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MORE BLINKING AND SWITCHING

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

Objective, Overview & Introduction

- Using an Arduino and Breadboard, students will understand I/O pins and how to move an I/O pin from one to another
- Students will connect a push button switch and and External LED using a bread board, and write code to read the value fo the switch and display it on the LED
- A LED with lights up when the Button is pushed, while using the Arduino will be the measurement of success

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SEE APPENDIX A, FOR LICENSING & ATTRIBUTION INFORMATION

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CAN I GET A COPY OF THESE SLIDES? YES, PROBABLY…

Most presentation lecture slides can be found indexed on www.steamclown.org and maybe blogged about here on Jim The STEAM Clown's Blog, where you can search for the presentation title. While you are there, sign up for email updates

If you are on of my SVCTE Mechatronics Engineering Students, Look here on the SVCTE Mechatronics Engineering Blog: https://svctemechatronics.blogspot.com/

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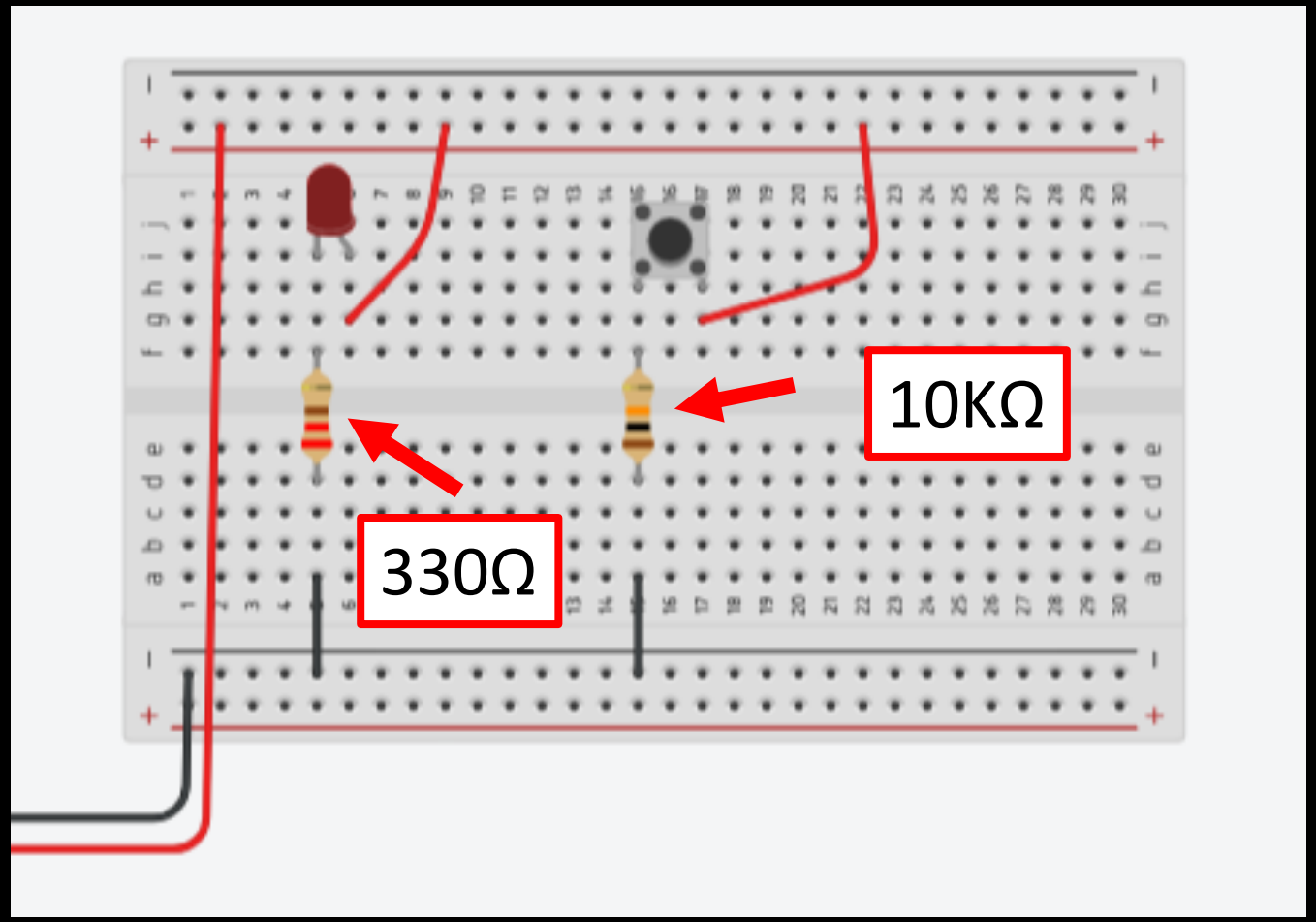
RESOURCES & MATERIALS NEEDED

