tangible

Digital Output

Tangible Matrix

Context	DIGITAL	ANALOG
INPUTS	BUTTON	POTENTIOMETER photoCell
OUTPUTS	LED BLINK	LED FADE

Digital OUTPUT

Context	DIGITAL	ANALOG
INPUTS	BUTTON	POTENTIOMETER photoCell
OUTPUTS	**LED BLINK**	LED FADE

REFERENCE

Digital Output

CONTEXT

	Digital	Analog
Input		
Output	■	

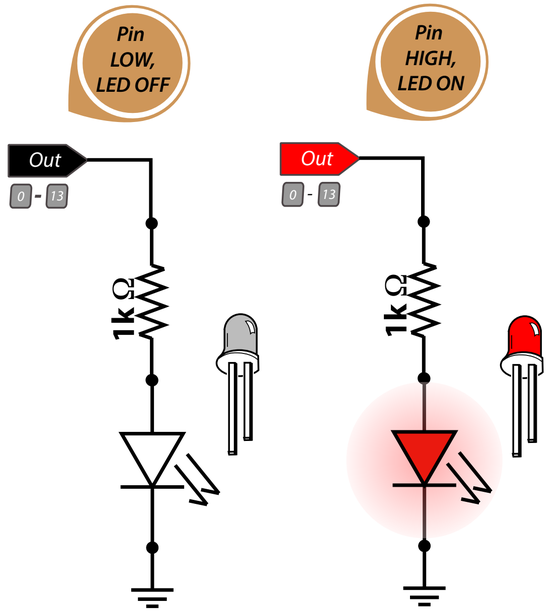
COMMAND

digitalWrite (*pin*, *state*);

pin = 0-13

state = HIGH (1, 5V) , LOW (0, GND)

CIRCUIT



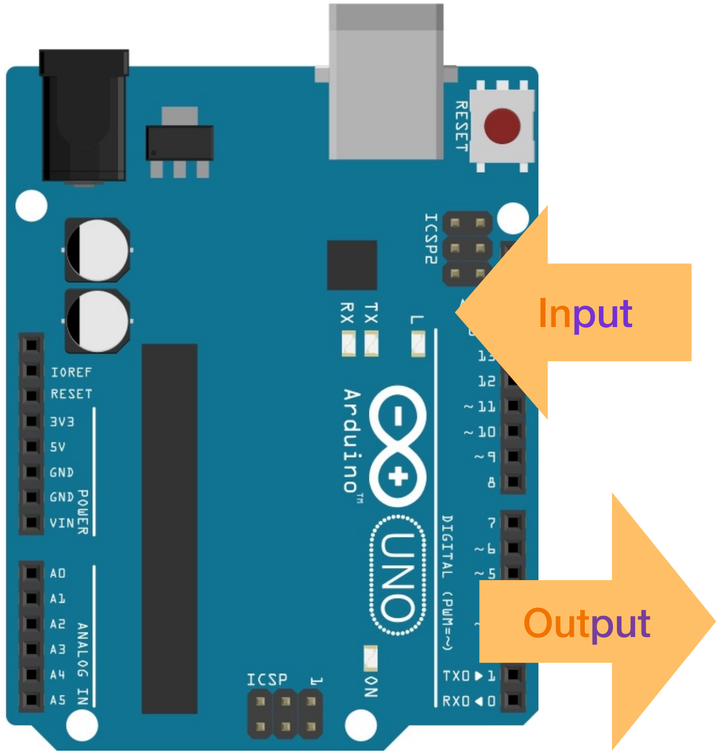
CODE

```
int ledPIN = 13;


void setup() {

  pinMode( ledPIN, OUTPUT );

}

void loop() {

  digitalWrite( ledPIN, 1 );
  delay(1000);

  digitalWrite( ledPIN, 0 );
  delay(1000);

}
```

The CONTEXT

INPUT / OUTPUT

When we discuss **INPUT** and **OUTPUT** we mean relative to our **ARDUINO**.



INPUT
Electric **SIGNAL** that moves **IN** **to** the **Arduino**

OUTPUT
Electric **SIGNAL** that moves **OUT** **of** the **Arduino**

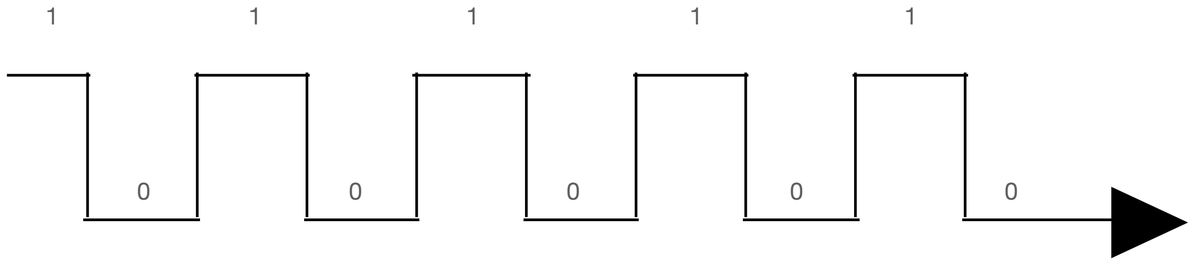
DIGITAL

Refers to **SIGNALS**, **CIRCUITs** or **LOGICAL** systems that

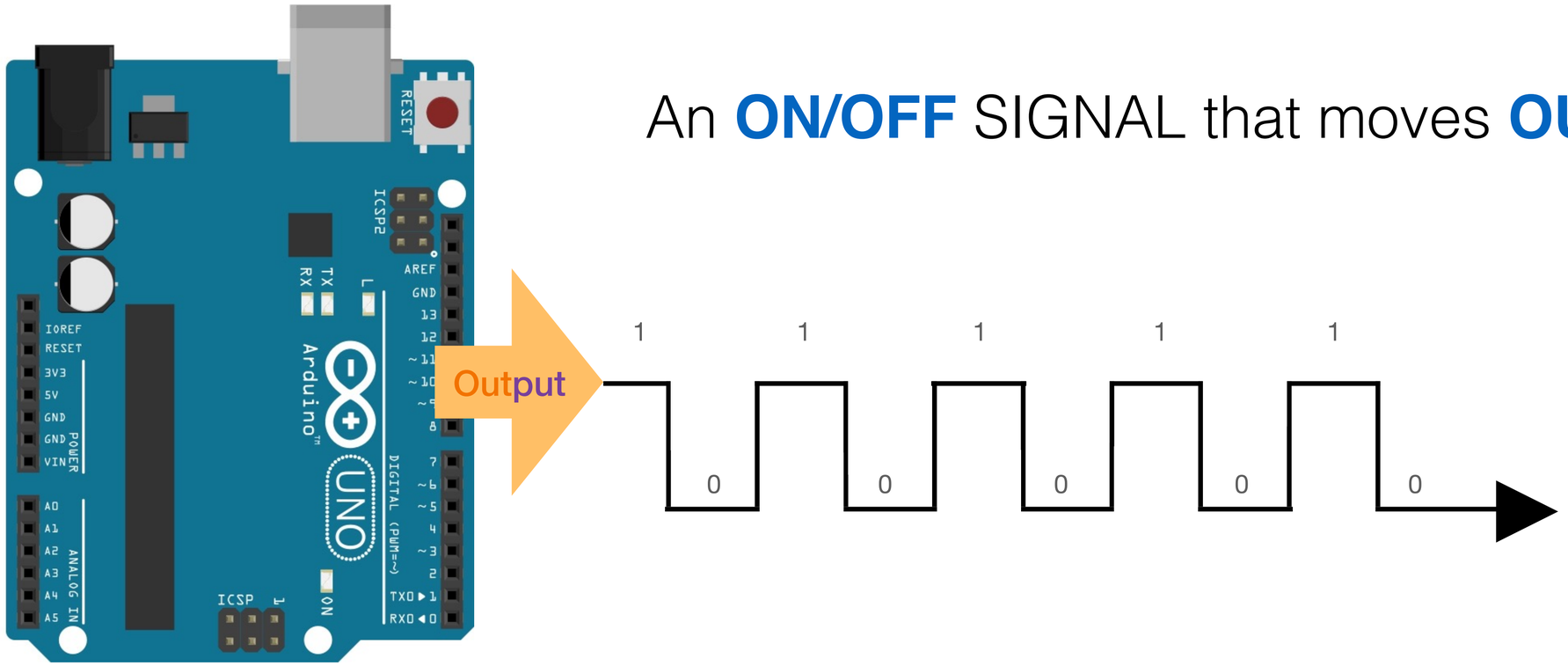
have

ONLY TWO STATES
(0,1)

An **ON/OFF** SIGNAL.



