

# A circuit to light an LED

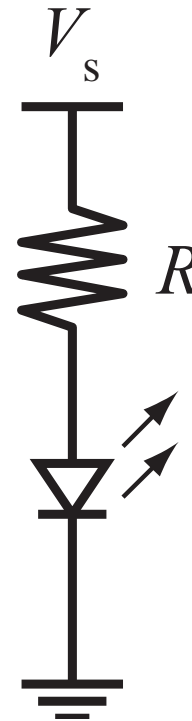
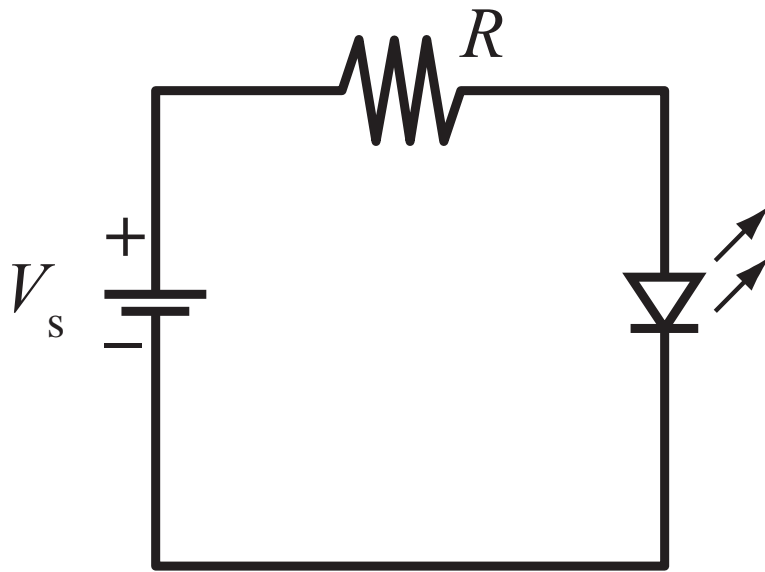
ME 120