- Arduino
- Breadboard & jumper wires
- LED, 330Ω Resistor
- pushButton switch, 10KΩ Resistor

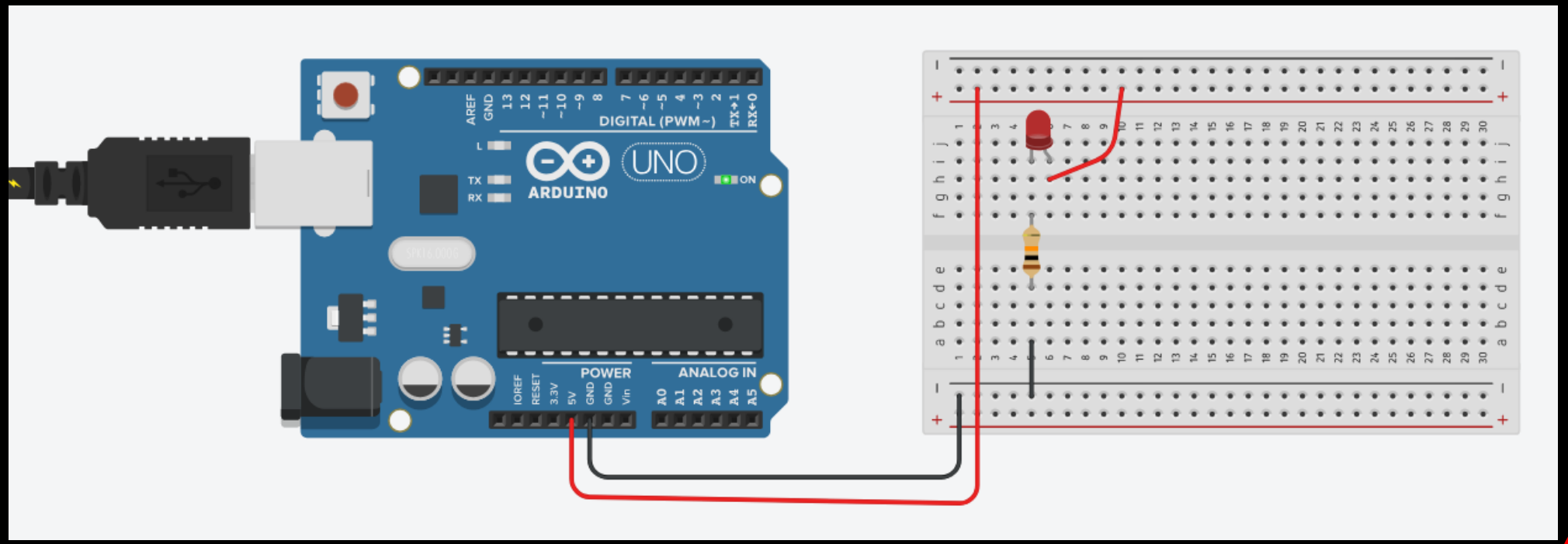
FROM LAST LAB…

- Have a 330Ω resistor and LED connected, so it is lit
- Have a pushButton connected to a 10KΩ resistor to GND



JUST CONNECT LED TO VCC(5V) & GND

- Connect wires from VCC(5v) & GND to breadboard
- Connect 220Ω or 330Ω resistor and LED



