



# Armstrong

## School Program 2023-2024

### Lesson 2



# Armstrong

entertainment meets education

REGISTER NOW



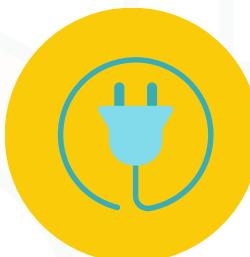
<https://armstrongedu.com/>



# Lesson Content



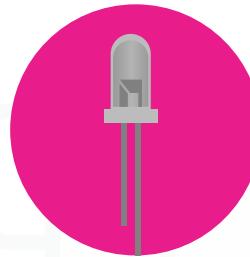
**Revising previous lesson**



**Electrical circuit basics**



**Getting started with Tinkercad**



**Blinking LEDs**



# Remember

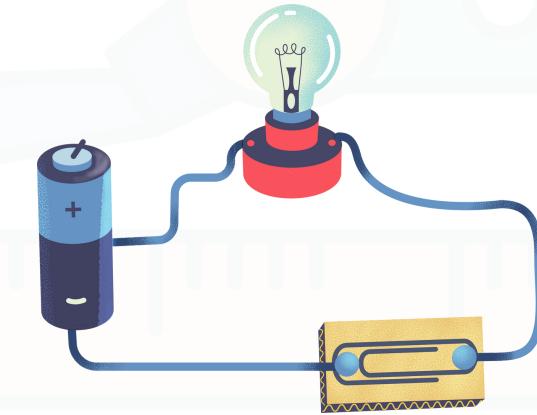
**HIGH= on, LOW=off**

In programming a pin is **HIGH** when it outputs electricity (led on) and **LOW** when it doesn't output electricity.



# Electronic circuits

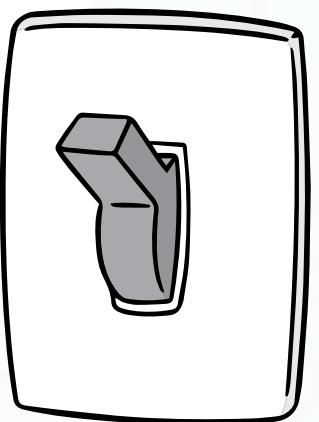
**How does a flashlight work?**



A flashlight is a device that produces light when you press a button.

**what parts are inside a flashlight?**

The batteries, the switch, the lamp.



# Electronic circuits

## Batteries

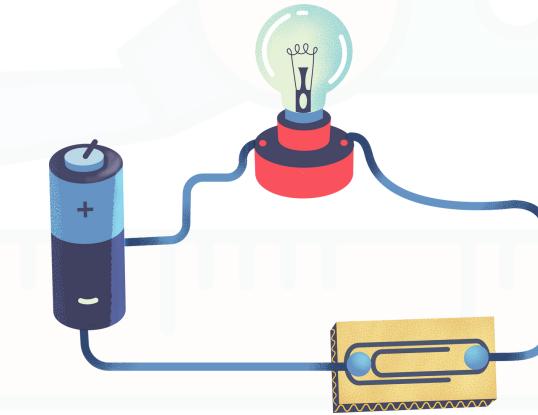
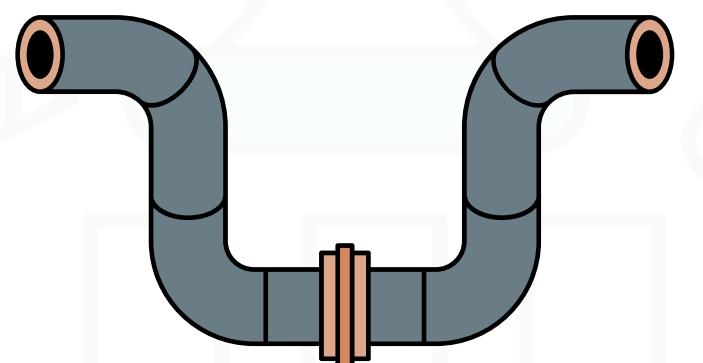


Batteries are like tiny boxes that store electricity.

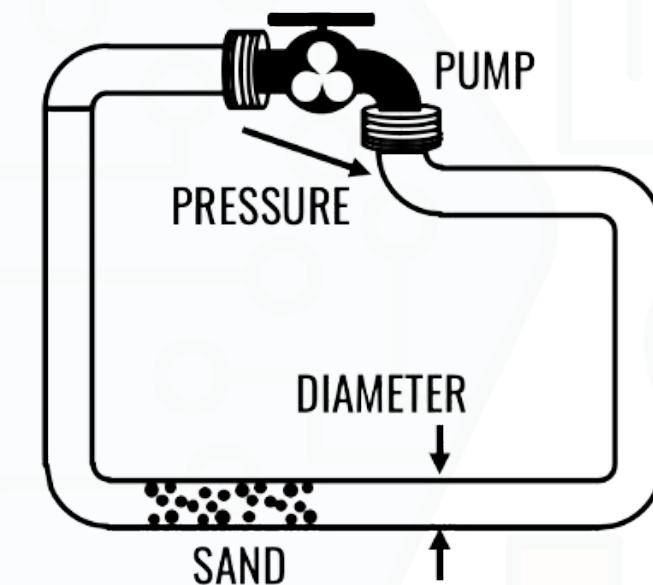
## what is electricity?



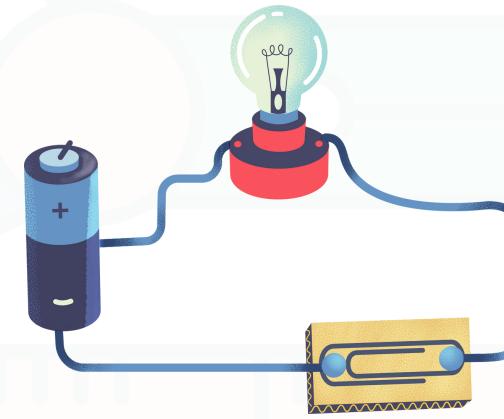
Electricity is a form of energy that can make things move or glow.  
Electricity flows like water in a pipe, but it needs a path to follow.



## Water



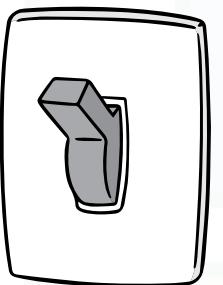
# Electronic circuits



## What is a circuit?

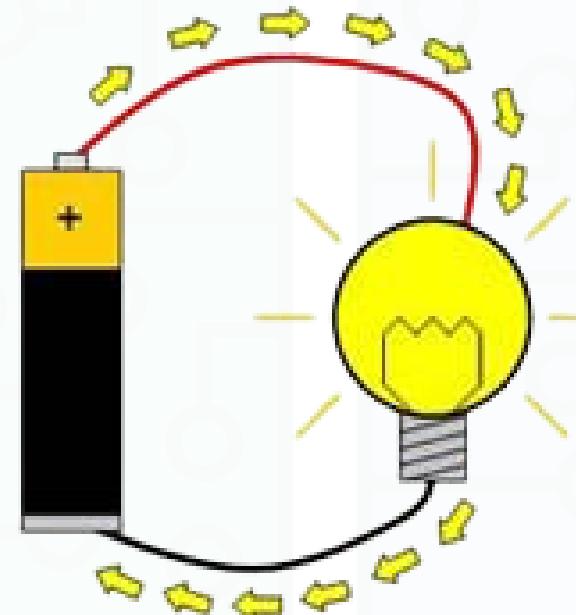
A circuit is like a circle. When a circuit is closed, the electric current can move from the power source, such as a battery, to the device, such as a light bulb, and back to the power source. This makes the device work.

## Switch

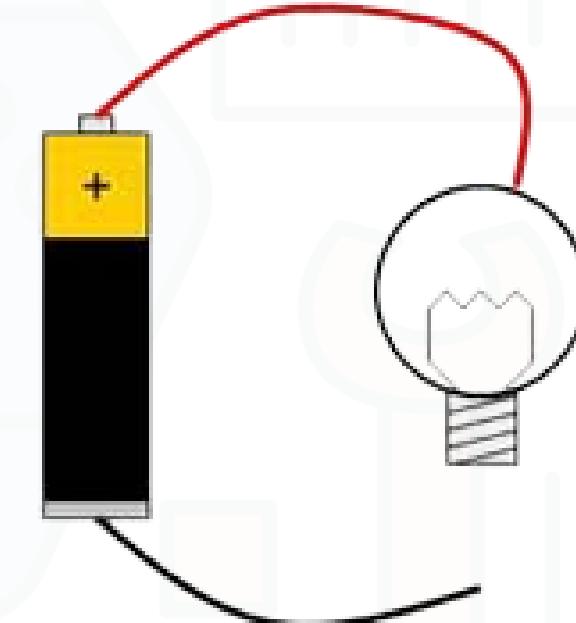


A switch is like a gate that controls the flow of electricity.