DIGITAL OUTPUT



An **ON/OFF** SIGNAL that moves **OUT** of the Arduino

The CODE

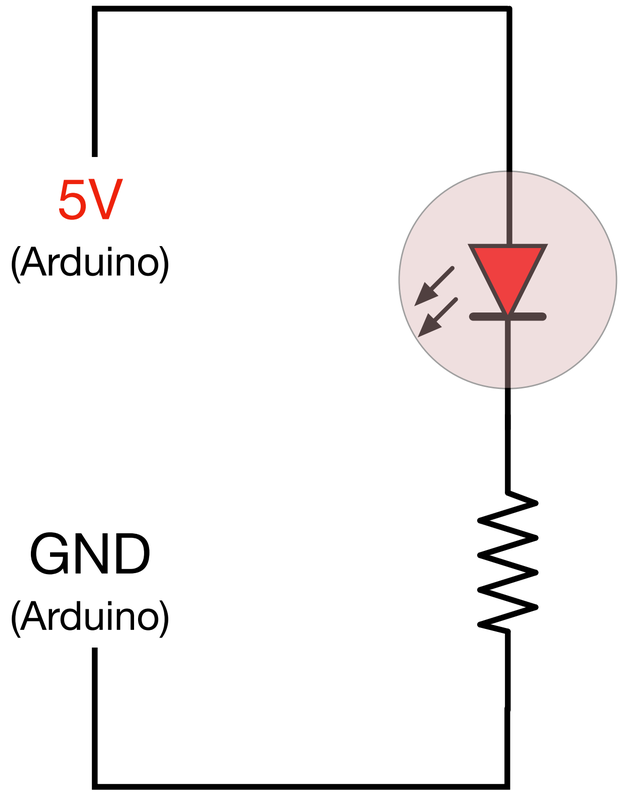
Digital **Output** (**Blink** an LED)

digitalWrite(*pin, state*);

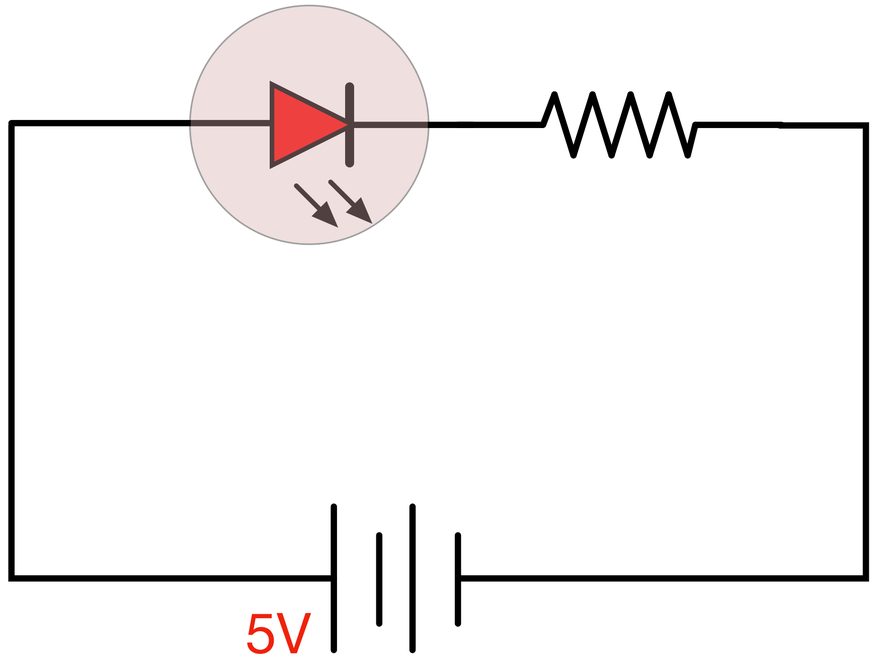
state = 0, 1 (LOW, HIGH)

The CIRCUIT

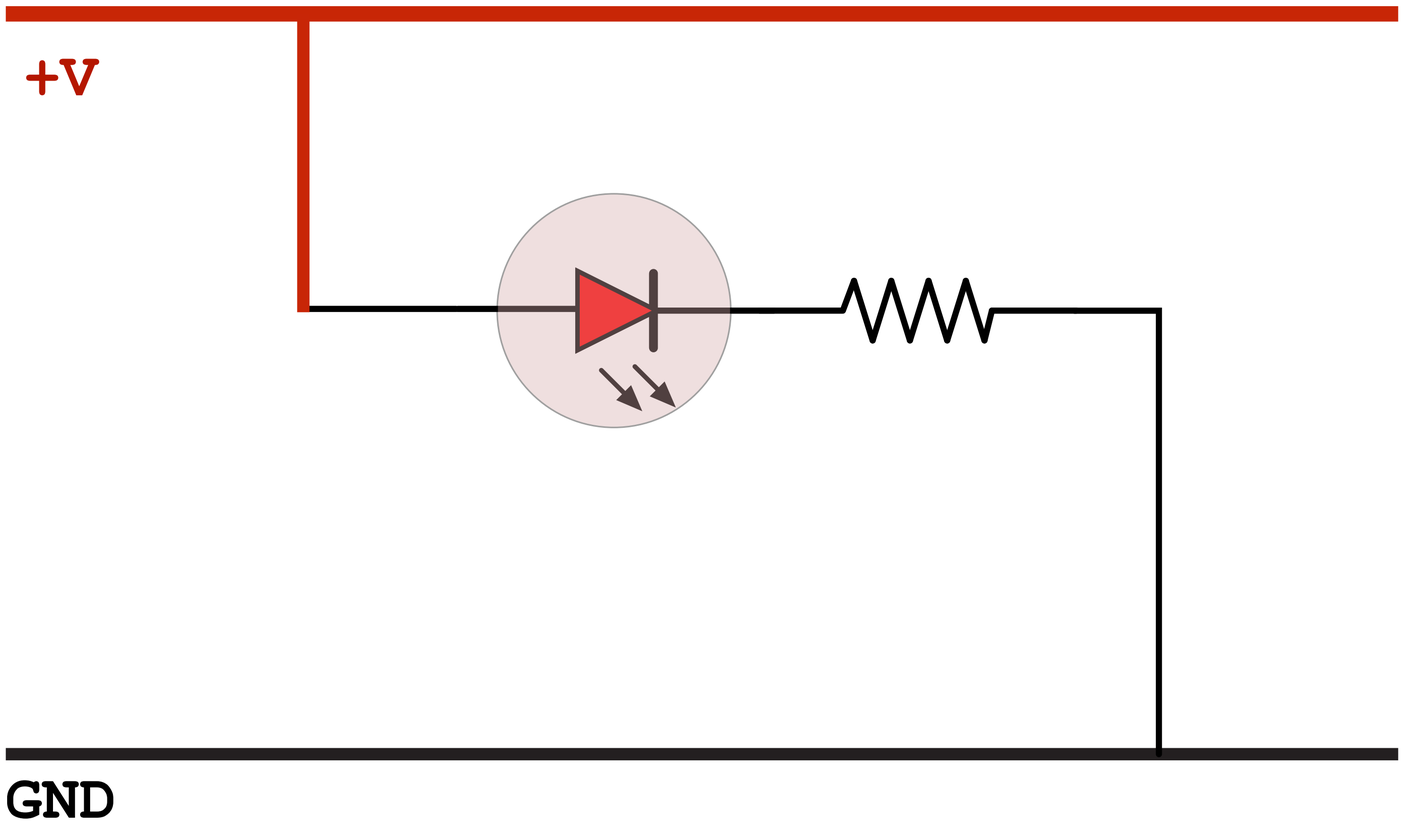
Here is the first circuit we built on a breadboard.



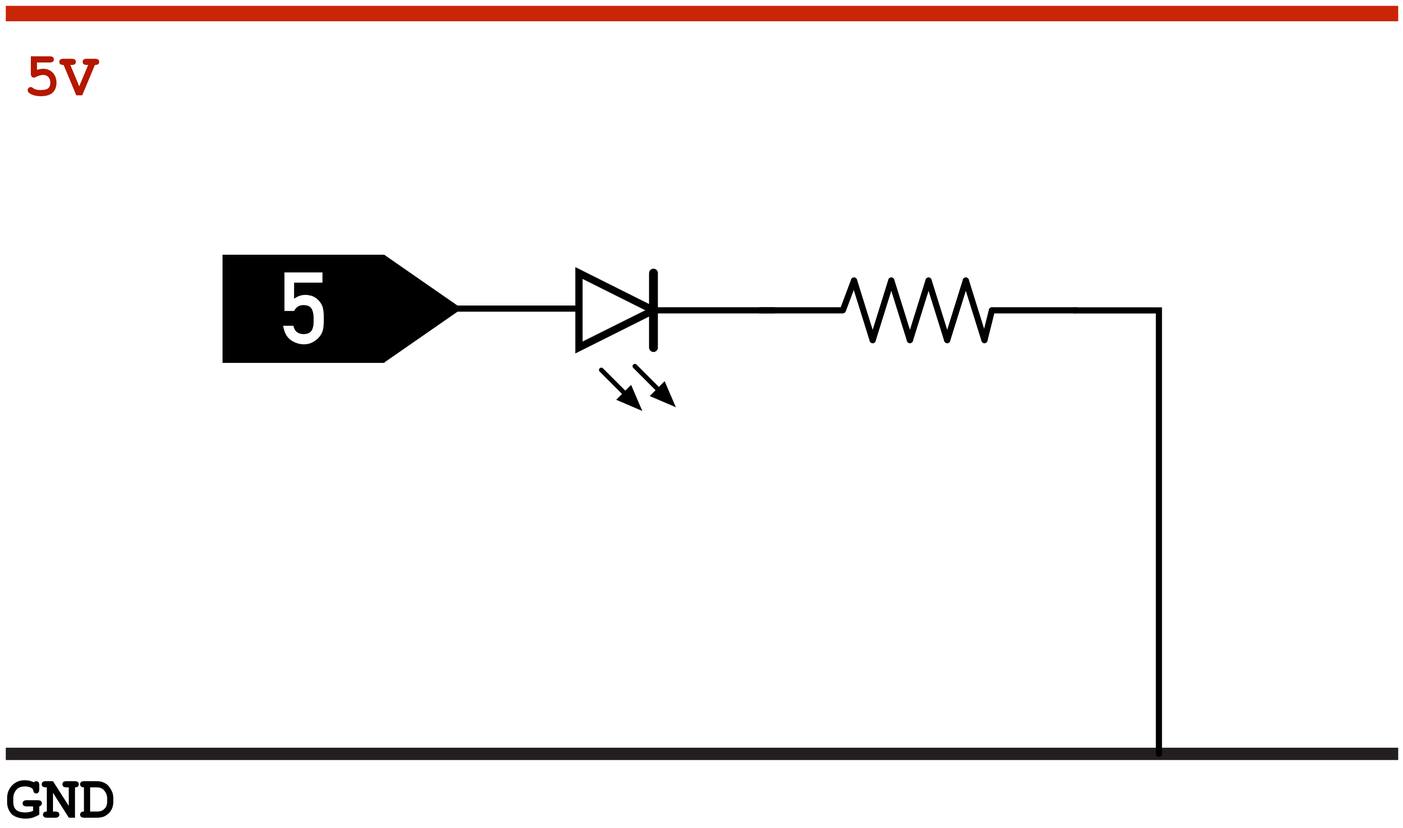
Let’s rotate it on its side.