Go Download a Basic Blink Sketch

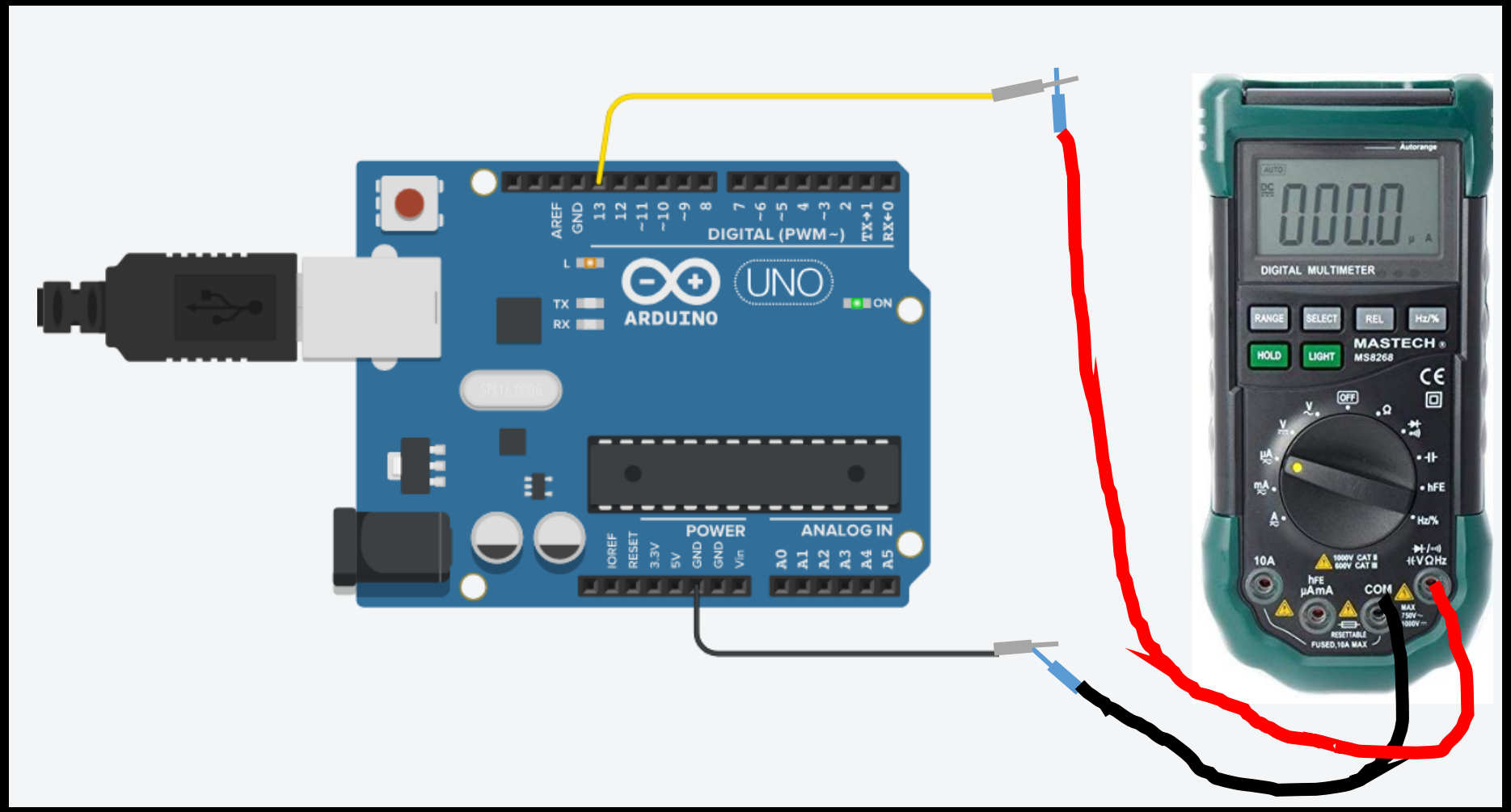
- blink_1_STEAMClown – on my Github in the arduinoCode repository
  - https://github.com/jimTheSTEAMClown/arduinoCode/blob/master/blink_1_STEAMClown
- Open the Arduino IDE and load and run the blink_1_STEAMClown sketch
- Is your on board LED (pin 13) flashing?

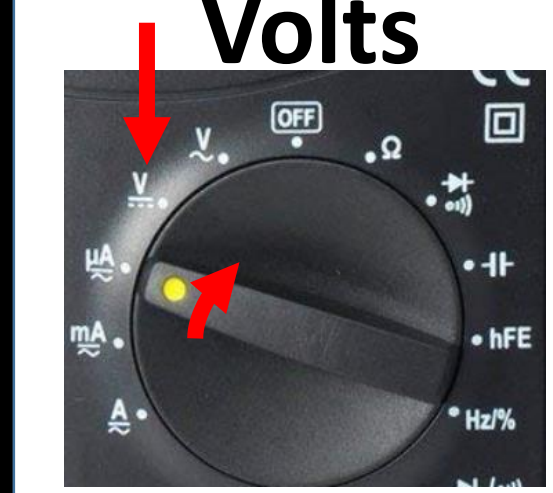
WHAT IS THE LED OUTPUT PIN?

```
// ================================================
// The setup routine runs once when you load the sketch or press reset:
// This is where you define pin directions
void setup()
{
  // initialize the pins used in this sketch
  pinMode(13, OUTPUT);
}

// this "main" loop routine runs over and over again forever:
void loop()
{
  //Set pin 13 to HIGH. This provides 5 volts to the LED and turns it on
  digitalWrite(13, HIGH);
  delay(1000);      //Wait for a second
  //Set pin 13 LOW and This turns the LED off
  digitalWrite(13, LOW);
  delay(1000);      //Wait for a second
}
```