## Closed circuit



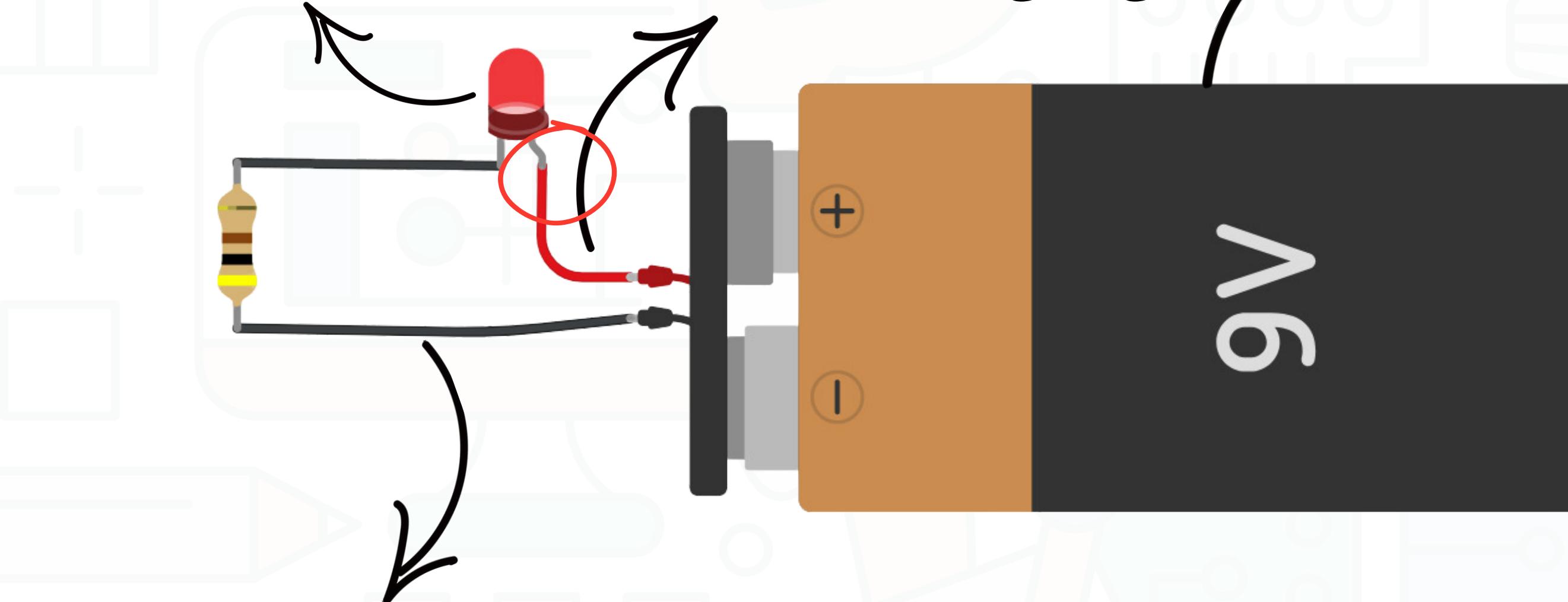
## Open circuit



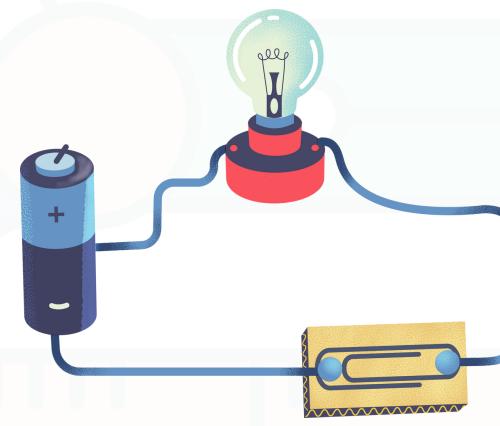
# Electronic circuits

Example of a closed circuit

LED + connected to long leg

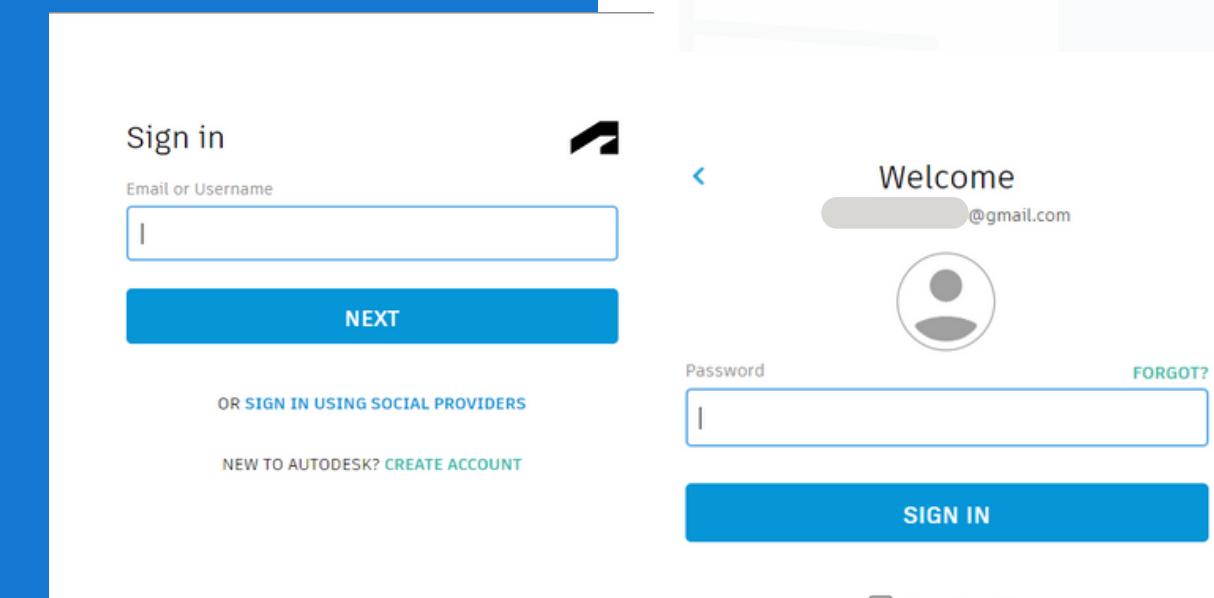
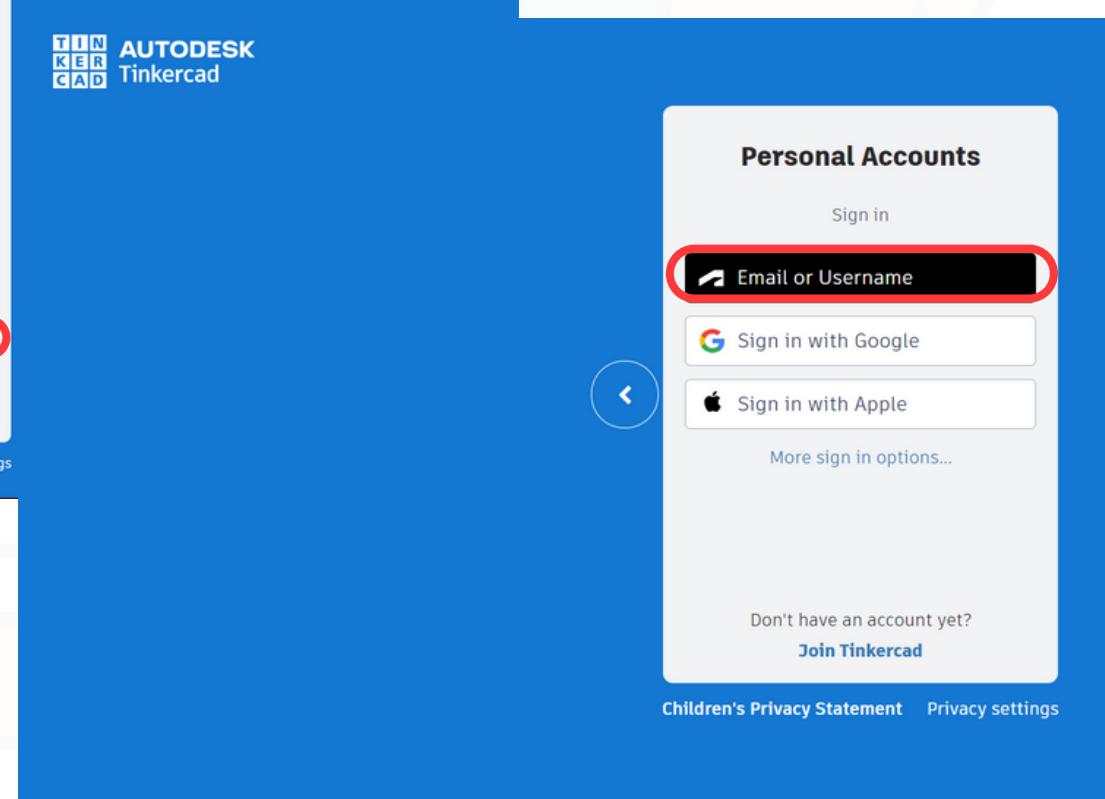
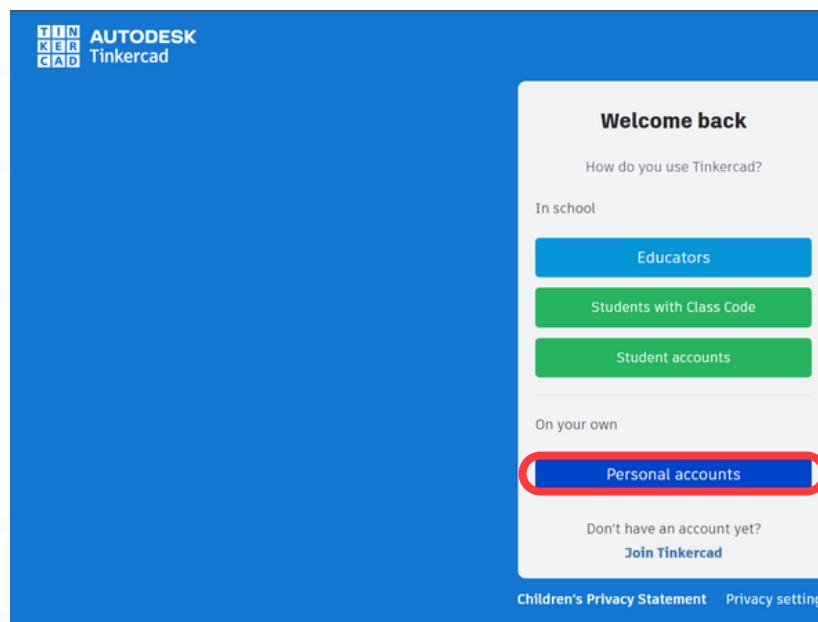


- connected to short LED's leg



# Getting started with Tinkercad

## Step 1: sign in.



**AUTODESK**  
Tinkercad



# Getting started with

## Step 2: create new circuit.

The screenshot shows the Tinkercad interface for creating a new circuit. On the left, the sidebar includes options for 3D Design, Circuit (which is selected), and Codeblocks. The main workspace shows an Arduino Uno connected to a breadboard with various components like resistors, capacitors, and a motor. A red arrow points from the 'Components Basic' dropdown menu to a yellow box labeled 'Select "All" to get all components'. Another red box highlights the 'All' option in the dropdown. A red box also highlights the component library itself. A yellow arrow points from the 'Basic' label to the 'All' label. The top bar shows the user 'Swanky Tumelo' and a 'Rename your circuit' field. A blue box on the left says 'Time is running out to enter the Throwble Challenge and see your design added to the Sim Lab editor!». The right sidebar lists categories like Starters, Basic, Arduino, Micro:Bit, Circuit Assemblies, and All, with specific components like 9V Battery, Coin Cell 3V Battery, and 1.5V Battery listed at the bottom.

# Getting started with



## Step 3: connect and simulate.

To change the wire color

WIRE COLOR

- Black
- Red
- Orange
- Yellow
- Green
- Turquoise
- Blue
- Purple
- Pink
- Brown
- Grey
- White