Let’s rotate it on its side.

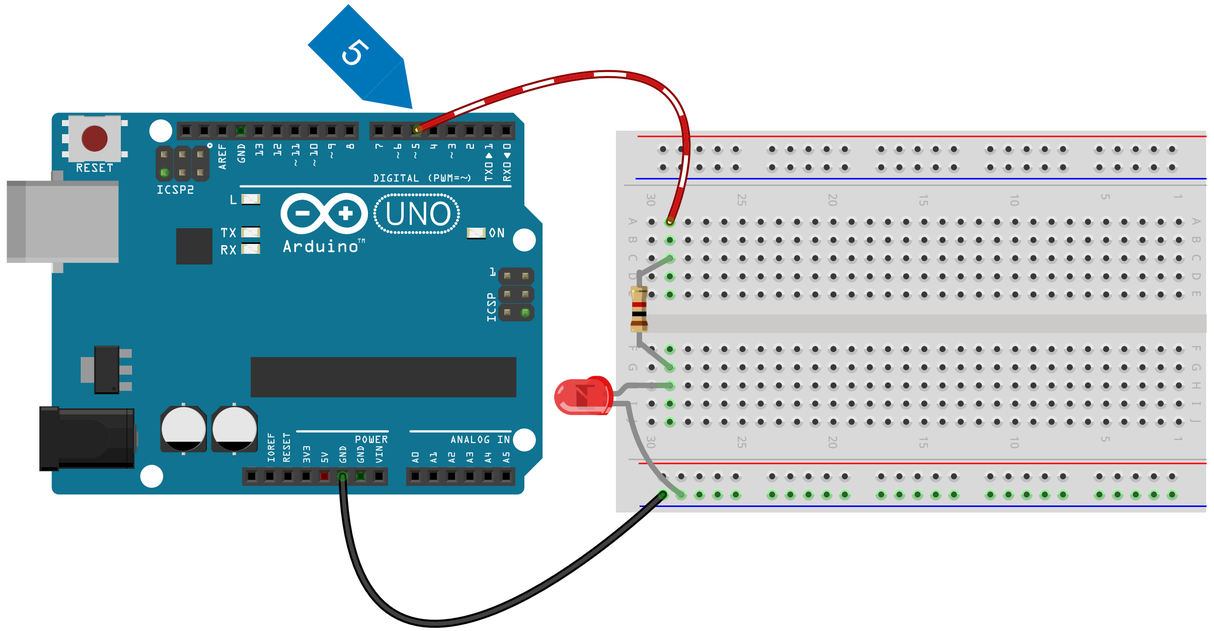


Then, remove the battery and connect to Pin 5 on your Arduino.

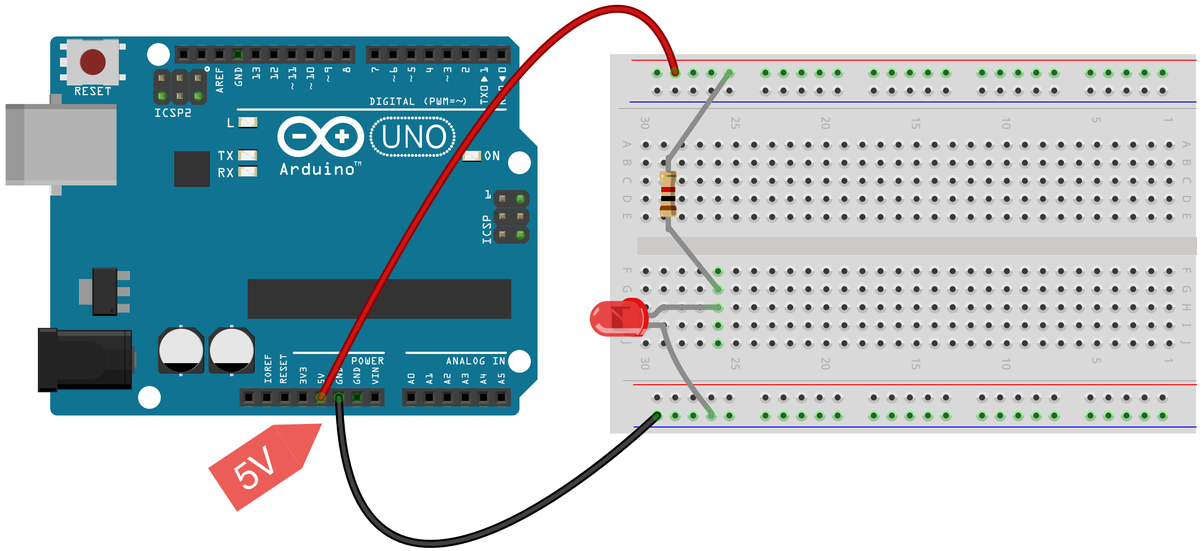


Let’s compare …

Goal Circuit

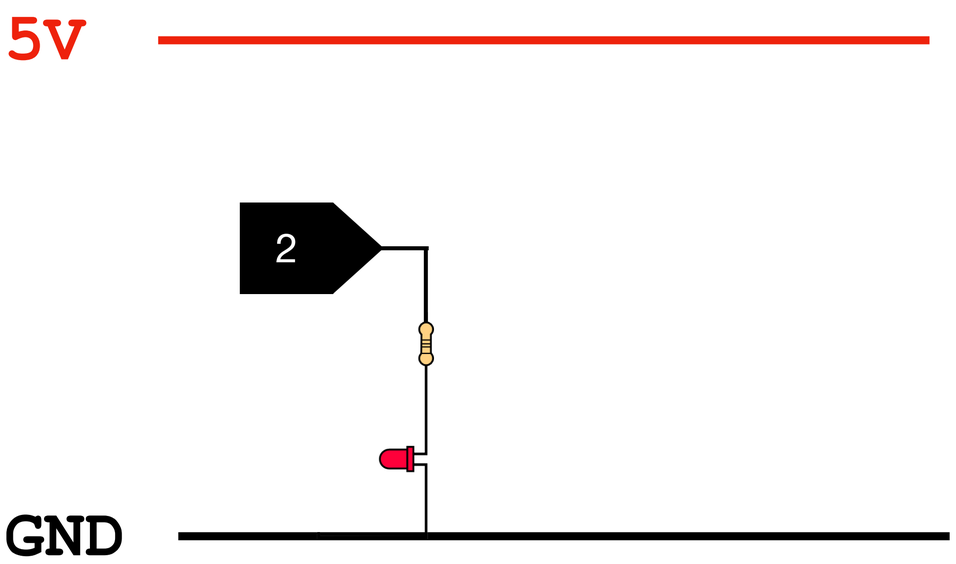


First Circuit:

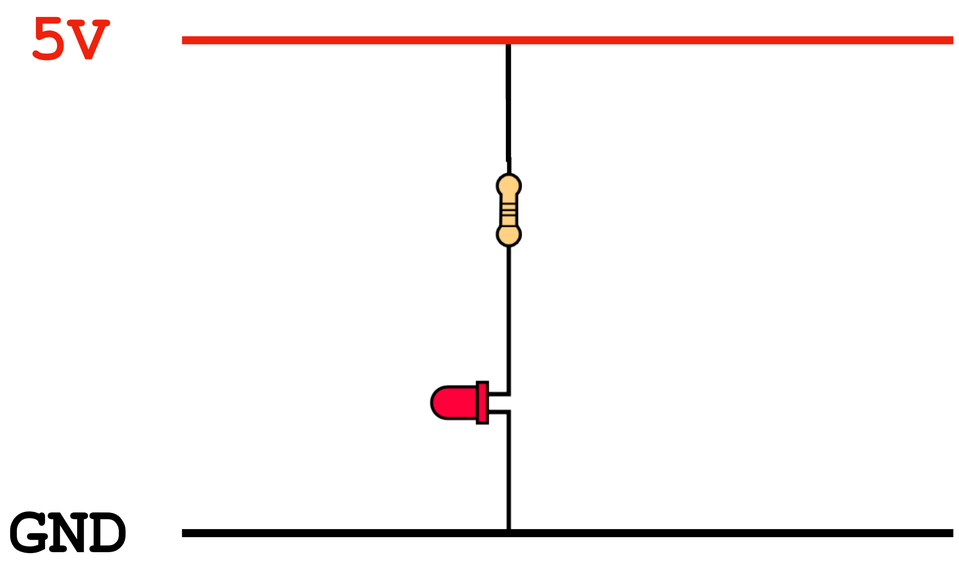


Arduino Digital Pins

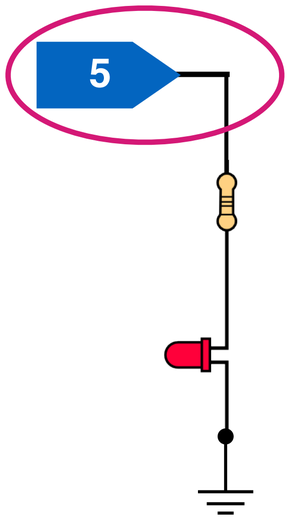
BLINK circuit - POWER from a PIN!

