, HIGH);
}
```