All changes saved

Code Start Simulation Send To

Components Basic

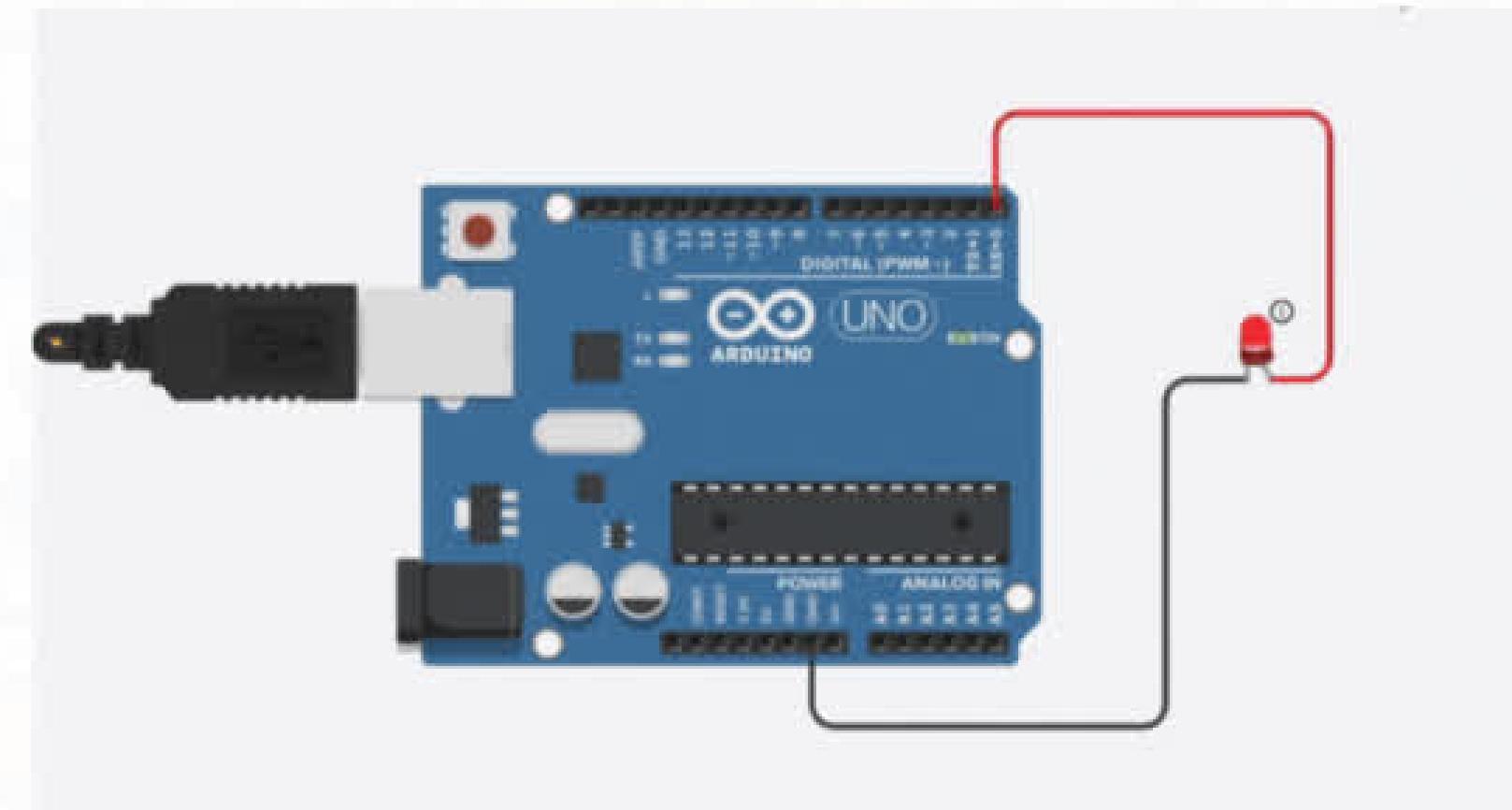
Search

Push Button Arduino Led

Components

- Potentiometer
- Capacitor
- Slideswitch
- 9V Battery
- Coin Cell 3V Battery
- 1.5V Battery
- Breadboard Small
- micro:bit
- Arduino Uno R3
- Vibration Motor
- DC Motor
- Micro Servo
- Hhvhv
- NPN
- LED RGB

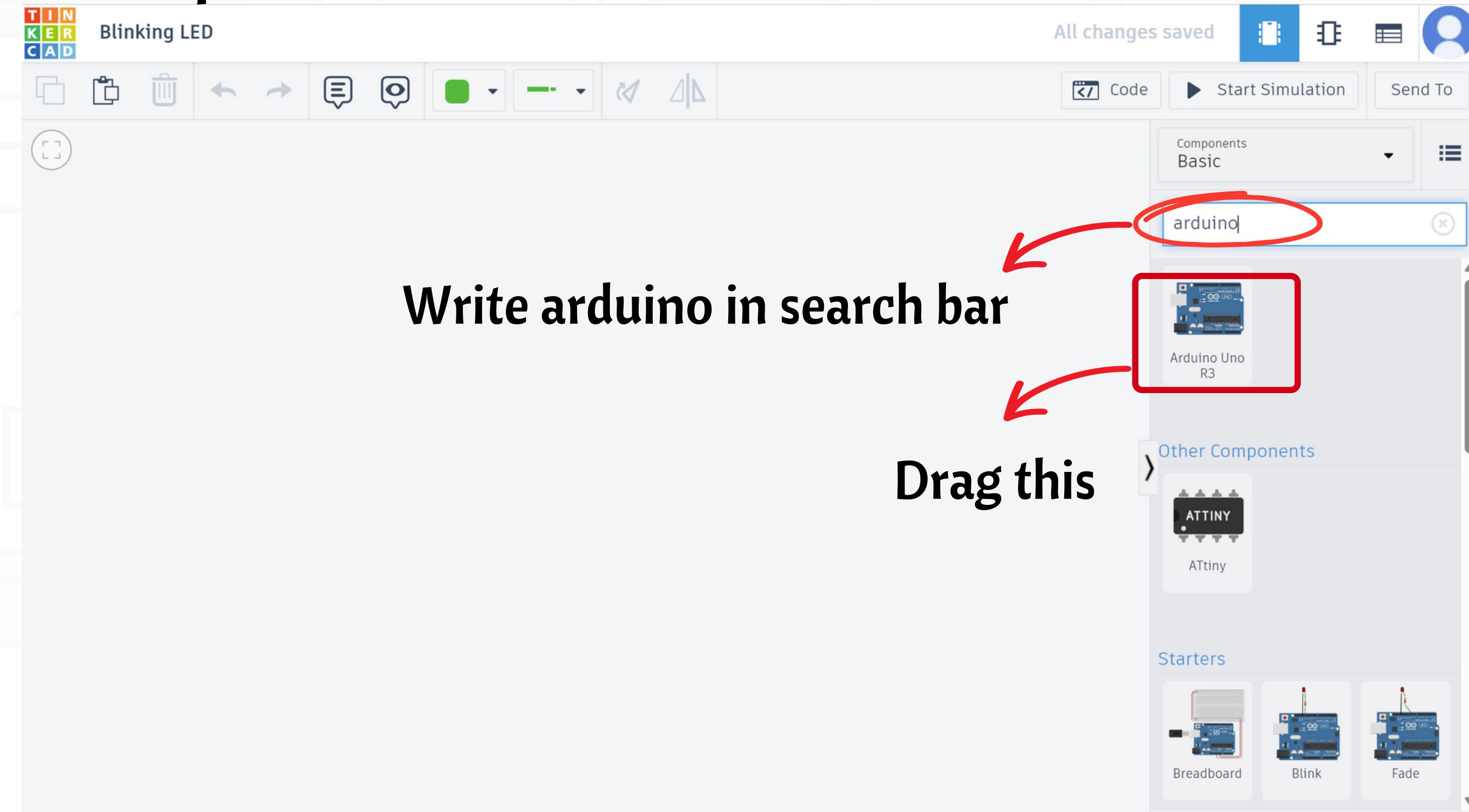
# Let's start our first simulation



# Blinking LEDs



## Step 1: components



The screenshot shows the Tinkercad interface. In the top left, it says "TINKER CAD" and "Blinking LED". The top right shows "All changes saved" and icons for Code, Start Simulation, and Send To. Below the toolbar is a search bar with "arduino" typed in, circled in red with a red arrow pointing to it from the text "Write arduino in search bar". Below the search bar is a component library card for the "Arduino Uno R3", also circled in red with a red arrow pointing to it from the text "Drag this". The library categories shown are Components (Basic), Other Components, and Starters.

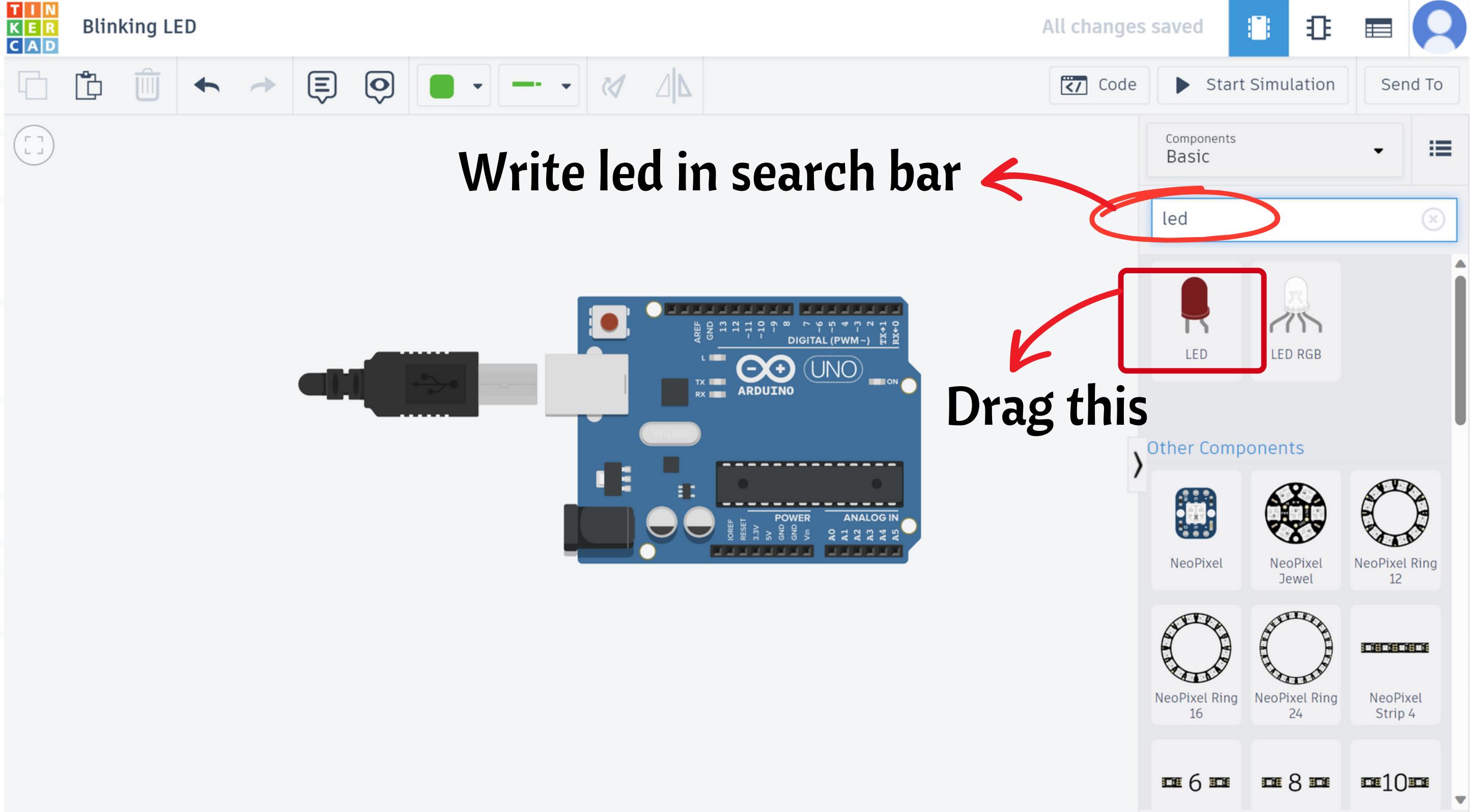
Write arduino in search bar

Drag this

# Blinking LEDs



## Step 1: components



**TINKERCAD** Blinking LED All changes saved Code Start Simulation Send To

Components Basic

led

LED

LED RGB

Other Components

NeoPixel NeoPixel Jewel NeoPixel Ring 12

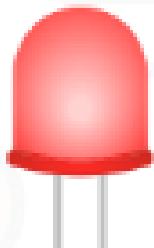
NeoPixel Ring 16 NeoPixel Ring 24 NeoPixel Strip 4