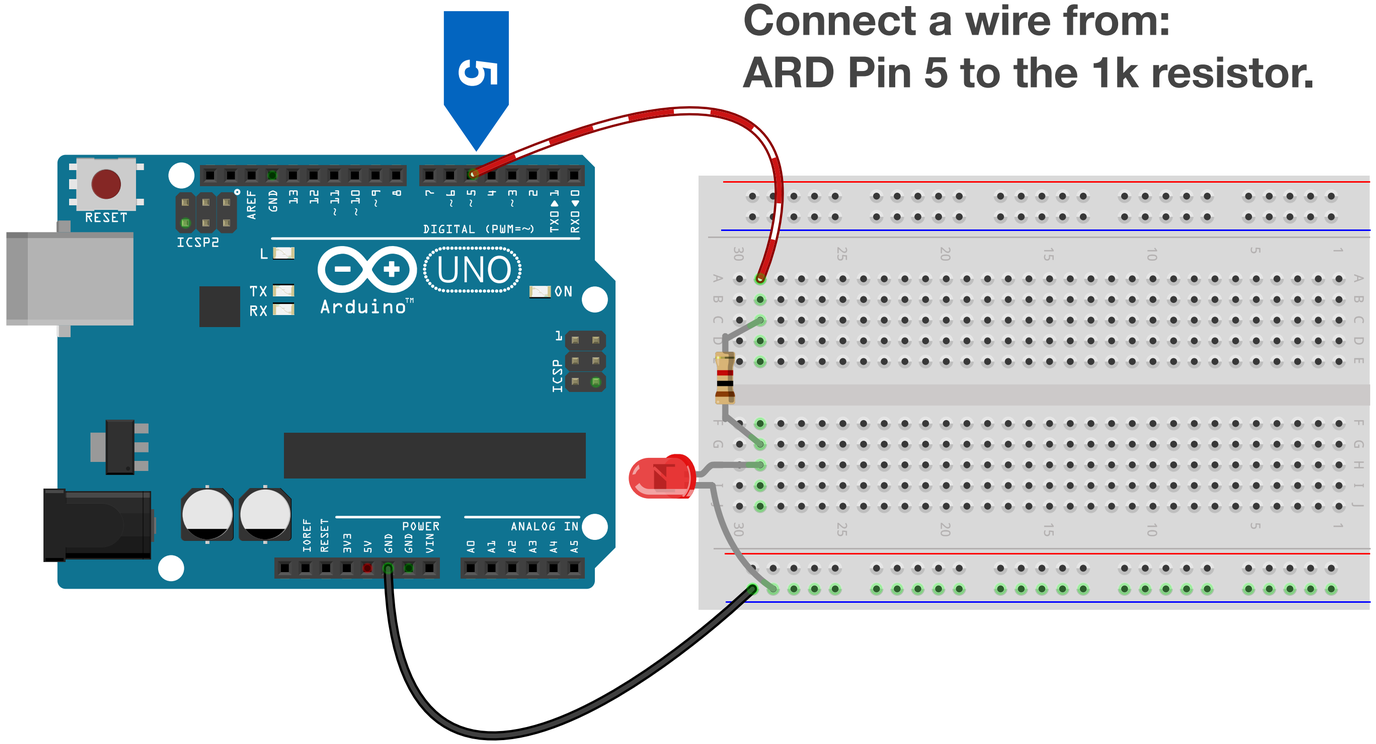


Intro circuit - continuous POWER



Its a simple mod





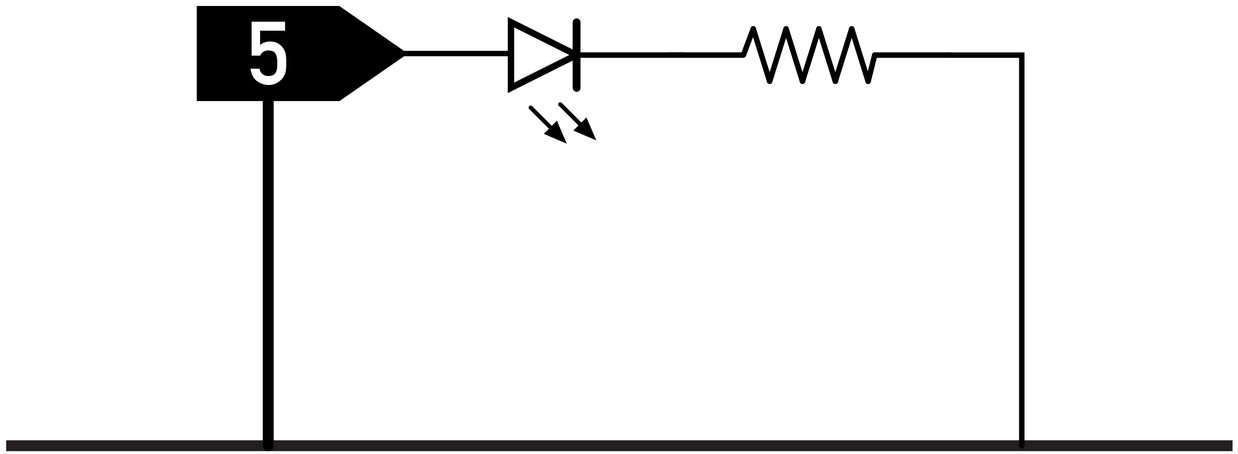
Let’s Add Code

(Making things BLINK)

Let’s Upload Code

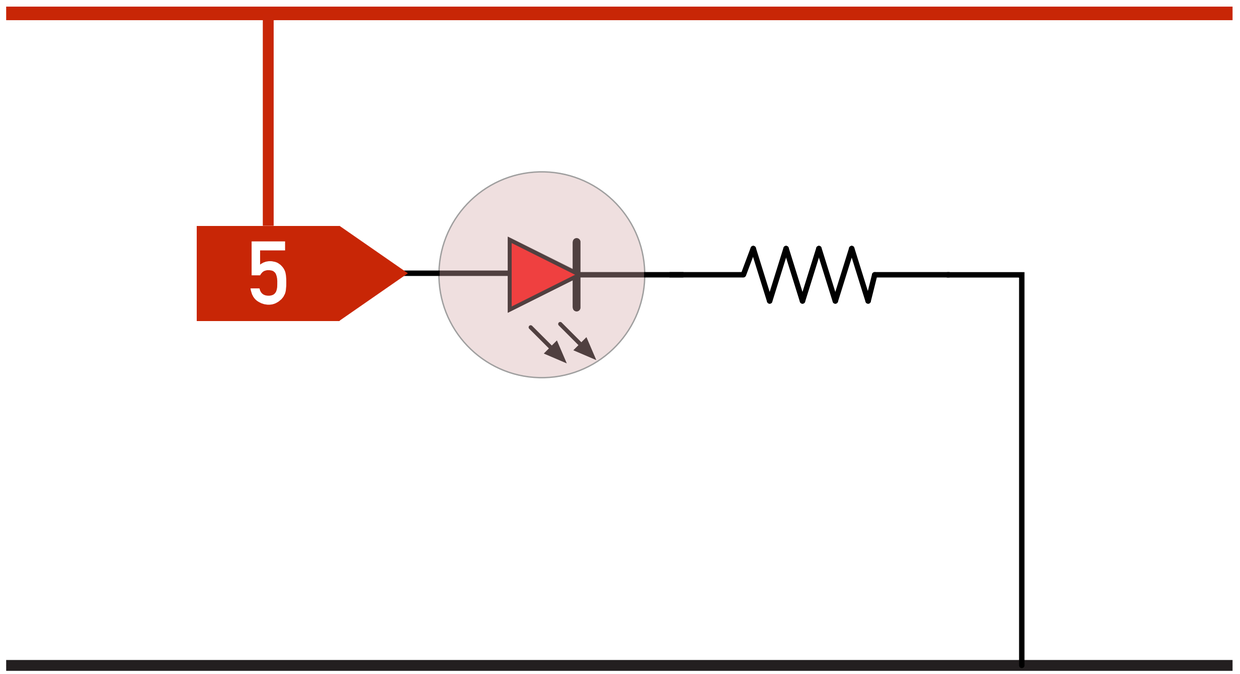
01-simpleBlink.ino

What’s Going ON ?




```
digitalWrite(5, LOW);
```

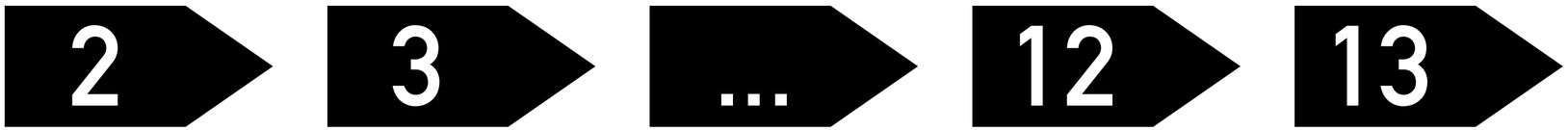
What’s Going ON ?




```
digitalWrite(5, HIGH);
```