MEASURING THE PULLUP EFFECT





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WHAT IS THE LED OUTPUT PIN?

```
// ================================================
// The setup routine runs once when you load the sketch or press reset:
// This is where you define pin directions
void setup()
{
  // initialize the pins used in this sketch
  pinMode( 10, OUTPUT);
}

// this "main" loop routine runs over and over again forever:
void loop()
{
  //Set pin 13 to HIGH. This provides 5 volts to the LED and turns it on
  digitalWrite( 10, HIGH);
  delay(1000);      //Wait for a second
  //Set pin 13 LOW and This turns the LED off
  digitalWrite( 10, LOW);
  delay(1000);      //Wait for a second
}
```

Change the I/O pin to pin 10

Now compile and reload Sketch

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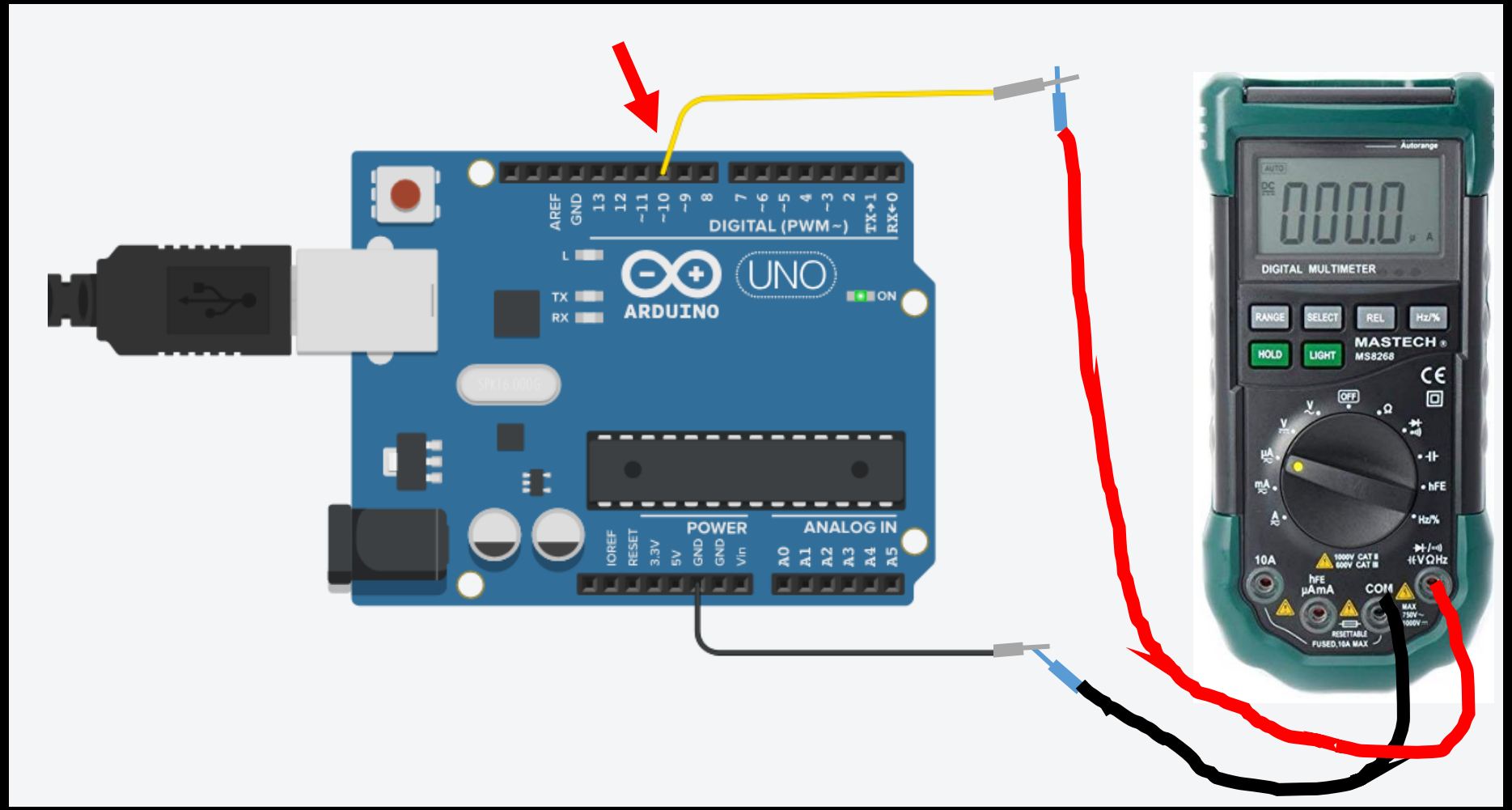
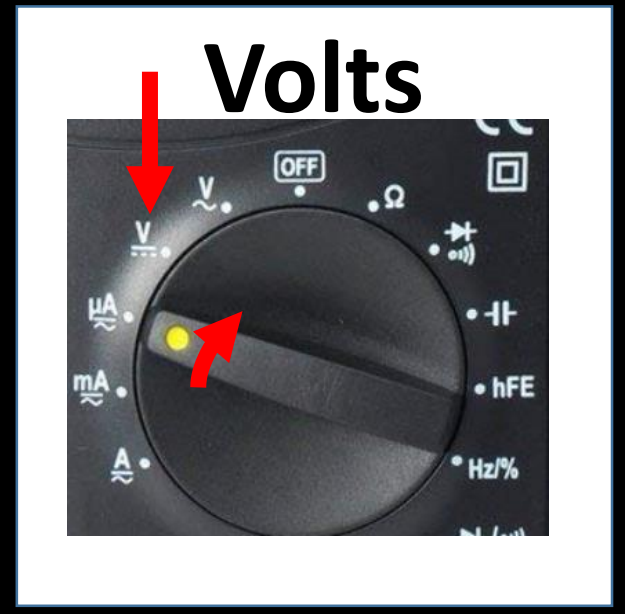
MEASURING THE PULLUP EFFECT