6 8 10

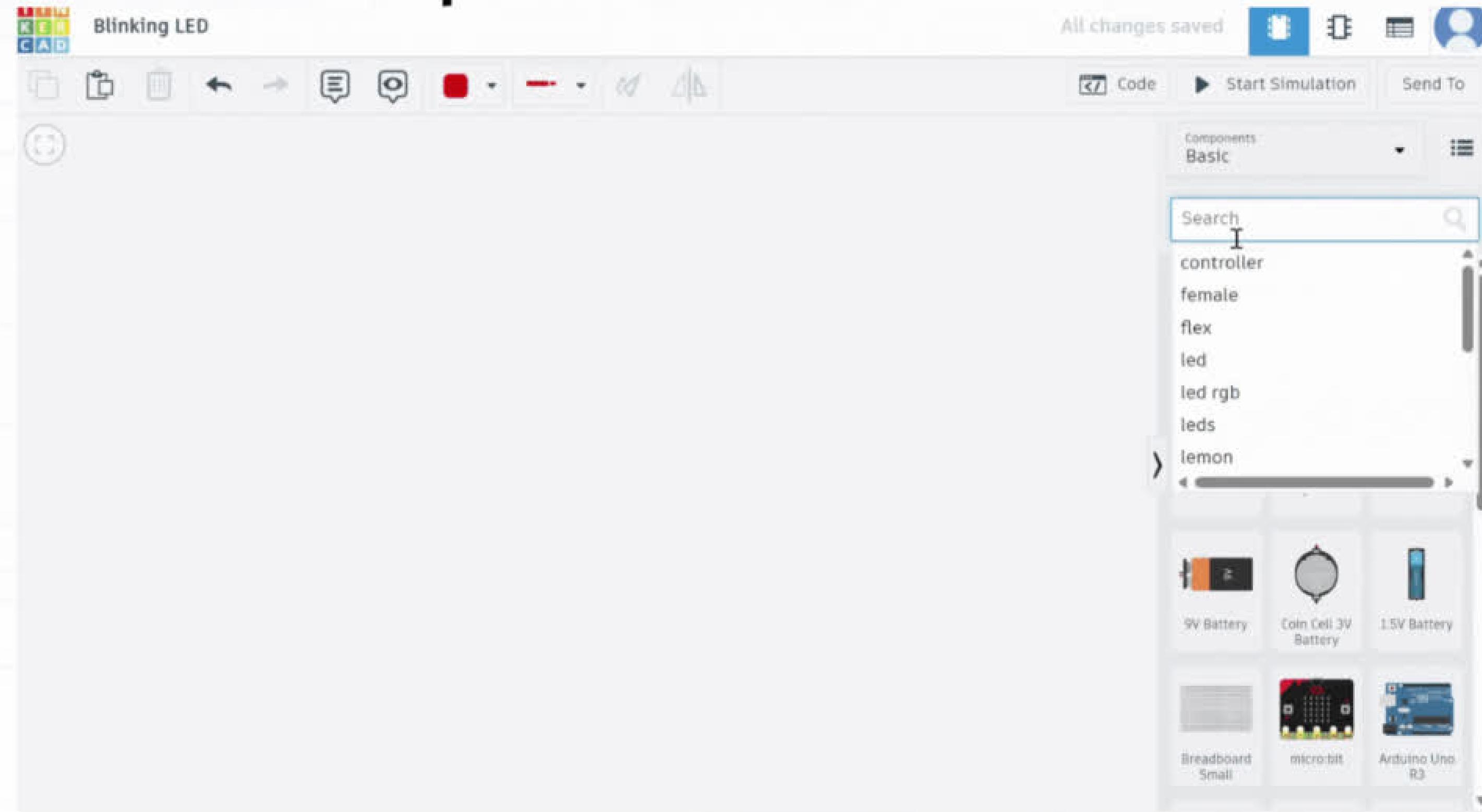
**Write led in search bar**

**Drag this**

# Blinking LEDs



## Step 2: Connect components

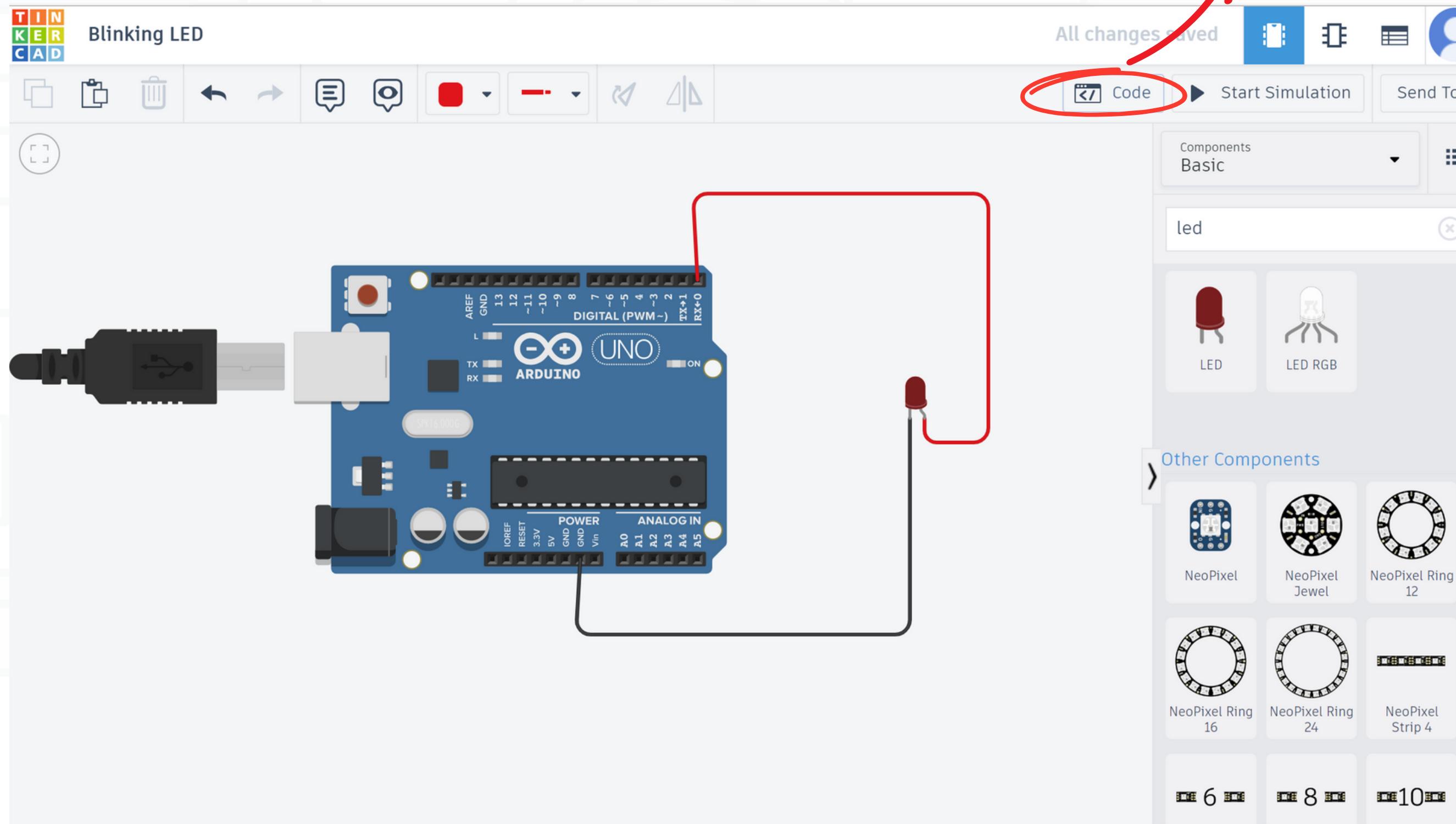


The screenshot shows the KEEPCAD software interface. The title bar says "Blinking LED". The top menu includes "File", "Edit", "Search", "Tools", "Help", "Code", "Start Simulation", and "Send To". A search bar on the right contains the text "controller". Below it is a list of components: "female", "flex", "led", "led rgb", "leds", and "lemon". At the bottom, there are icons for "9V Battery", "Coin Cell 3V Battery", "1.5V Battery", "Breadboard Small", "micro:bit", and "Arduino Uno R3".