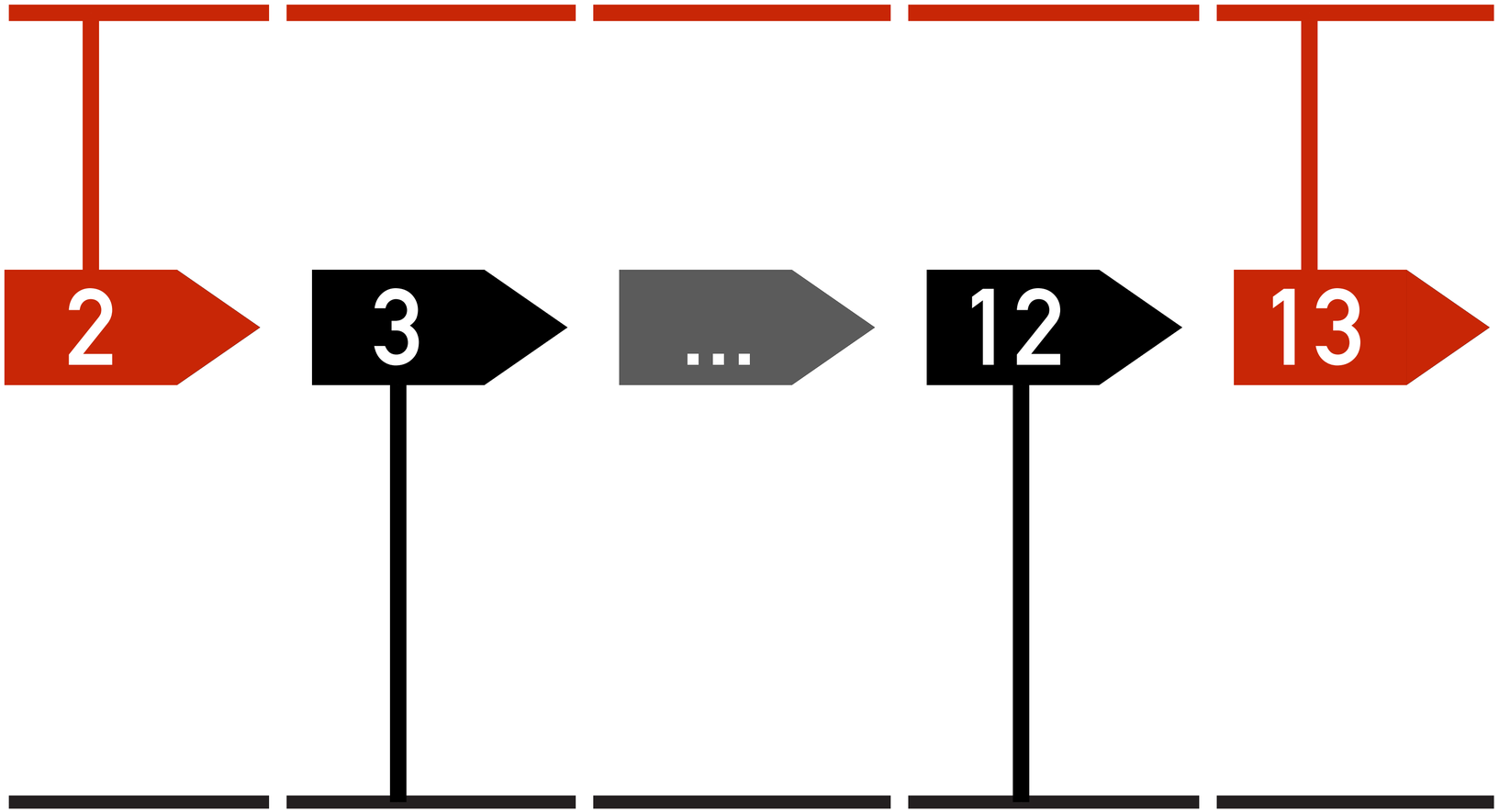
One more time …

Digital pins are independent waterfalls.



One more time …

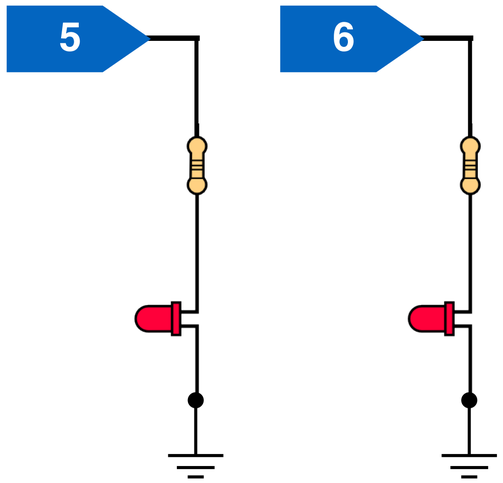
Pin VOLTAGE can be set with words <CODE>.

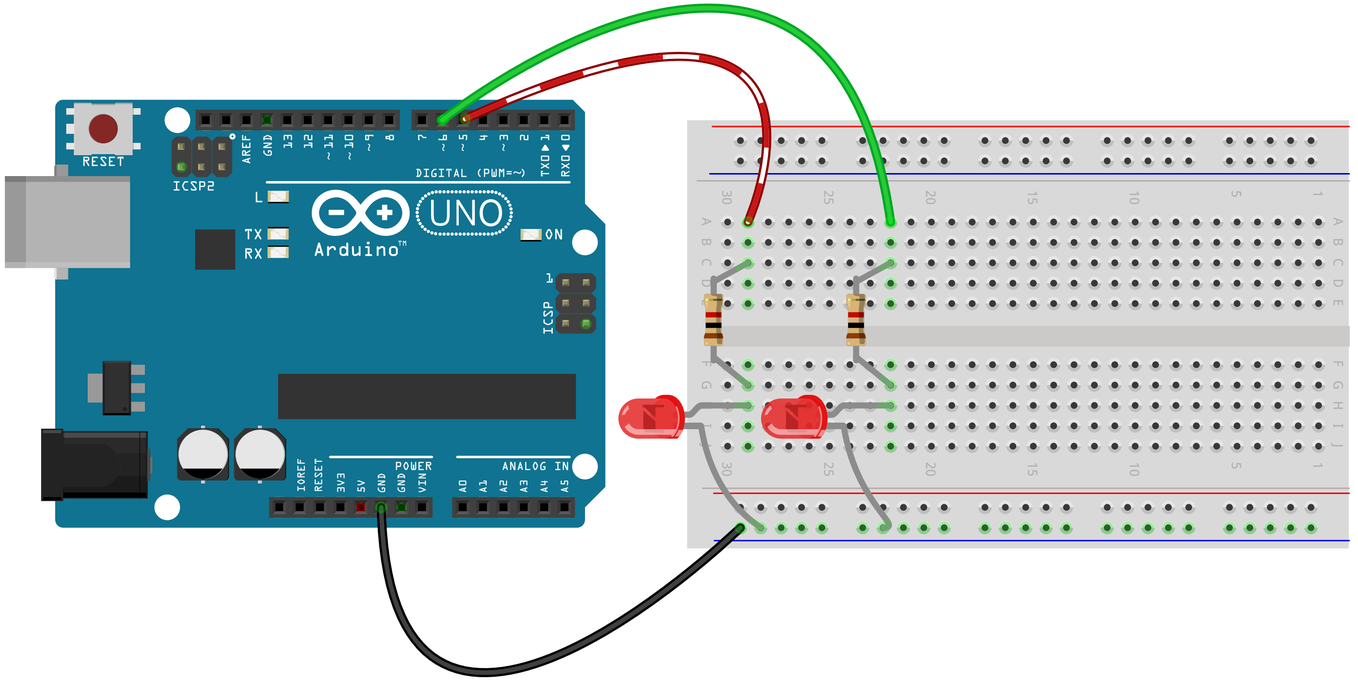


Going beyond

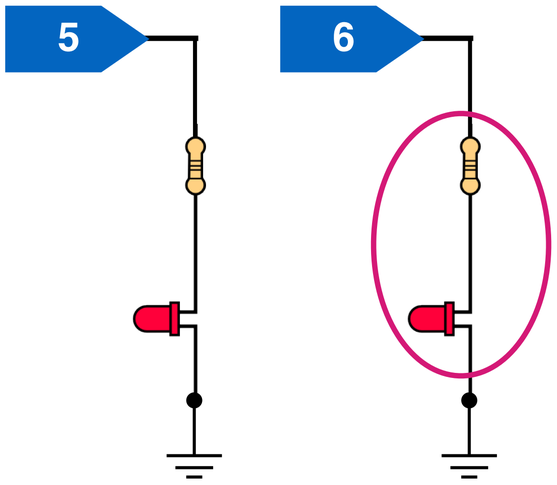
(multiple LEDs)