Mechanical and Materials Engineering

Portland State University

<http://web.cecs.pdx.edu/~me120>

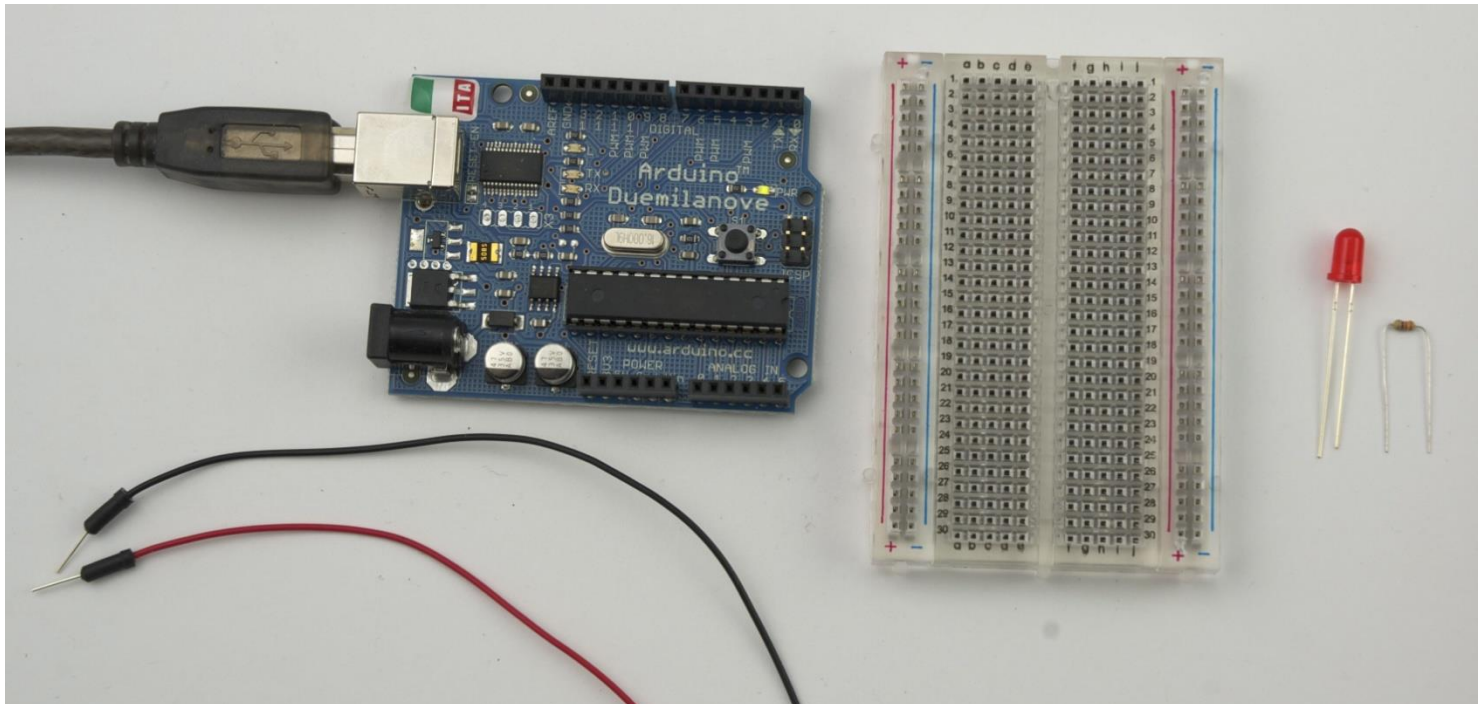
# LED circuit: Two equivalent pictures



# Building an LED Circuit

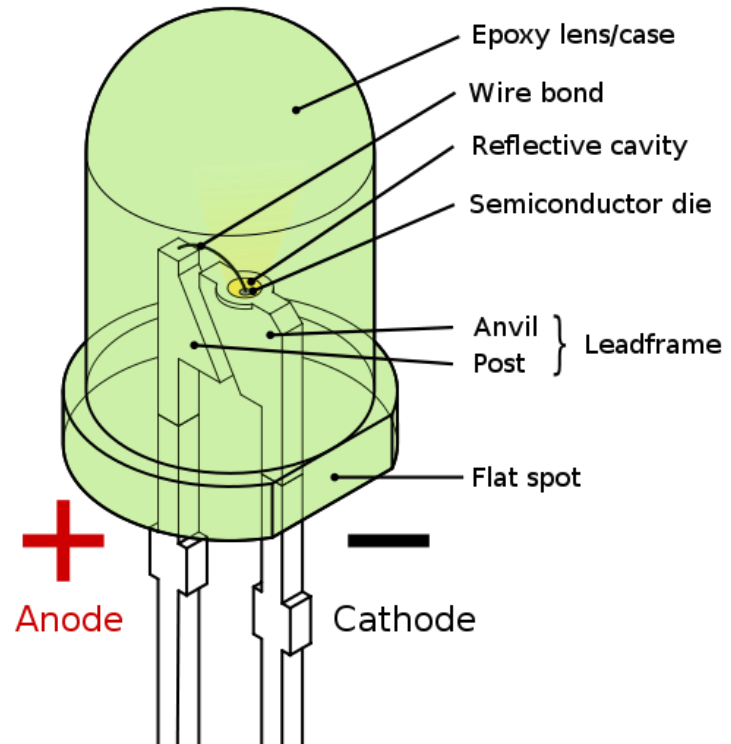
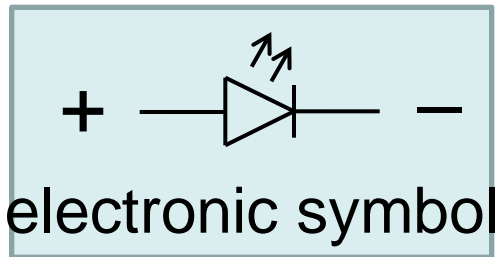
## **Supplies:**

- 2 two jumper wires
- LED
- 330 $\Omega$  and 10k $\Omega$  resistors
- Arduino
- Breadboard
- USB cable (from your computer)