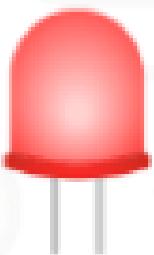
# Blinking LEDs

## Step 3: Write code to blink one LED

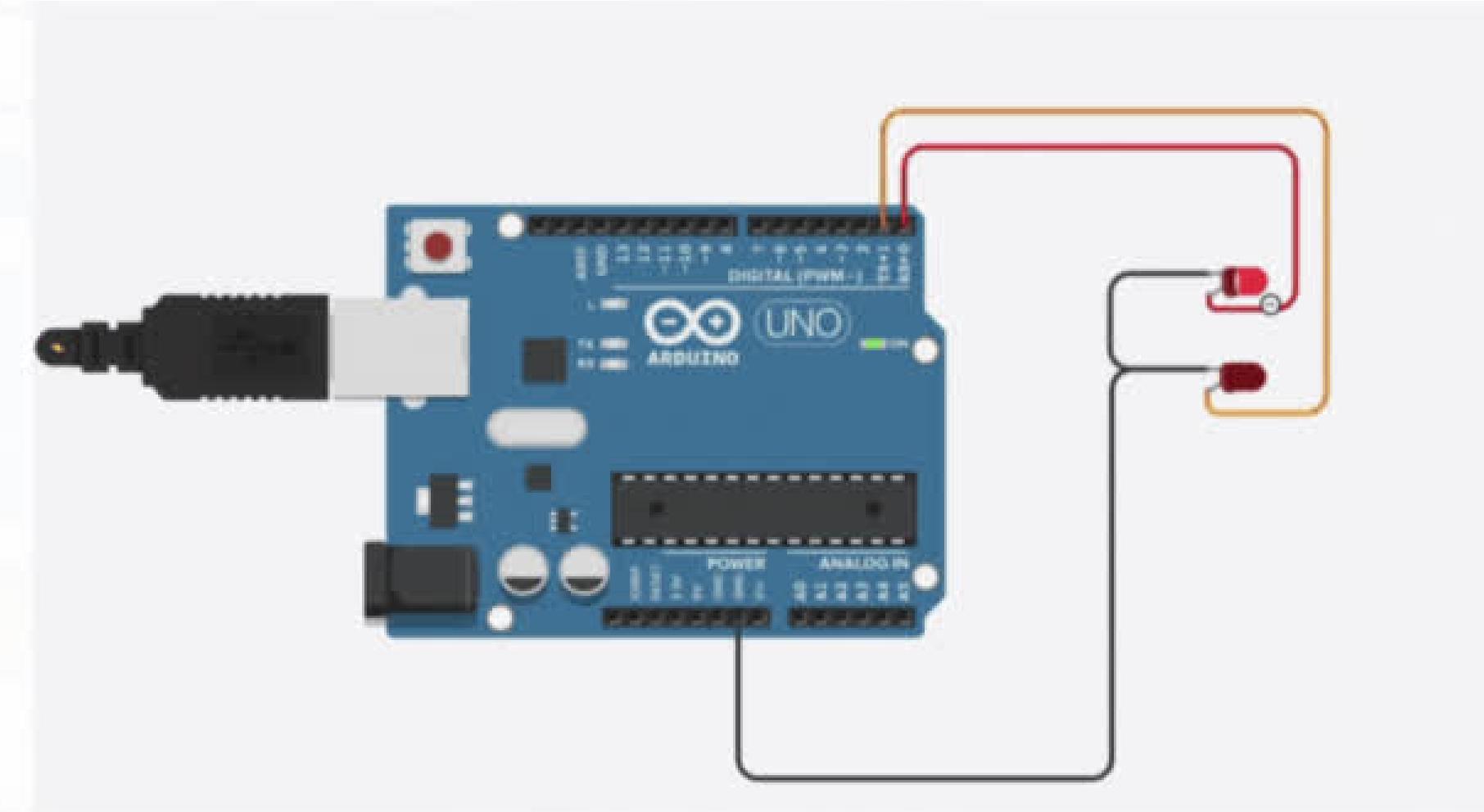
Click here to write code



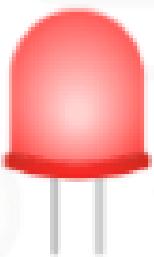
# Blinking LEDs



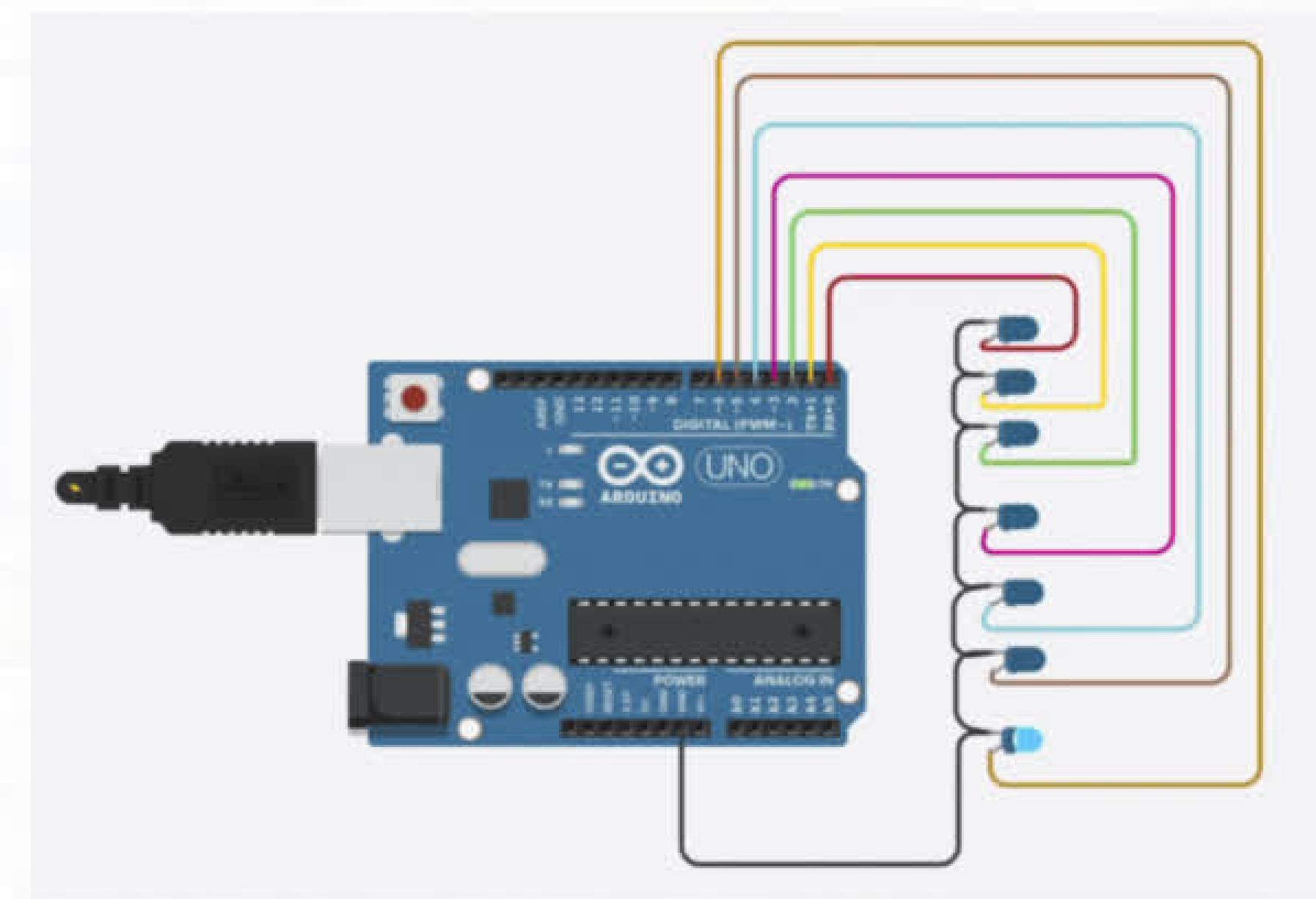
## Mission 1: Blink 2 LEDs



# Blinking LEDs



## Mission 2: Blink 7 LEDs

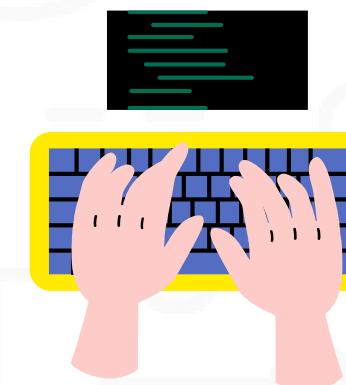


# Code

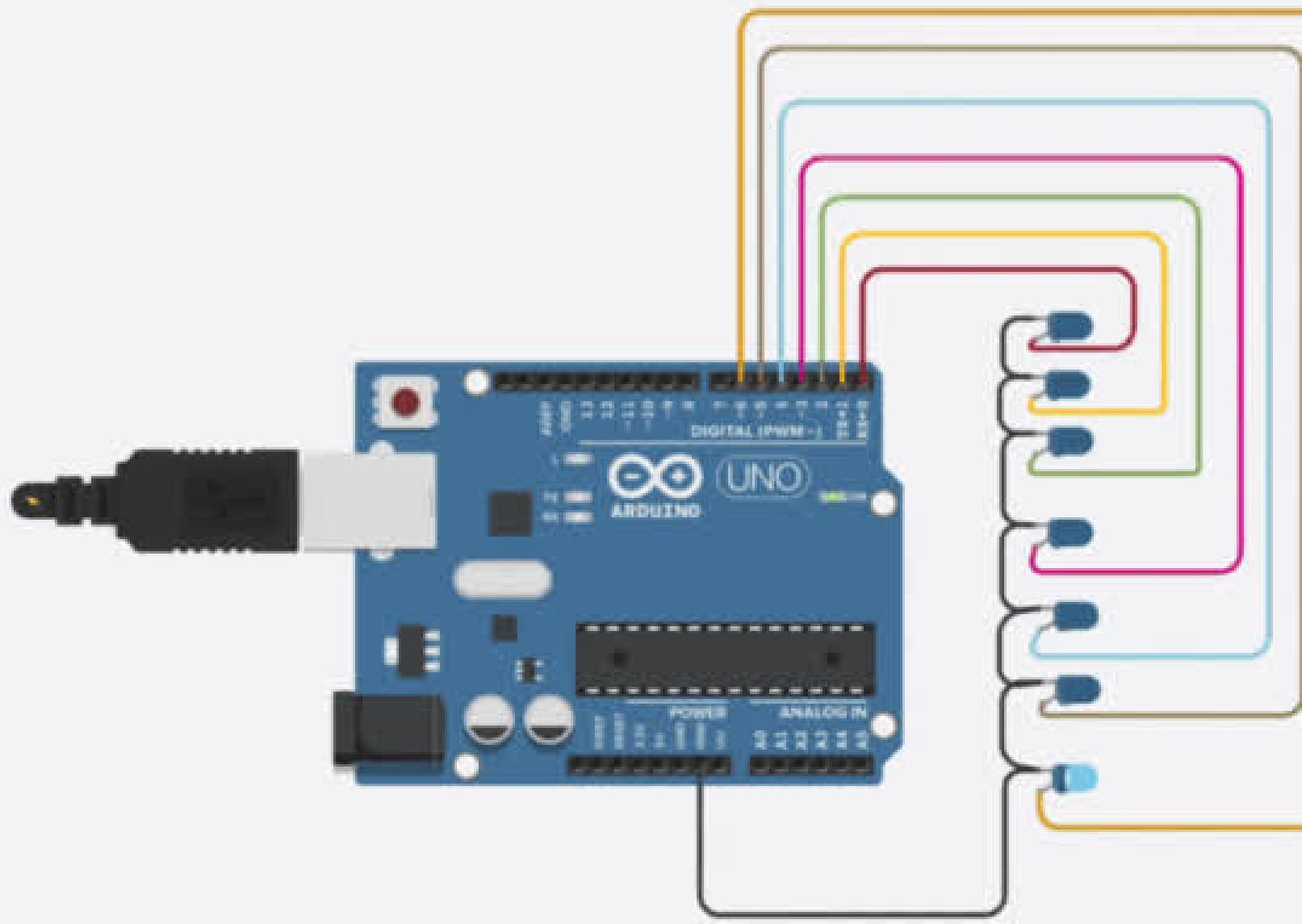


```
void setup() {  
    pinMode(0, OUTPUT);  
    pinMode(1, OUTPUT);  
    pinMode(2, OUTPUT);  
    pinMode(3, OUTPUT);  
    pinMode(4, OUTPUT);  
    pinMode(5, OUTPUT);  
    pinMode(6, OUTPUT);  
}
```