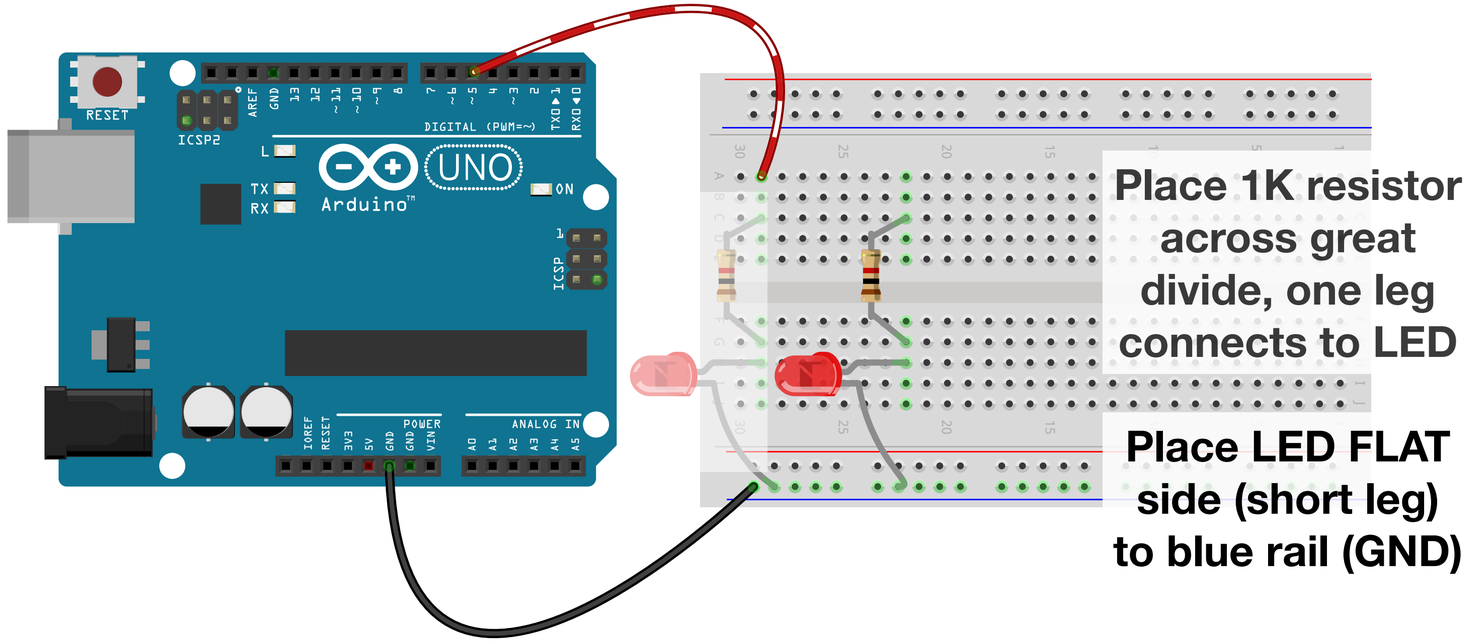
Let’s Blink two LEDs



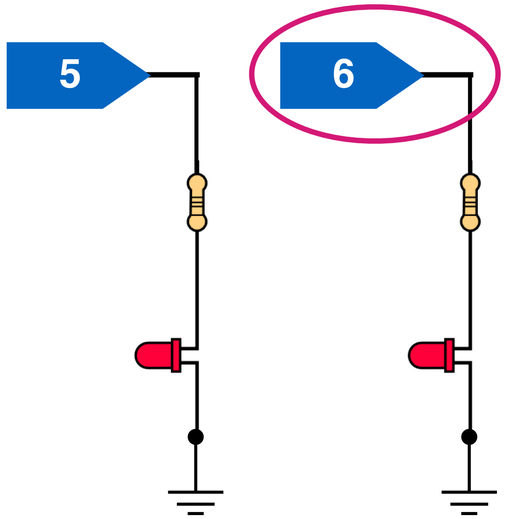


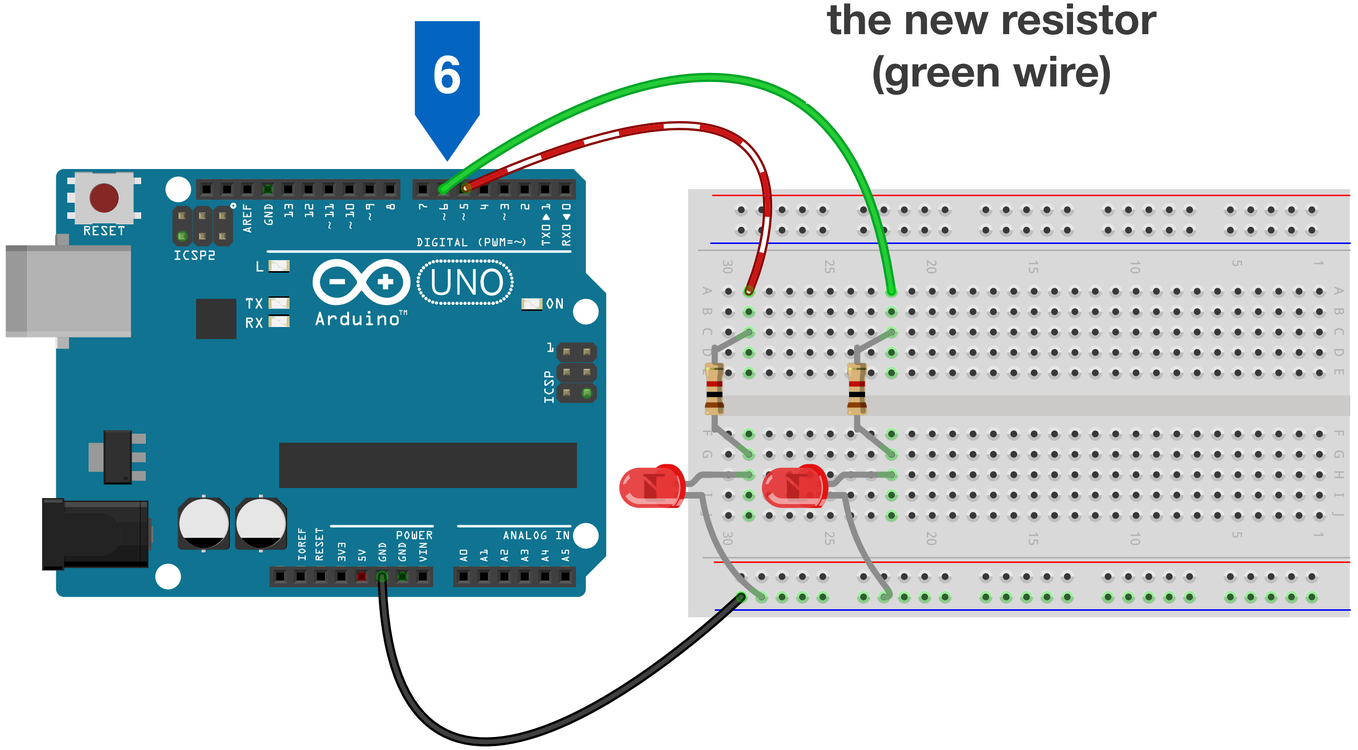
Let’s break this build down:





Let’s Blink two LEDs



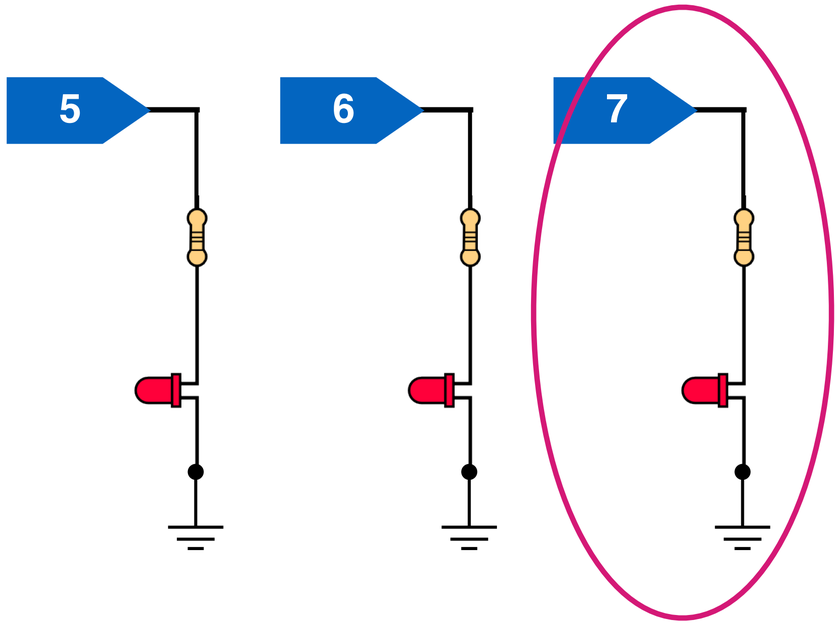


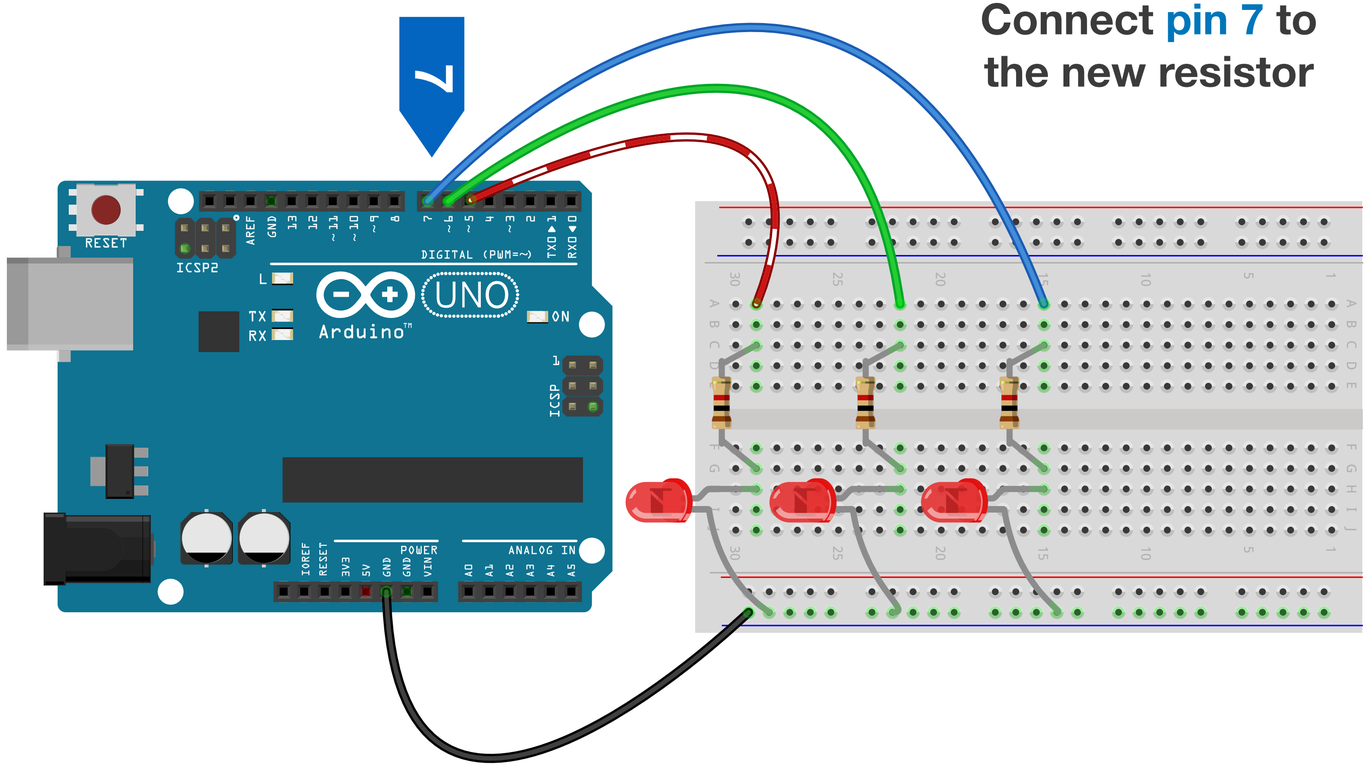
Can we extend our code to talk to TWO LEDs?