# LEDs

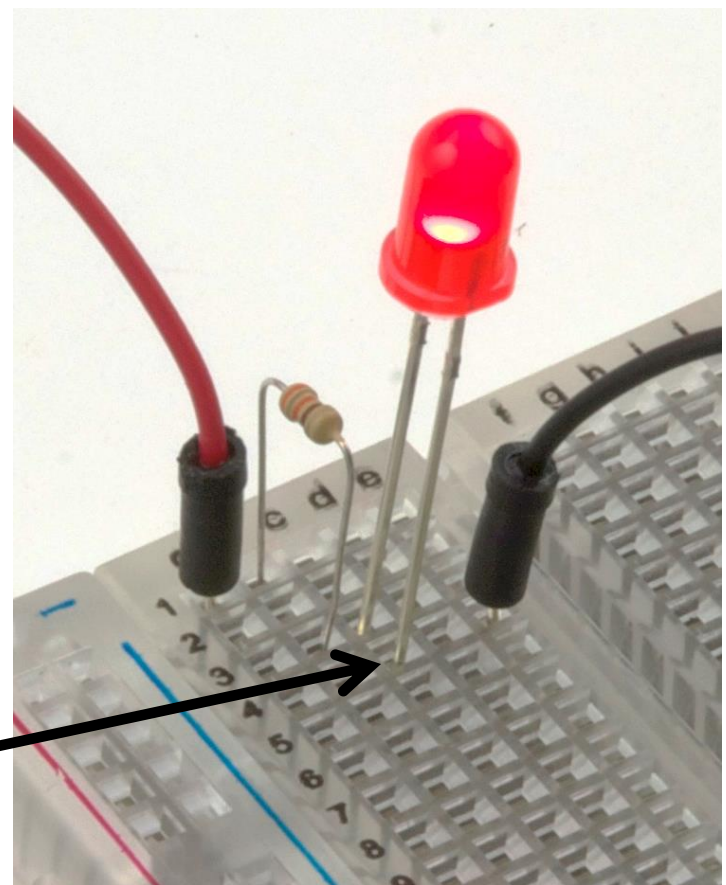
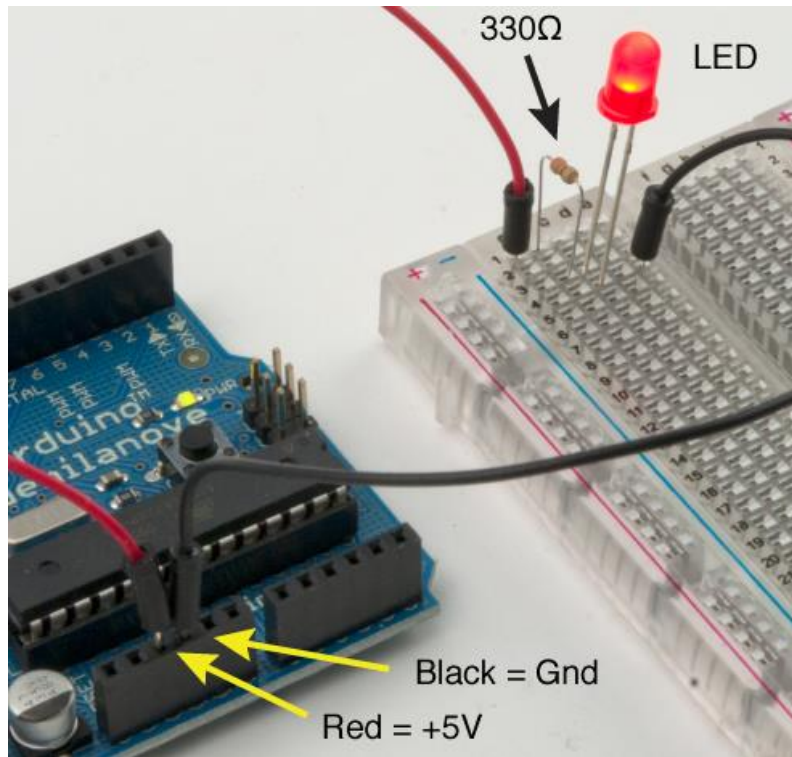
LED = Light Emitting Diode