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Go Download Another Blink Sketch

- blink_2_STEAMClown – on my Github in the arduinoCode repository
  - https://github.com/jimTheSTEAMClown/arduinoCode/blob/master/blink_2_STEAMClown
- Open the Arduino IDE and load and run the blink_2_STEAMClown sketch
- Is your on board LED (pin 13) flashing?

WHAT IS A VARIABLE OR ALIAS?

```
// ================================================================
const int arduinoBoardLED = 13;          // define as constant integer on pin 13
// ================================================================
// The setup routine runs once when you load the sketch or press reset:
// This is where you define pin directions
void setup()
{
  // initialize the pins used in this sketch
  pinMode(arduinoBoardLED, OUTPUT);
}

// this "main" loop routine runs over and over again forever:
void loop()
{
  //Set pin 13 to HIGH. This provides 5 volts to the LED and turns it on
  digitalWrite(arduinoBoardLED, HIGH);
  delay(1000);        //Wait for a second
  //Set pin 13 LOW and This turns the LED off
  digitalWrite(arduinoBoardLED, LOW);
  delay(1000);        //Wait for a second
}
```

WHAT IS A VARIABLE OR ALIAS?

```
// ================================================================
const int arduinoBoardLED =  10;        // define as constant integer on pin 13
// ================================================================
// The setup routine runs once when you load the sketch or press reset:
// This is where you define pin directions
void setup()
{
  // initialize the pins used in this sketch
  pinMode(arduinoBoardLED, OUTPUT);
}

// this "main" loop routine runs over and over again forever:
void loop()
{
  //Set pin 13 to HIGH. This provides 5 volts to the LED and turns it on
  digitalWrite(arduinoBoardLED, HIGH);
  delay(1000);        //Wait for a second
  //Set pin 13 LOW and This turns the LED off
  digitalWrite(arduinoBoardLED, LOW);
  delay(1000);        //Wait for a second
}
```