If it goes sideways

02-blinkTwo.ino

Three?


5
6
7


7
Connect pin 7 to the new resistor
RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
Arduino™
UNO
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN

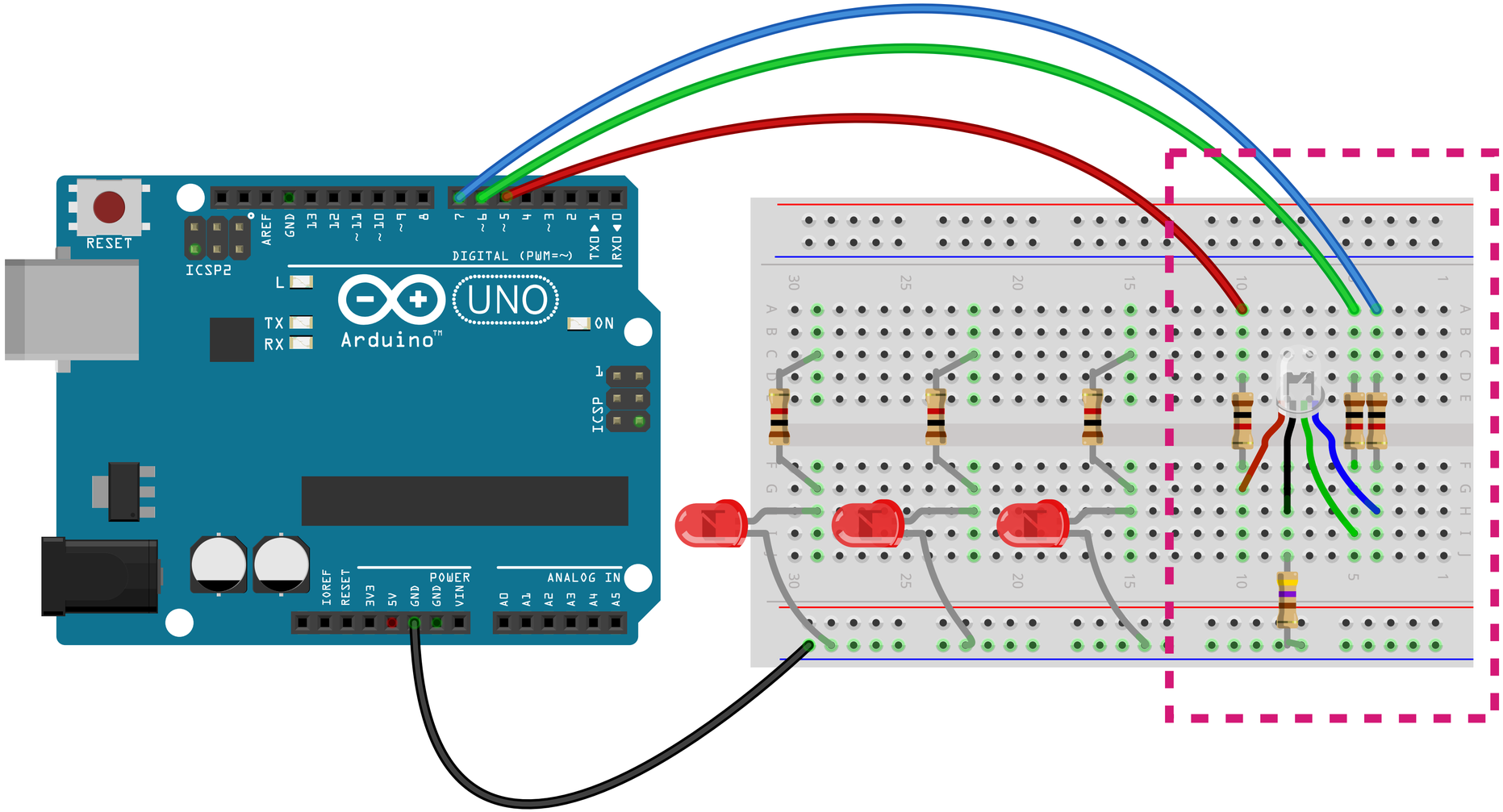
Let’s upload 3-led code

03-blinkThree.ino

CIRCUIT
variations
RGB

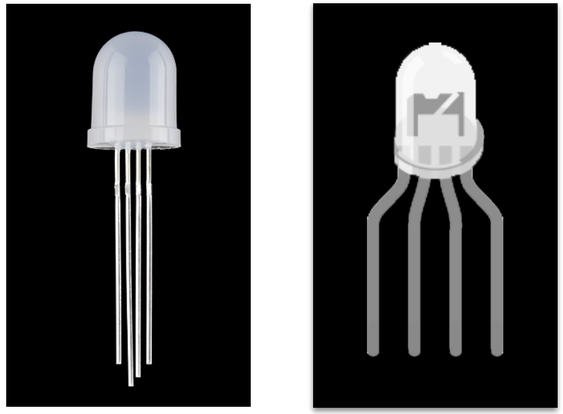
GOAL — Let's ADD an RGB circuit

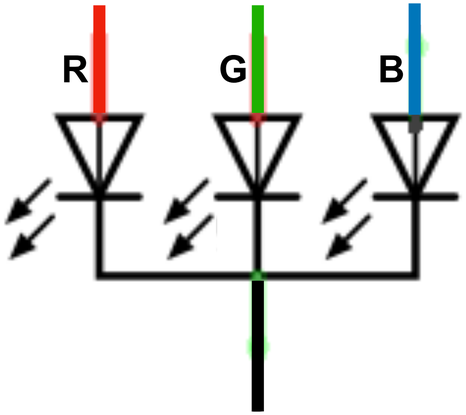
For location only — Keep RGB to the right!



RGB led

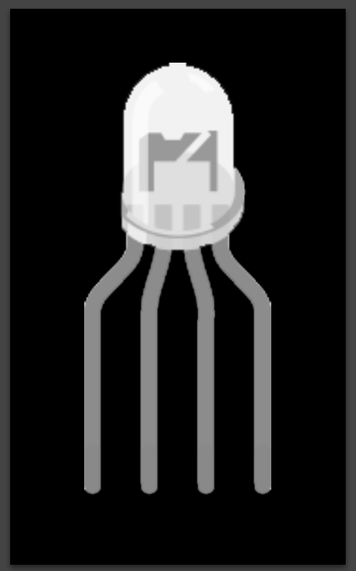
New part — RGB LED

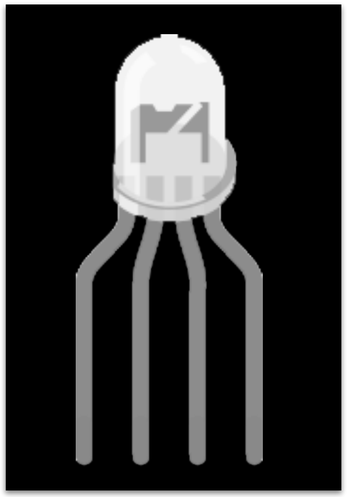




- **RGB LEDs want to GLOW (eventually — millions of colours)**
- like single LED cousins — they want a small amount of power — and they want it going in the right direction
- they want protection — from current limiting resistors

RGB led



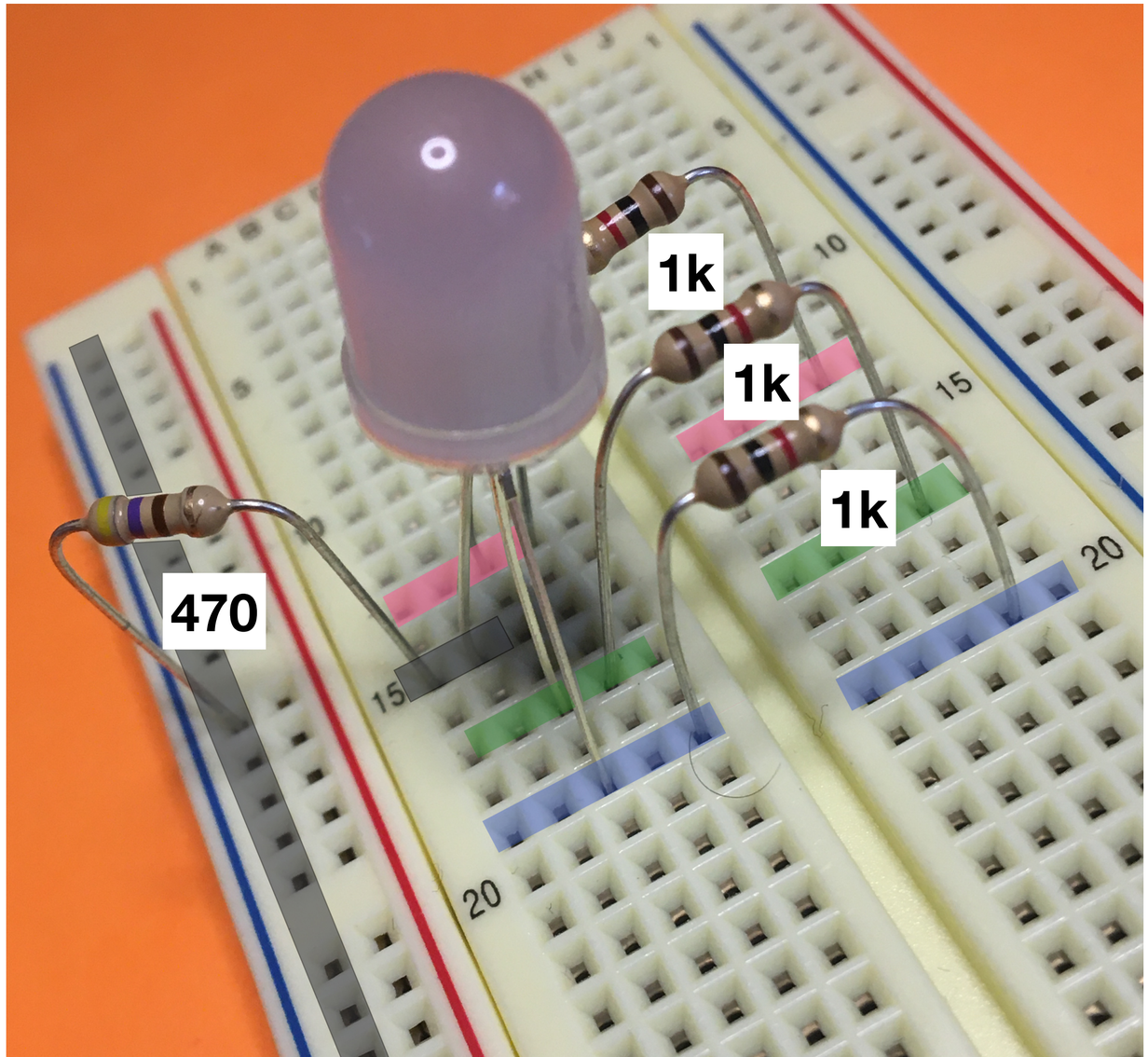


GROUND (GND)
is longest!