*Diagram from Wikipedia description of an LED*

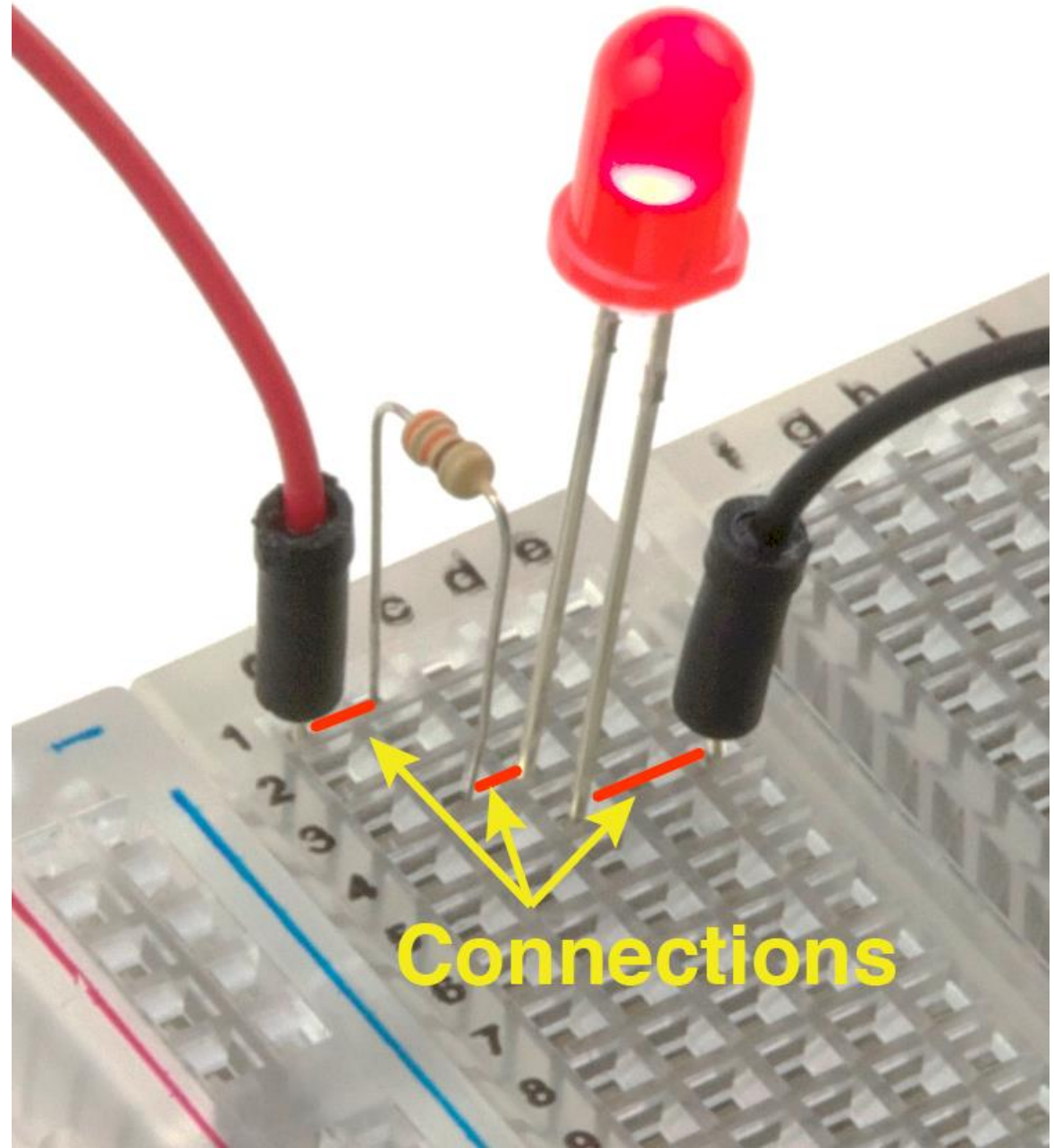
Electricity can only flow one way through an LED (or any diode).  
The flat spot on the LED must be connected to ground (GND).