# Code



## Mission 2: Blink 7 LEDs



```
void loop() {
    //blink led 0
    digitalWrite(0, HIGH);
    delay(1000);
    digitalWrite(0, LOW);
    delay(1000);

    //blink led 1
    digitalWrite(1, HIGH);
    delay(1000);
    digitalWrite(1, LOW);
    delay(1000);

    //blink led 2
    digitalWrite(2, HIGH);
    delay(1000);
    digitalWrite(2, LOW);
    delay(1000);
```

```
digitalWrite(3, HIGH);
delay(1000);
digitalWrite(3, LOW);
delay(1000);

//blink led 4
digitalWrite(4, HIGH);
delay(1000);
digitalWrite(4, LOW);
delay(1000);

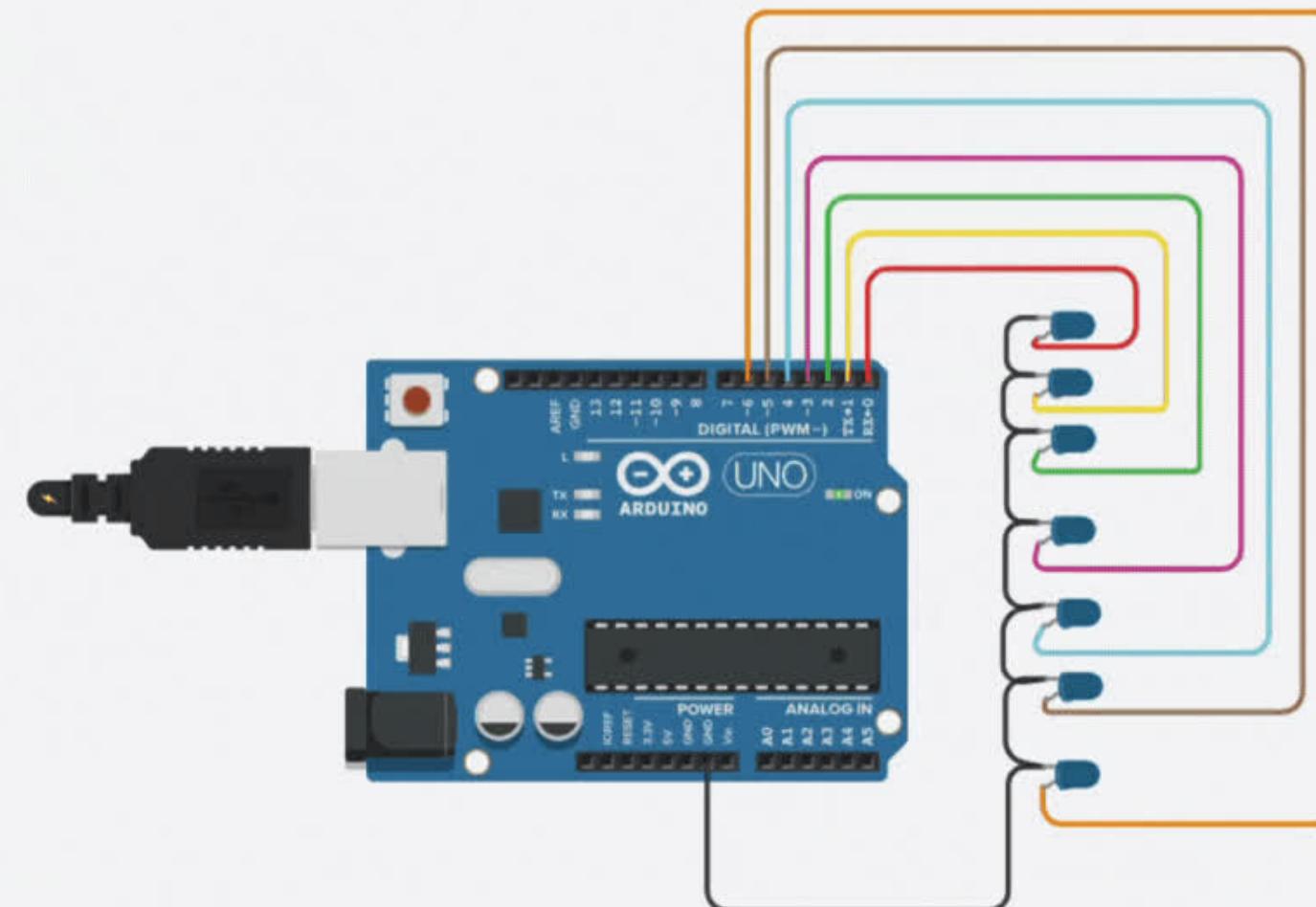
//blink led 5
digitalWrite(5, HIGH);
delay(1000);
digitalWrite(5, LOW);
delay(1000);
```

Same Goes for LED 6

# Blinking LEDs



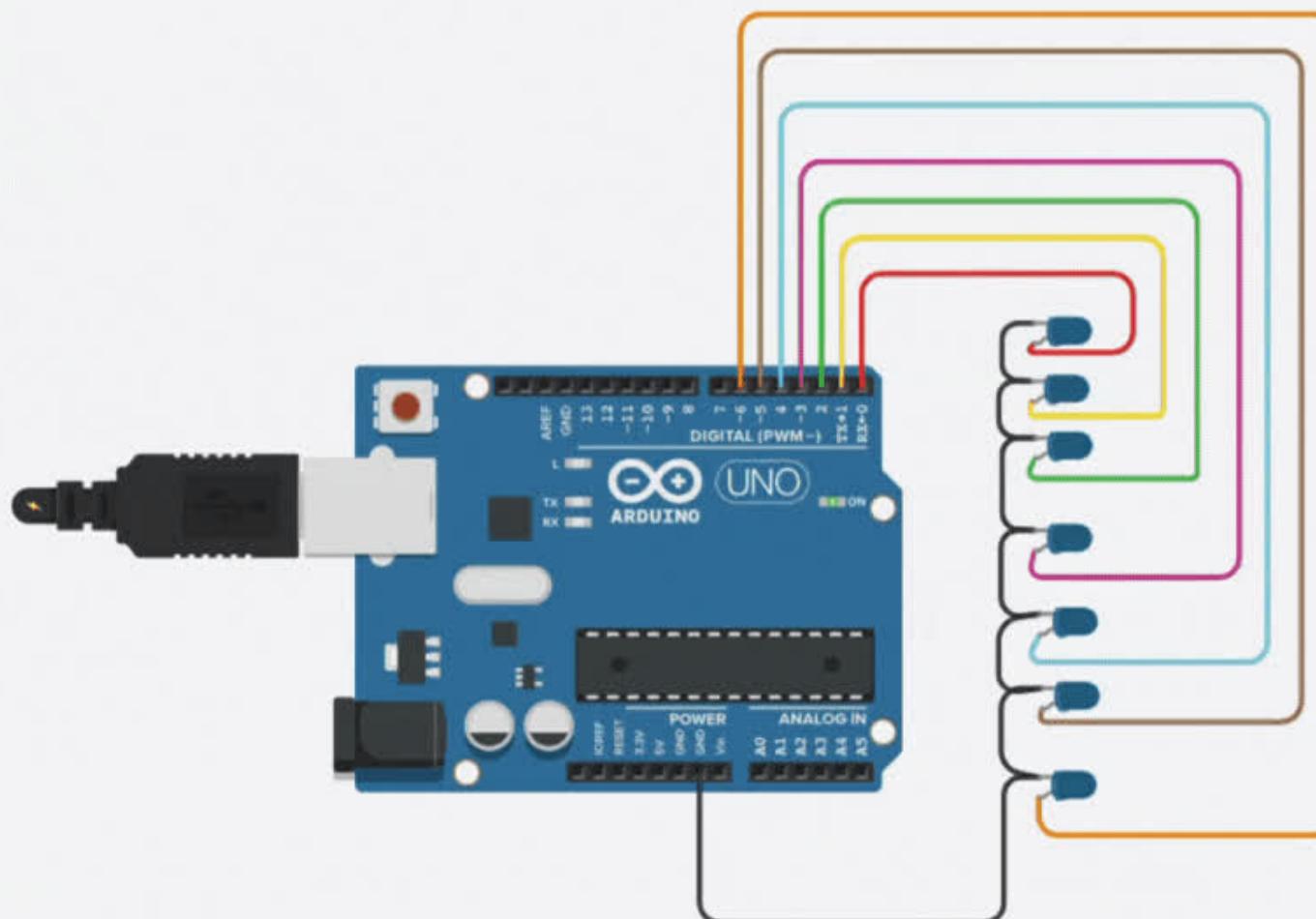
## Mission 3: Blink 7 LEDs with pattern #1



# Code



## Mission 3: Blink 7 LEDs with pattern #1



HIGH

```
void loop() {
    //light led 0
    digitalWrite(0, HIGH);
    delay(1000);

    //light led 1
    digitalWrite(1, HIGH);
    delay(1000);

    //light led 2
    digitalWrite(2, HIGH);
    delay(1000);

    //light led 3
    digitalWrite(3, HIGH);
    delay(1000);

    //light led 4
    digitalWrite(4, HIGH);
    delay(1000);

    //light led 5
    digitalWrite(5, HIGH);
    delay(1000);

    //light led 6
    digitalWrite(6, HIGH);
    delay(1000);
}
```

LOW

```
//turn off led 6
digitalWrite(6, LOW);
delay(1000);

//turn off led 5
digitalWrite(5, LOW);
delay(1000);

//turn off led 4
digitalWrite(4, LOW);
delay(1000);

//turn off led 3
digitalWrite(3, LOW);
delay(1000);

//turn off led 2
digitalWrite(2, LOW);
delay(1000);

//turn off led 1
digitalWrite(1, LOW);
delay(1000);

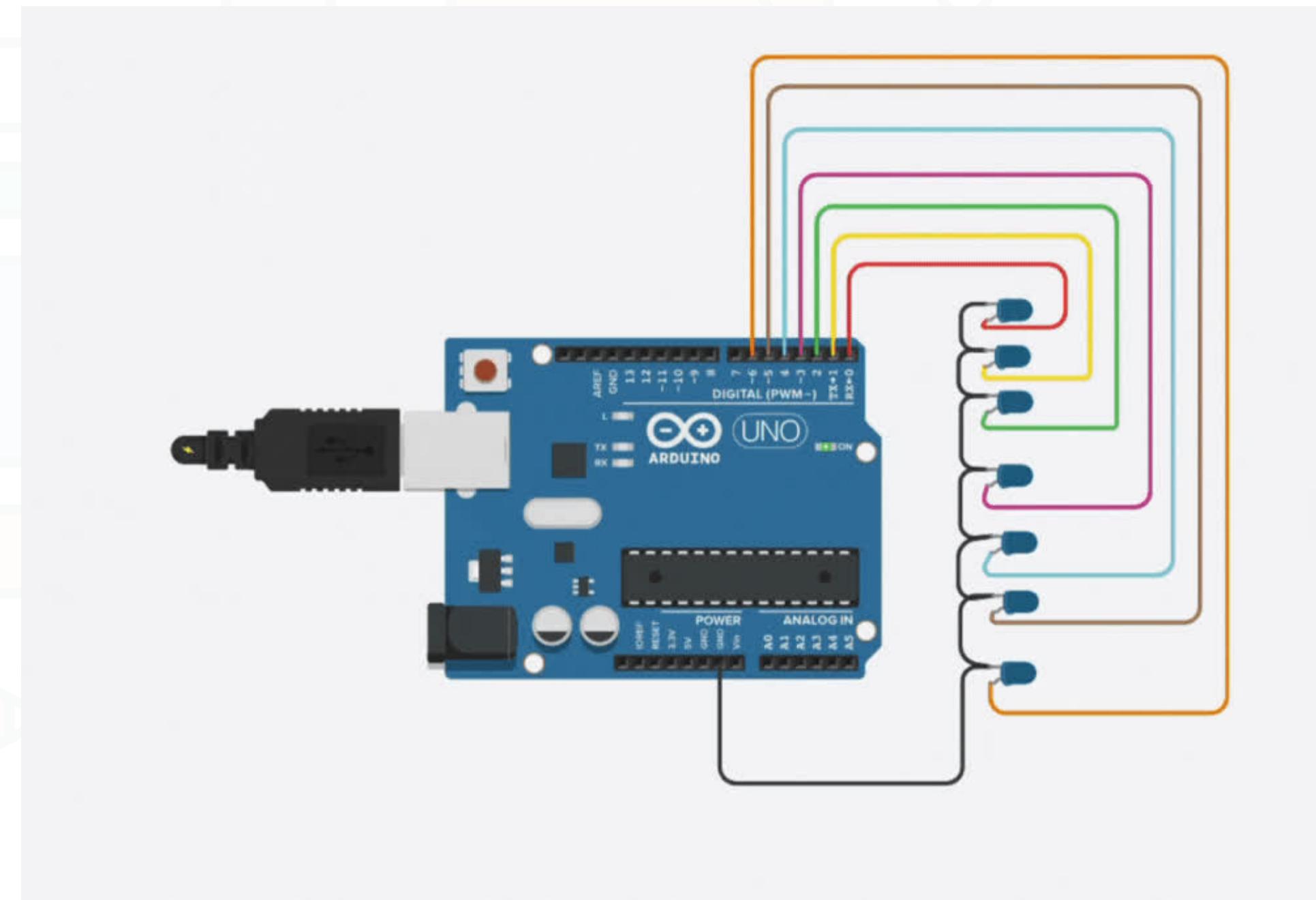
//turn off led 0
digitalWrite(0, LOW);
delay(1000);

}
```