Let's ADD an RGB circuit.

- Place a **470 ohm** resistor from GND leg to blue rail (GND).
- Put a **1K on each RGB leg, across great divide.**
- Connect 1k resistors to a strip of tie points **(not to power rail).**

NOTE - single color LEDs not shown



Place this on **right side** of your board

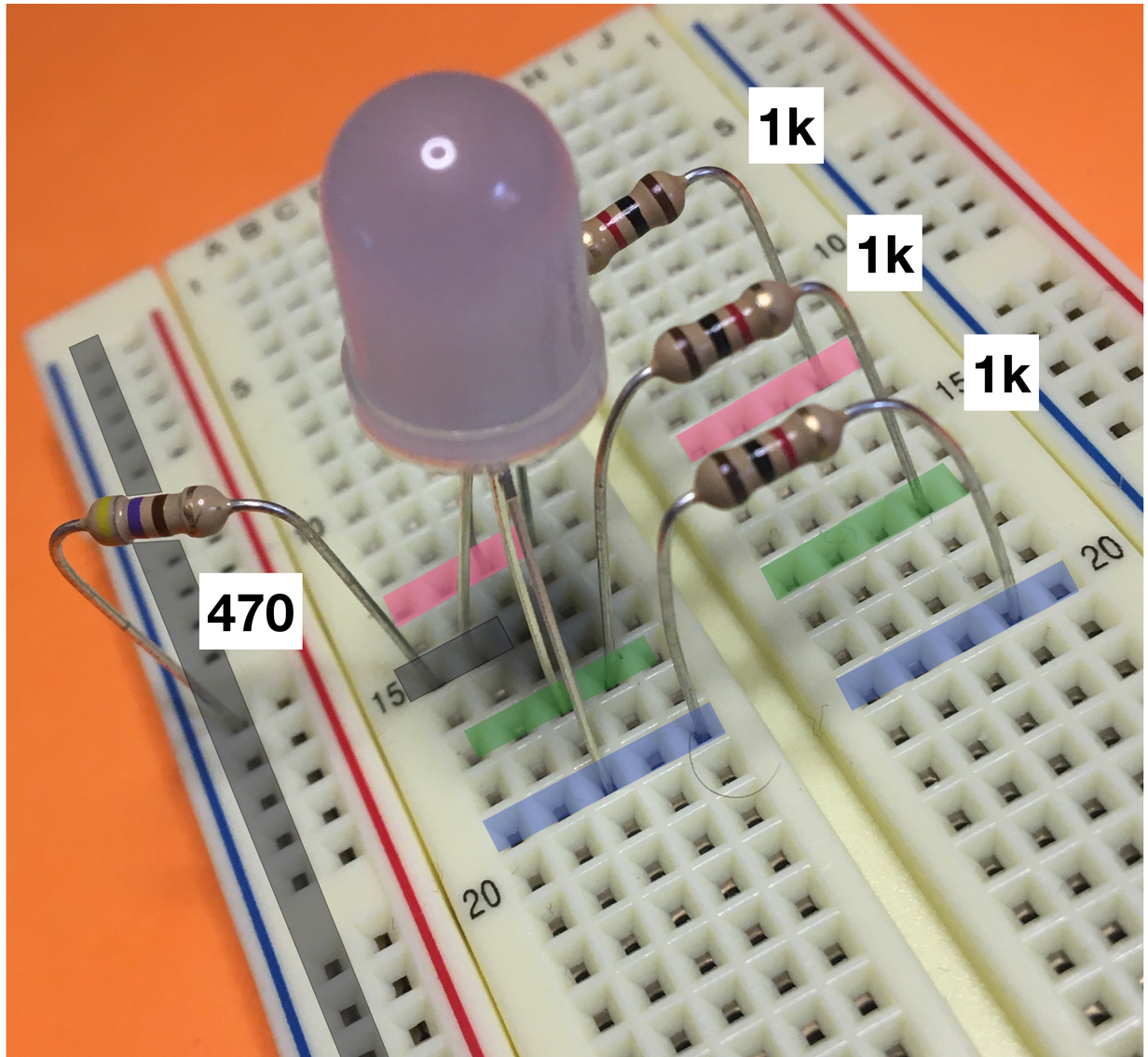
Explore :

Power up your Arduino.

Upload first code from today.
`01-simpleBlink.ino`

Connect **pin5** to the **RED** (left) leg of your **RGB** led.

(then move wire to G and B too)

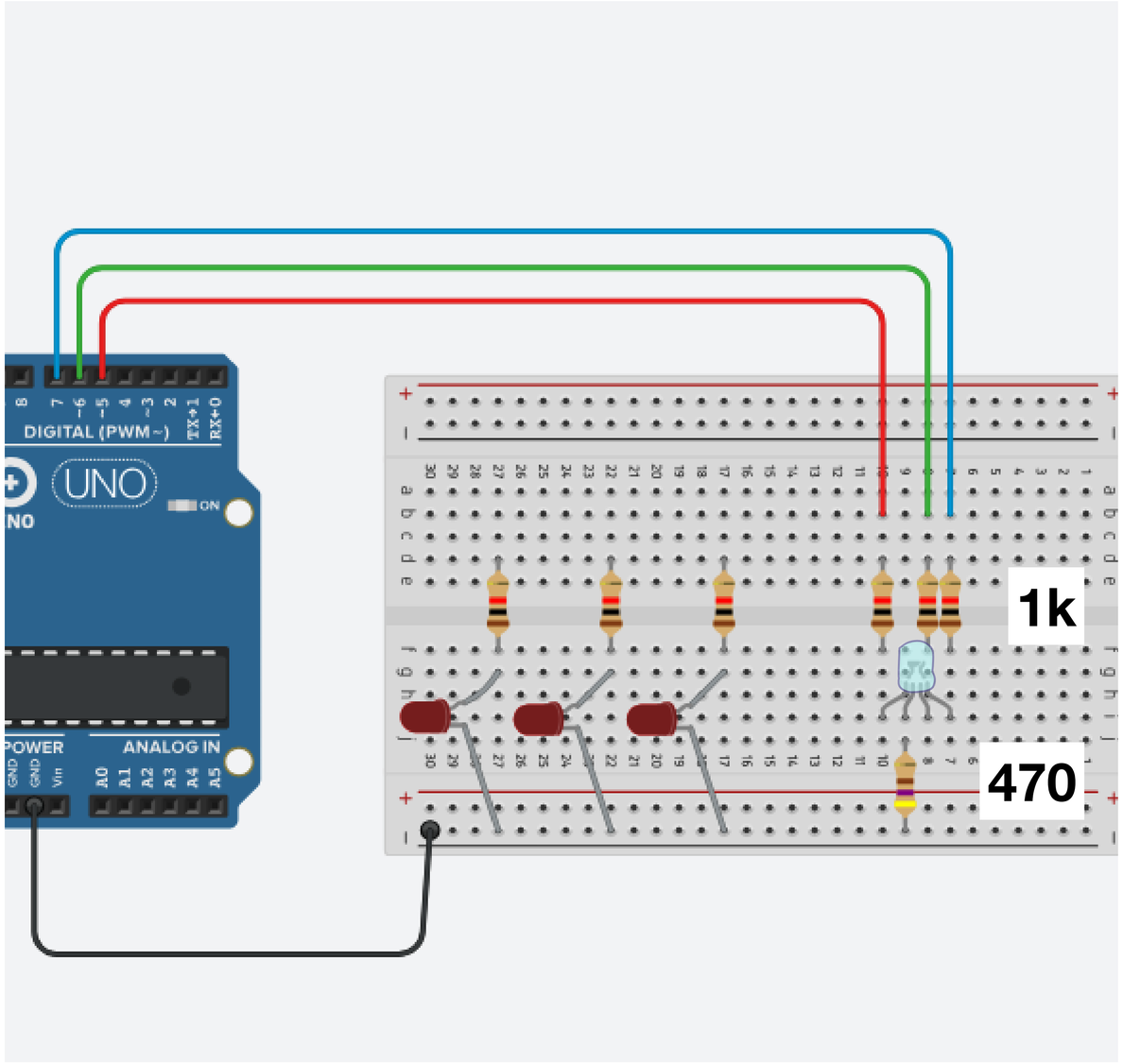


RGB CODE variations

5

6

7



Let’s re-upload 3-led code

03-blinkThree.ino

03-blinkThree.ino

Can you change this code to blink two (2) colours at a time?