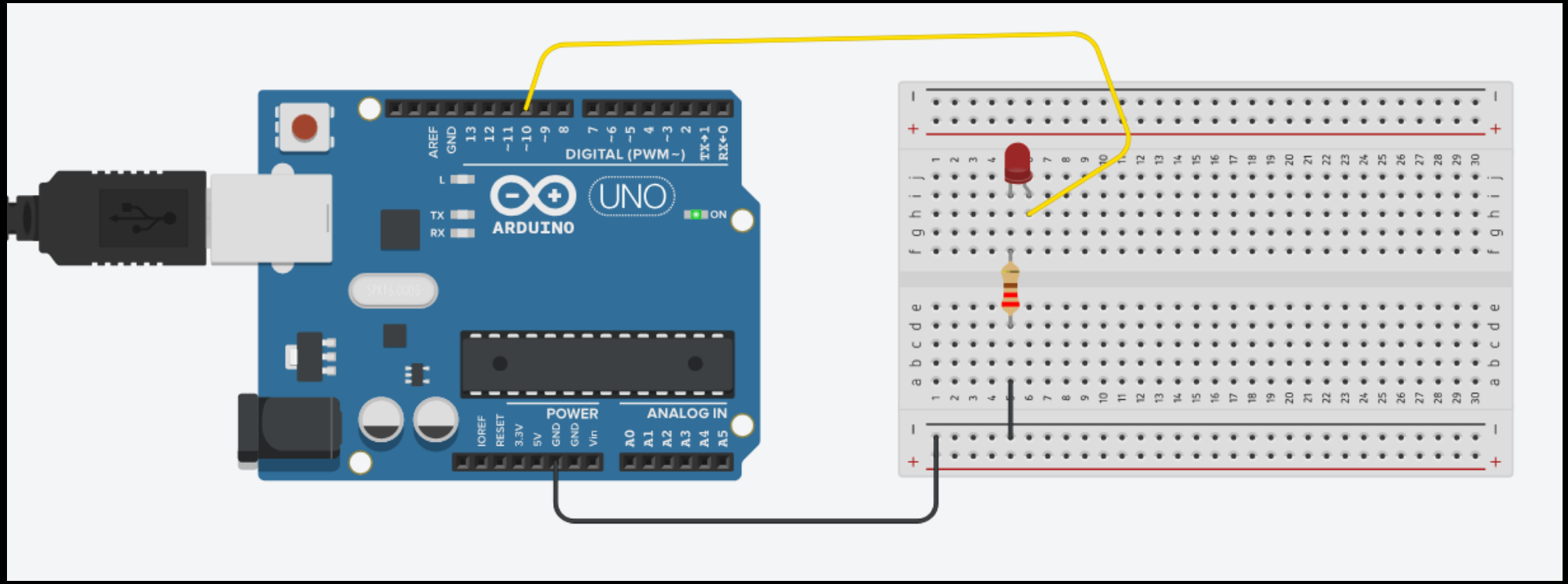
Change the I/O pin to pin 10

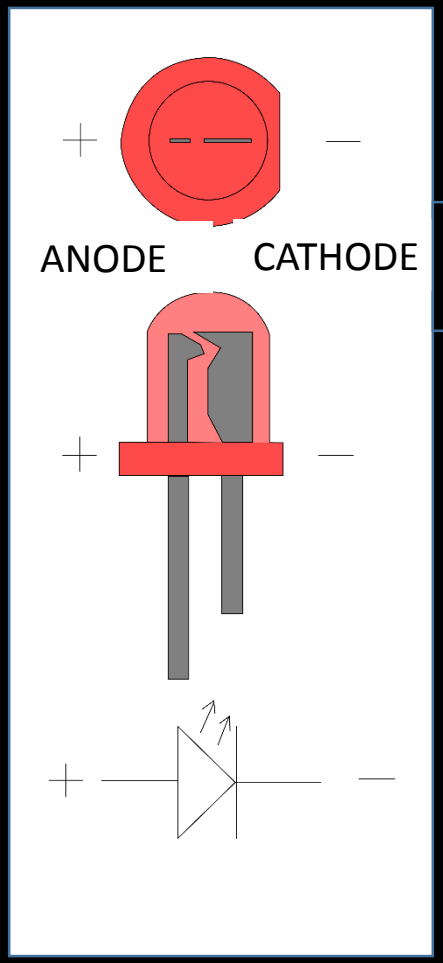
ardunoBoardLED is now =10

Cool, we did not have to do many edits…

Change the I/O pin to your LED on your breadboard

- Move the wire to pin 10 to the anode of the LED, through a 220Ω resistor to GND





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ADDING AN INPUT

Go Download Another Blink Sketch

- pushButton_LED_1_STEAMClown – on my Github in the arduinoCode repository
  - https://github.com/jimTheSTEAMClown/arduinoCode/blob/master/pushButton_LED_1_STEAMClown
- Open the Arduino IDE and load and run the pushButton_LED_1_STEAMClown sketch
- What pin is the pushButton connected to?

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I/O (INPUT/OUTPUT)

```
const int LED = 10;              // LED on pin 13
const int pushButton = 3;        // input pin for Push Button sensor
int buttonState = 0;     // variable to store the read value

void setup()
 {
        pinMode(LED, OUTPUT);  // set pin 13 as output
        pinMode(pushButton, INPUT);      // set pin "pushButton" as input
 }

void loop()
 {
        buttonState = digitalRead(pushButton);  // read the input pin
        digitalWrite(LED, buttonState);  // sets the LED to button's value
 }
```

LED is pin =10

What is the pushButton Pin?

What is buttonState?