# Building an always-on LED Circuit

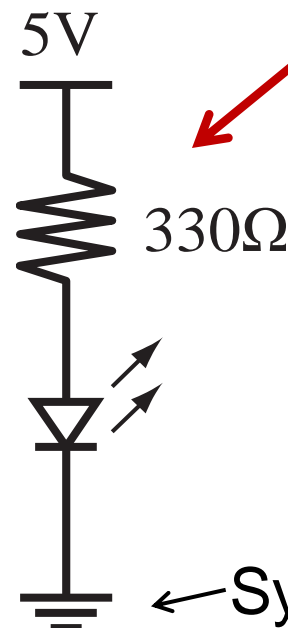
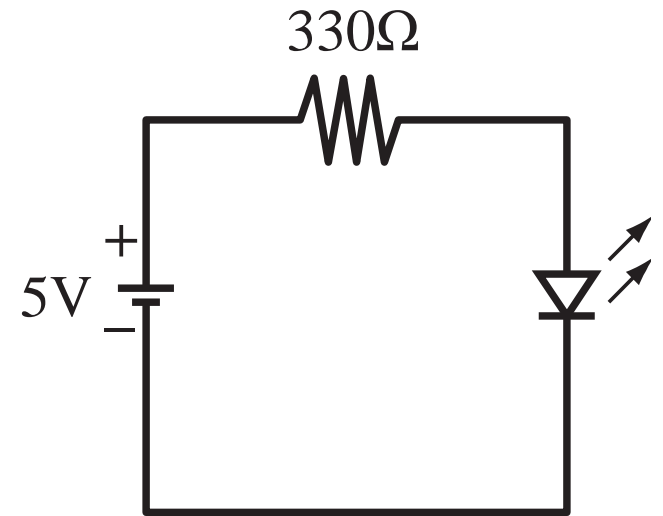
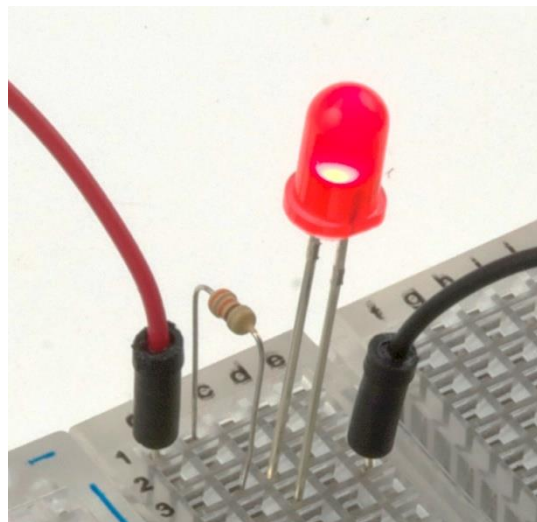
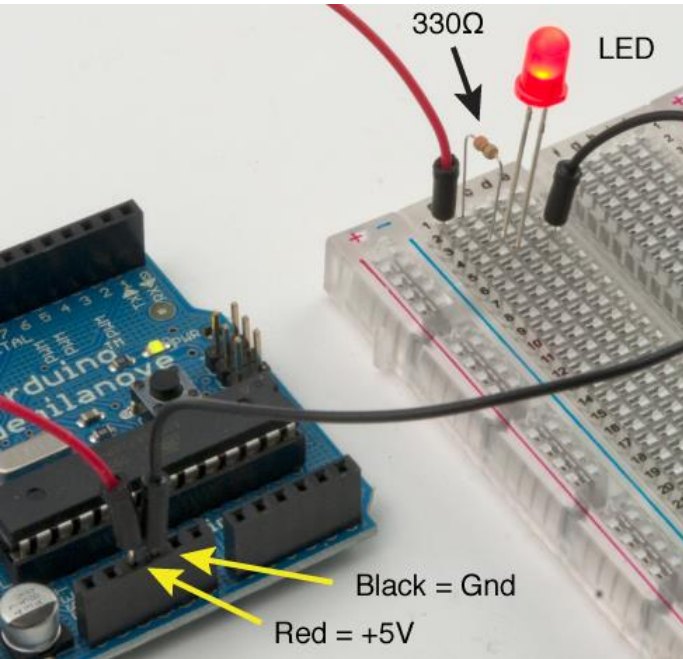