# Blinking LEDs



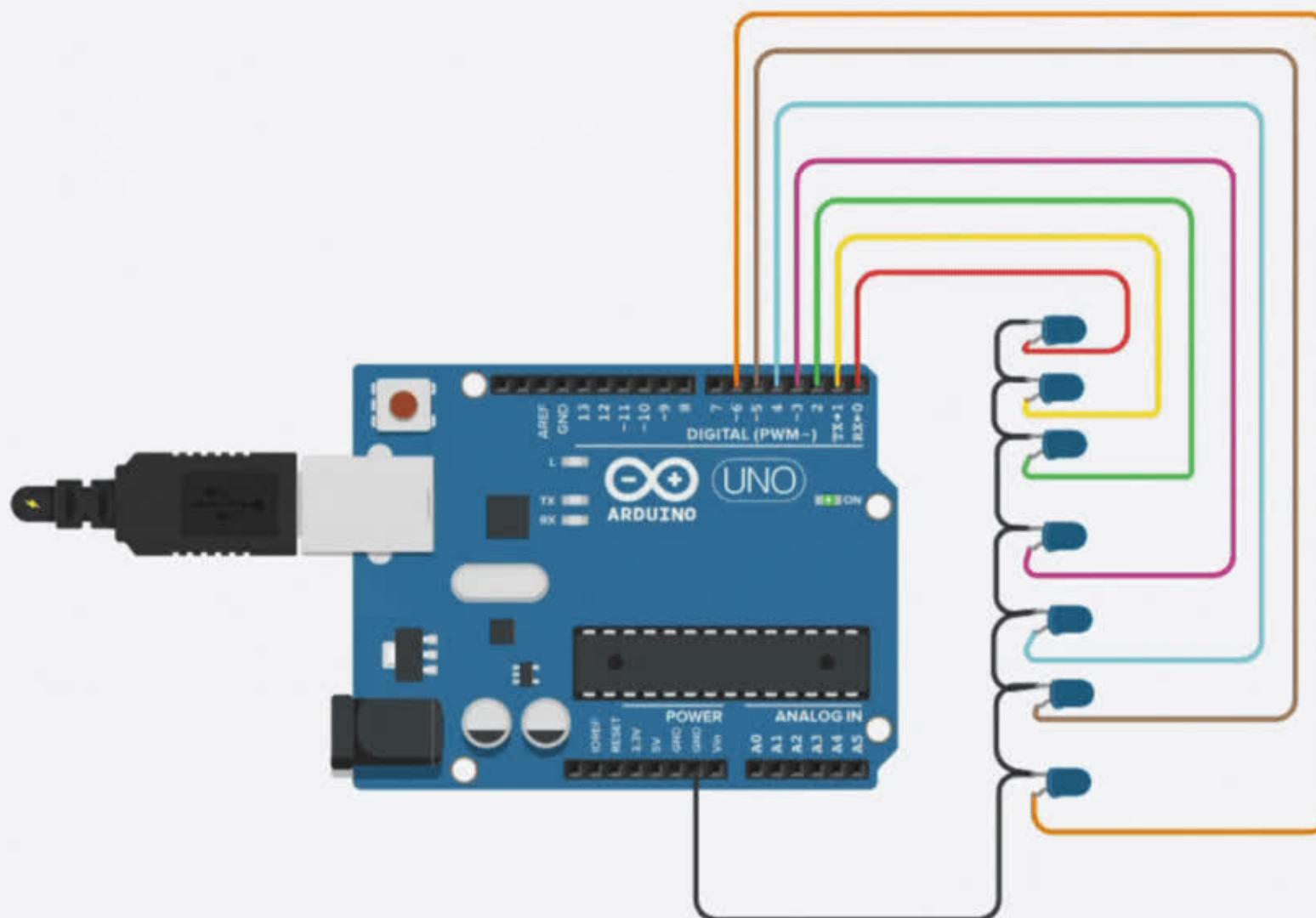
## Mission 4: Blink 7 LEDs with pattern #2



# Code



## Mission 4: Blink 7 LEDs with pattern #2



```
void loop() {
    digitalWrite(0, HIGH);
    digitalWrite(1, HIGH);
    delay(1000);

    //turn off the back
    digitalWrite(0, LOW);
    //turn on the front
    digitalWrite(2, HIGH);
    delay(1000);

    //turn off the back
    digitalWrite(1, LOW);
    //turn on the front
    digitalWrite(3, HIGH);
    delay(1000);

    //turn off the back
    digitalWrite(2, LOW);
    //turn on the front
    digitalWrite(4, HIGH);
    delay(1000);

    //turn off last 2 LEDs
    digitalWrite(5, LOW);
    digitalWrite(6, LOW);
    delay(1000);
}
```

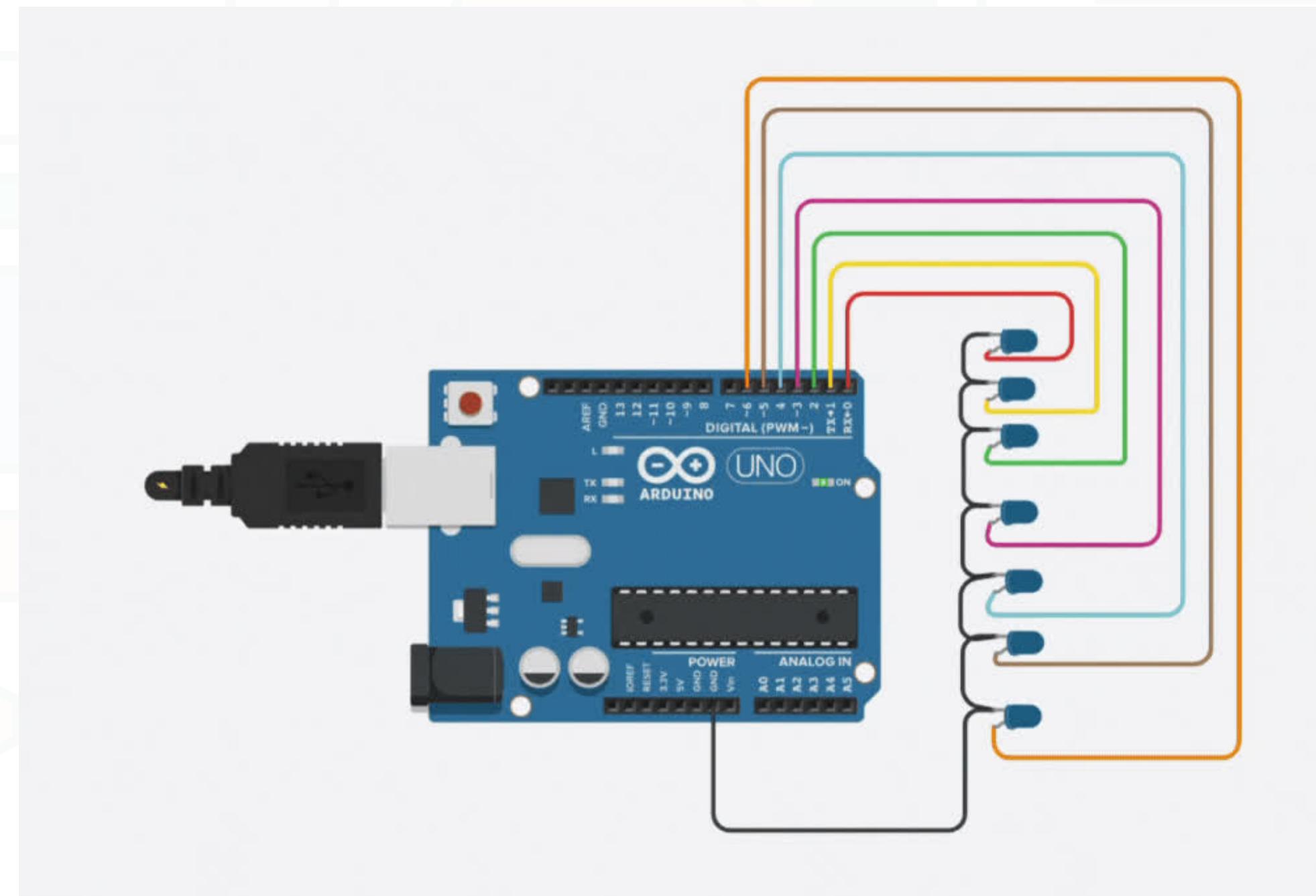
```
//turn off the back
digitalWrite(3, LOW);
//turn on the front
digitalWrite(5, HIGH);
delay(1000);

//turn off the back
digitalWrite(4, LOW);
//turn on the front
digitalWrite(6, HIGH);
delay(1000);
```

# Blinking LEDs



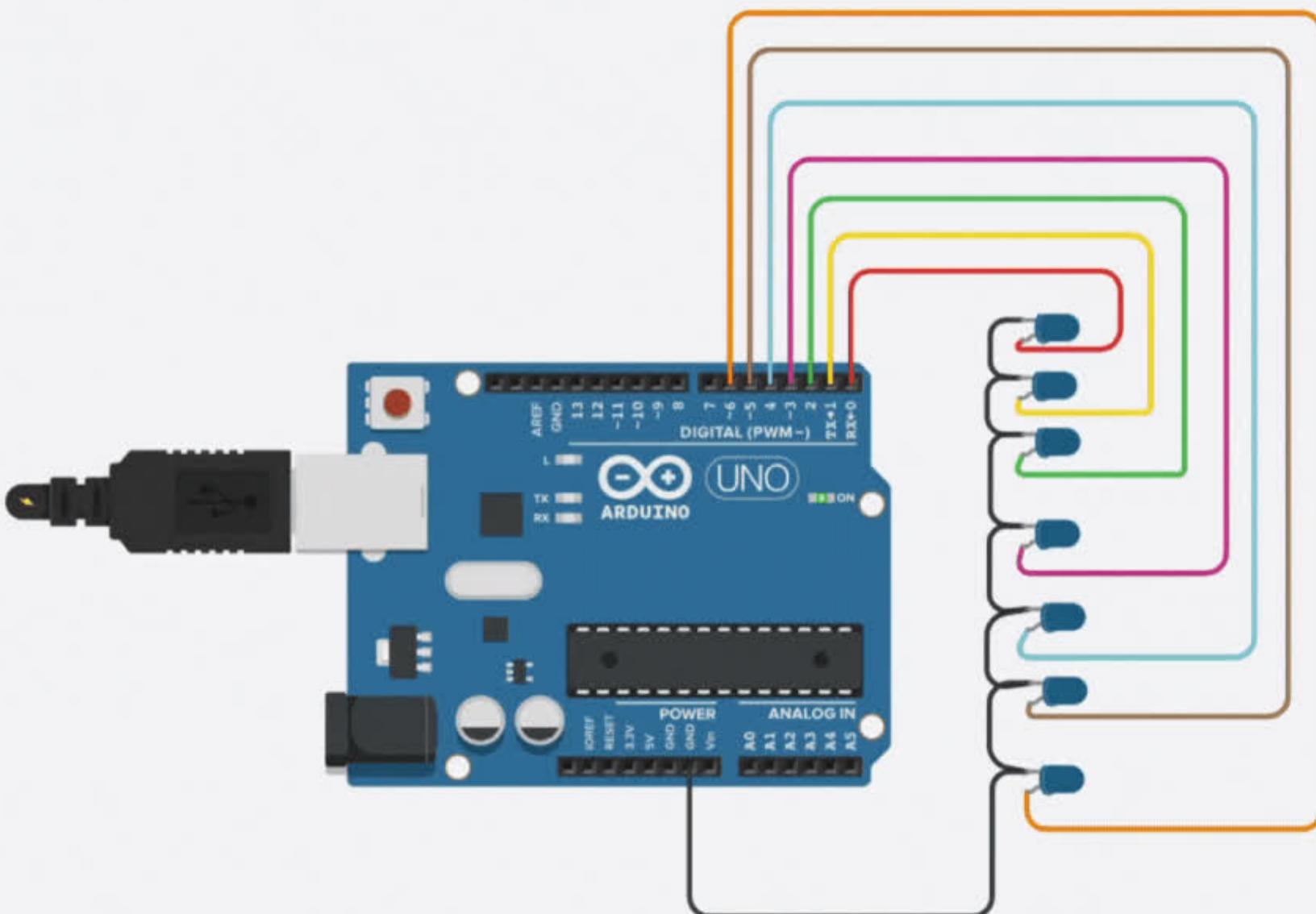
## Mission 5: Blink 7 LEDs with pattern #3