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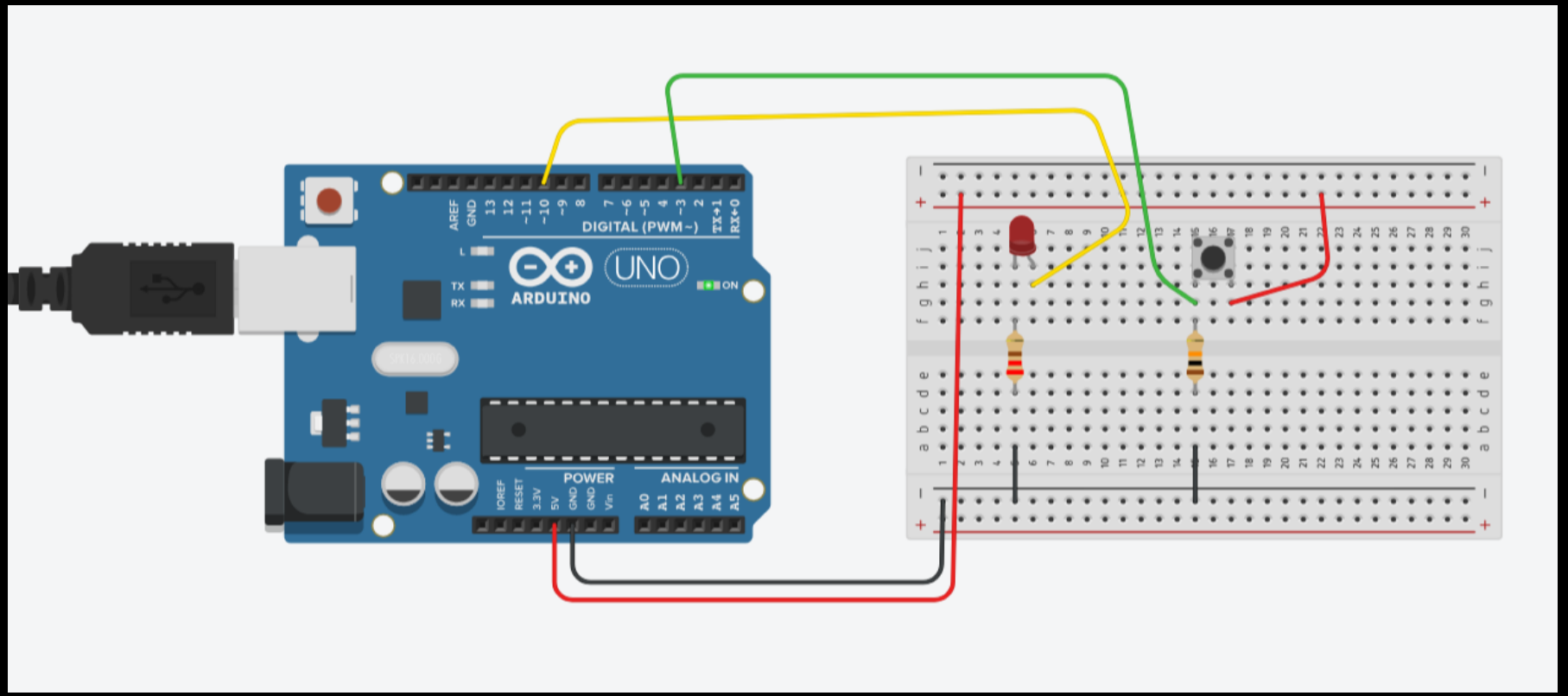
ADDING INPUTS

- Connect a pulldown resistor with a pushbutton switch



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NOW GO LOOK AT MORE SKETCHES

- On my Github in the arduinoCode repository
  - pushButton_LED_2_STEAMClown
  - pushButton_LED_3_STEAMClown

PUSHBUTTON_LED_2_STEAMCLOWN

```
int led = 10;
int pushButton = 3;
int pushButtonState;
// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
  pinMode(pushButton, INPUT);
}
// the loop routine runs over and over again forever:
void loop() {
  pushButtonState = digitalRead(pushButton);
  if(pushButtonState)
  {
    for (int i=0; i <= 5; i++)
    {
       digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
       delay(200);               // wait for a defined delay
       digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
       delay(200);               // wait for a defined delay
    }
  }
}
```

What is this code doing?