Short leg of LED connects to ground wire

# Breadboard LED circuit



# The Circuit



These circuit diagrams are equivalent

← Symbol for ground (GND)

# Replace the $330\Omega$ Resistor with the $10k\Omega$ Resistor

What happens and Why??

**ANSWER:** The smaller resistor ( $330\Omega$ ) provides less resistance to current than the larger resistor ( $10k\Omega$ ). For the same applied voltage, increasing the resistance decreases the current.

Therefore, replacing the  $330\Omega$  resistor with the  $10k\Omega$  resistor reduces the current and causes the LED to glow less brightly.

**What would happen if you forgot to put in a resistor?**

You would probably burn up your LED.



# Arduino program to blink an LED

Build the circuit on the breadboard

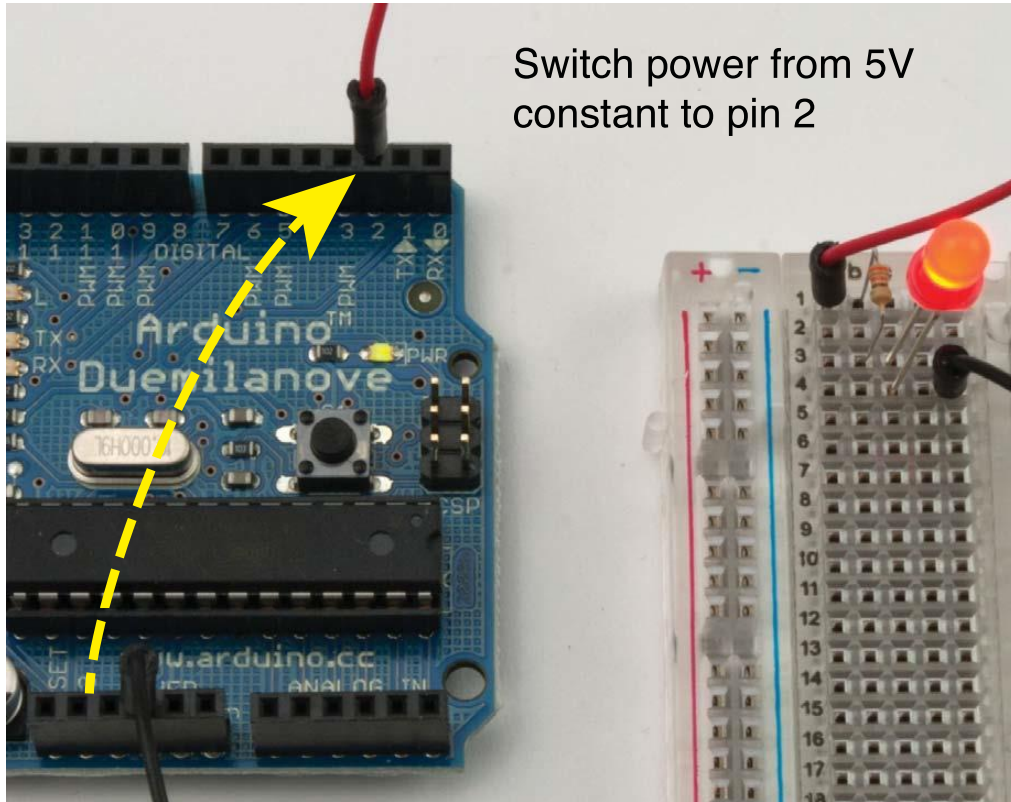
A slight modification to always-on LED circuit