# Code



# Mission 5: Blink 7 LEDs with pattern #3



```
void loop() {
    digitalWrite(0, HIGH);
    digitalWrite(6, HIGH);
    delay(1000);

    digitalWrite(0, LOW);
    digitalWrite(1, HIGH);
    digitalWrite(5, HIGH);
    digitalWrite(6, LOW);
    delay(1000);

    digitalWrite(1, LOW);
    digitalWrite(2, HIGH);
    digitalWrite(4, HIGH);
    digitalWrite(5, LOW);
    delay(1000);

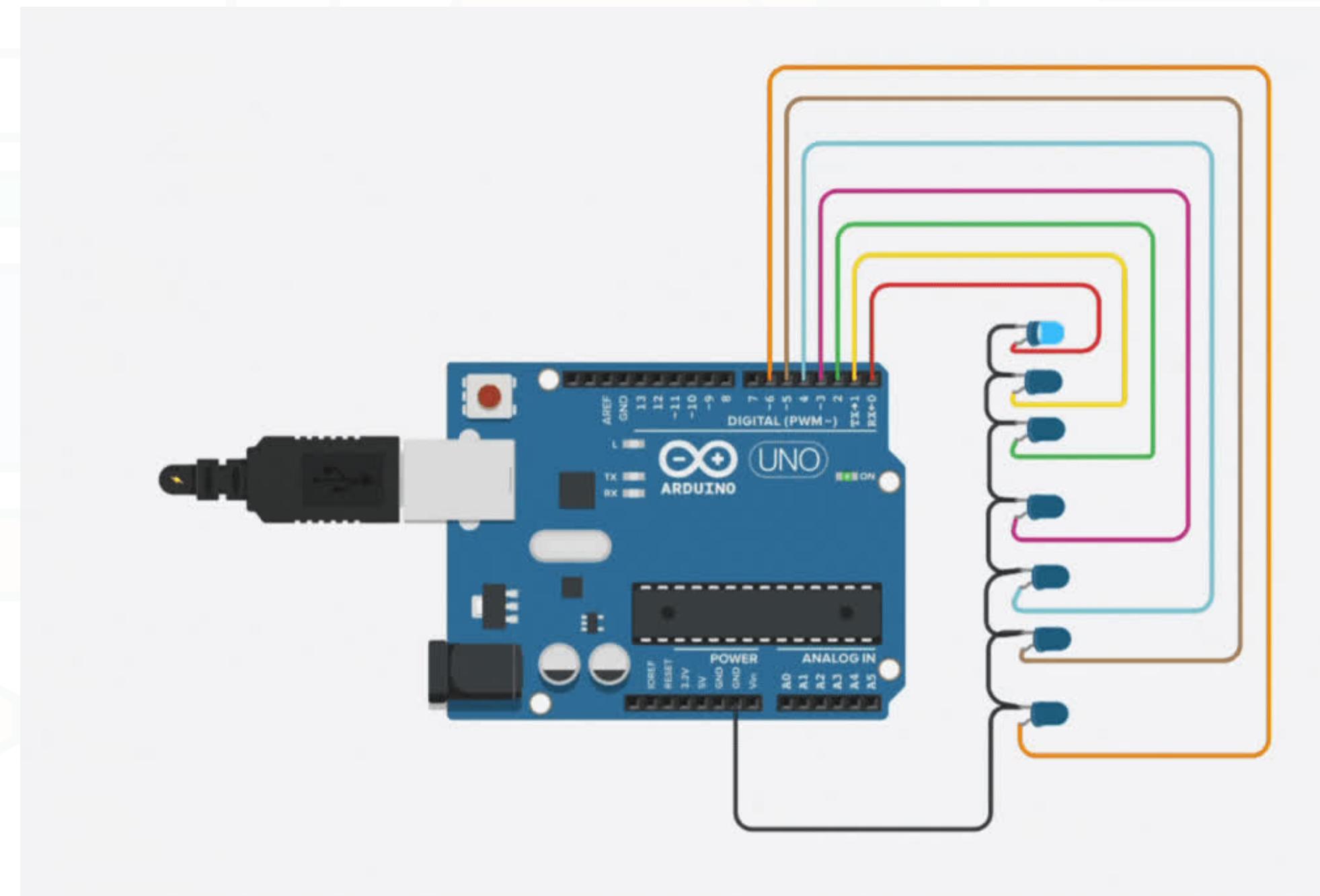
    digitalWrite(2, LOW);
    digitalWrite(3, HIGH);
    digitalWrite(4, LOW);
    delay(1000);}
```

```
//time to reverse  
digitalWrite(2, HIGH);  
digitalWrite(3, LOW);  
digitalWrite(4, HIGH);  
delay(1000);  
  
digitalWrite(1, HIGH);  
digitalWrite(2, LOW);  
digitalWrite(4, LOW);  
digitalWrite(5, HIGH);  
delay(1000);  
  
digitalWrite(0, HIGH);  
digitalWrite(1, LOW);  
digitalWrite(5, LOW);  
digitalWrite(6, HIGH);  
delay(1000);  
  
digitalWrite(0, LOW);  
digitalWrite(6, LOW);  
delay(1000);
```

# Blinking LEDs



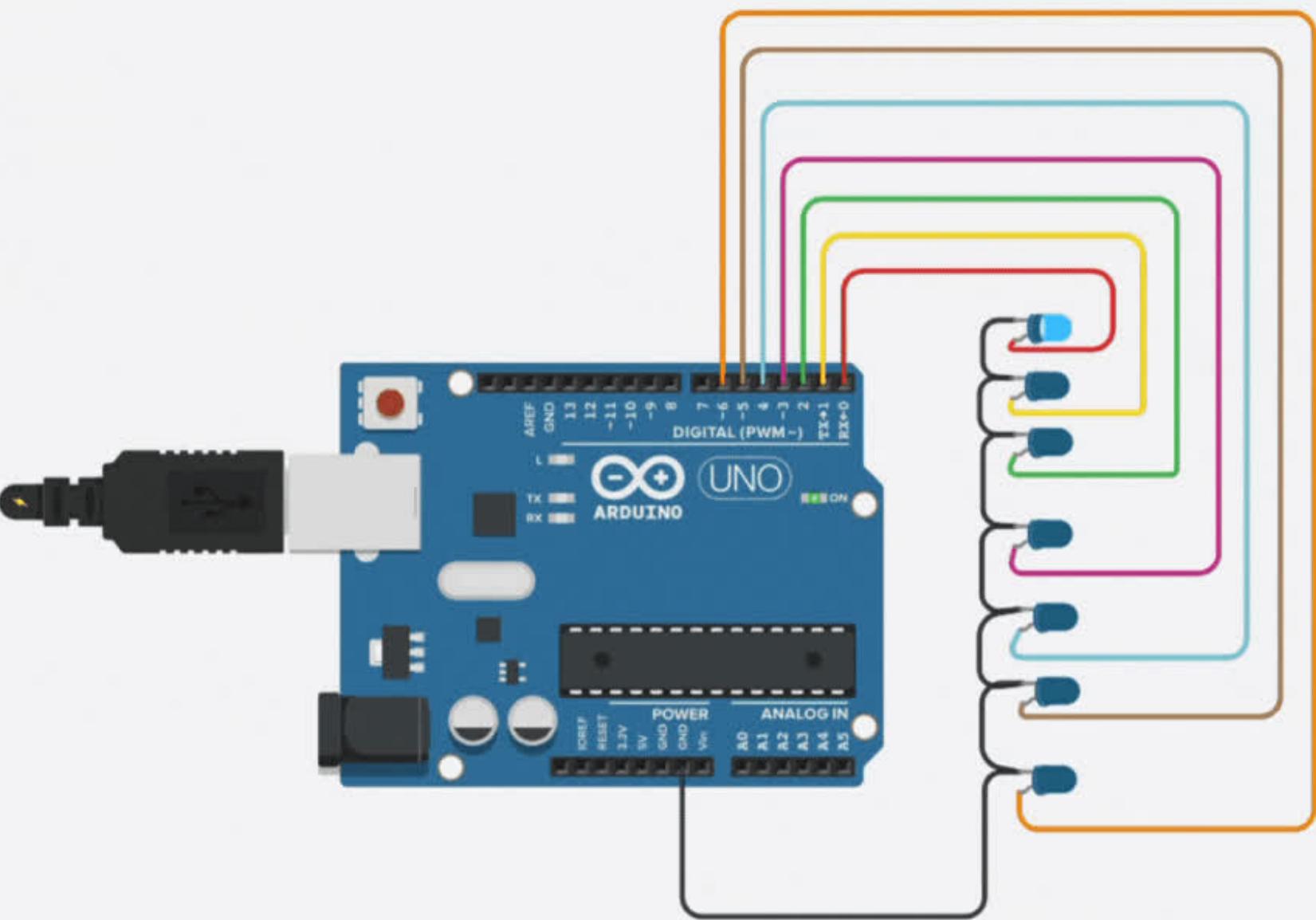
## Mission 6: Blink 7 LEDs with pattern #4



# Code



## Mission 6: Blink 7 LEDs with pattern #4



```
void loop() {
    digitalWrite(0, HIGH);
    delay(1000);

    digitalWrite(0, LOW);
    digitalWrite(2, HIGH);
    delay(1000);

    digitalWrite(2, LOW);
    digitalWrite(4, HIGH);
    delay(1000);

    digitalWrite(4, LOW);
    digitalWrite(6, HIGH);
    delay(1000);
}
```



```
//time to reverse

digitalWrite(4, HIGH);
digitalWrite(6, LOW);
delay(1000);

digitalWrite(2, HIGH);
digitalWrite(4, LOW);
delay(1000);

digitalWrite(2, LOW);
```