PUSHBUTTON_LED_3_STEAMCLOWN

```
void loop()
{
  buttonStatus = digitalRead(buttonPin);
  if (buttonStatus == HIGH)
  {
    digitalWrite(LED, HIGH);
    Serial.println ("Detected PushButton signal");
    // This is where you would put code that you wanted to happen when
    // buttonStatus is HIGH
    delay(100);
  }
  else // buttonStatus == LOW
  {
    digitalWrite(LED, LOW);
    Serial.println ("Waiting to Detect pushButton signal");
    // This is where you would put code that you wanted to happen when
    // buttonStatus is lOW
    delay(100);
  }
}
```

If/Else

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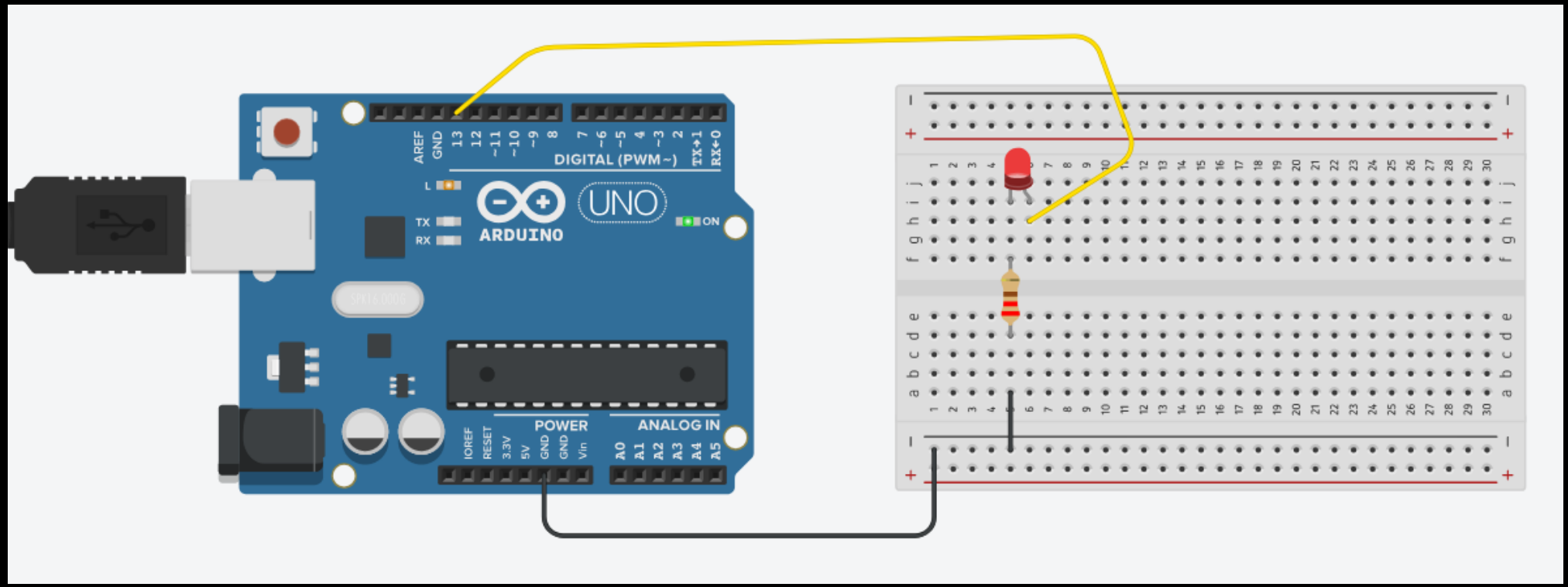
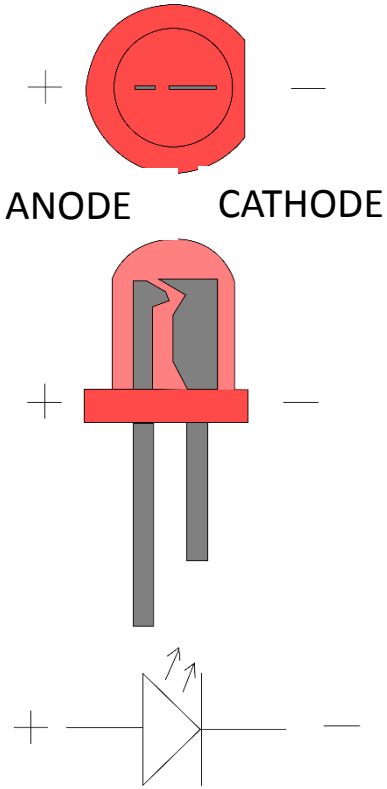
REFERENCE SLIDES

CONNECT AN LED ON YOUR BREADBOARD

- Connect a wire from pin 13 to the anode of the LED, through a 220Ω resistor to GND





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APPENDIX

Appendix A: License & Attribution

- This interpretation is primarily the Intellectual Property of Jim Burnham, Top STEAM Clown, at STEAMClown.org
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