Write your first Arduino program

Use the digital (on/off) output to turn LED on and off

# Connect the Power Wire to Pin 2

*(Use P2 as a digital output)*

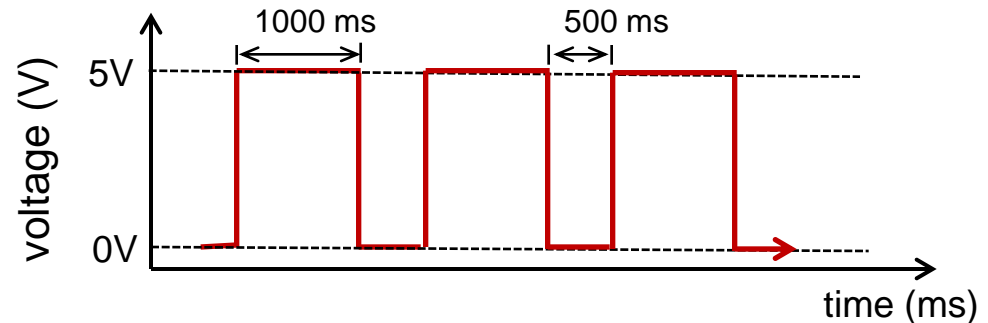
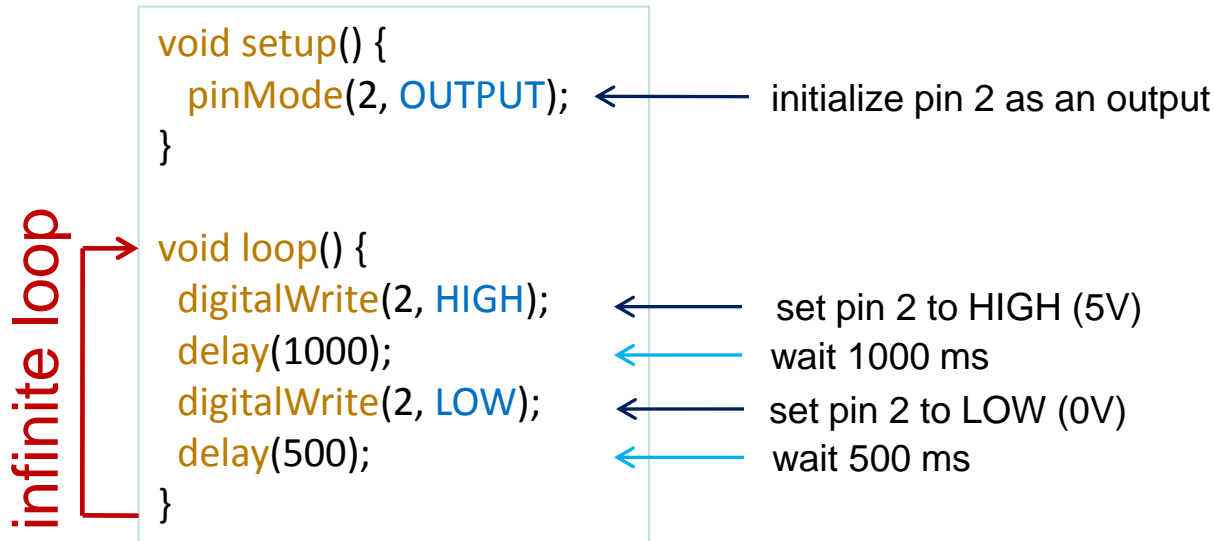


Switch power from 5V constant to pin 2

**Enter and run the following program:**

```
void setup() {  
  // initialize pin as an output:  
  pinMode(2, OUTPUT);  
}  
  
void loop() {  
  // turn the LED on  
  digitalWrite(2, HIGH);  
  // wait 1 second = 1000 ms  
  delay(1000);  
  // turn the LED off  
  digitalWrite(2, LOW);  
  // wait for 500 ms  
  delay(500);  
}
```

# How the Program Works



HIGH = 5V and LOW = 0V (Always!!!!)