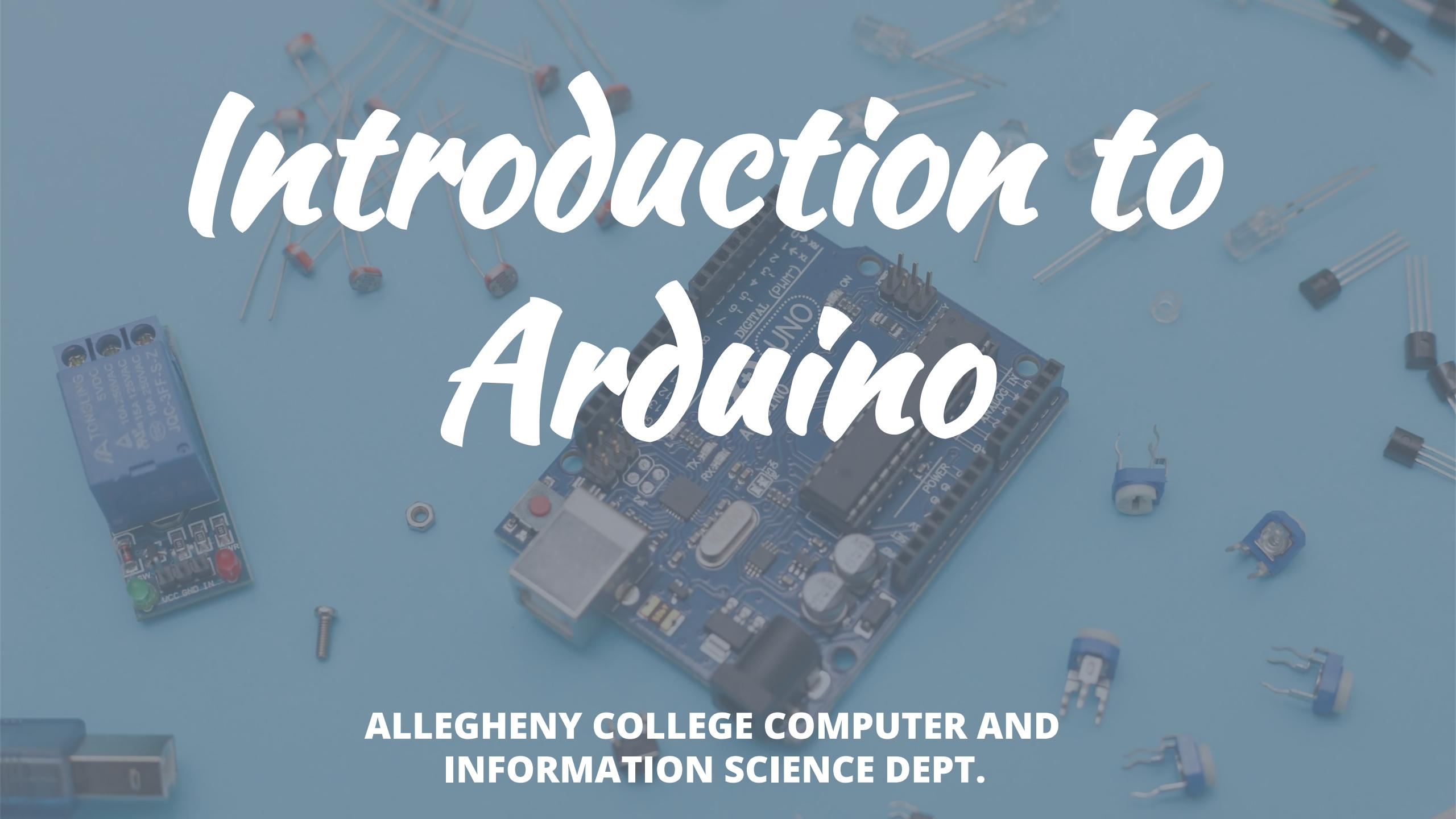


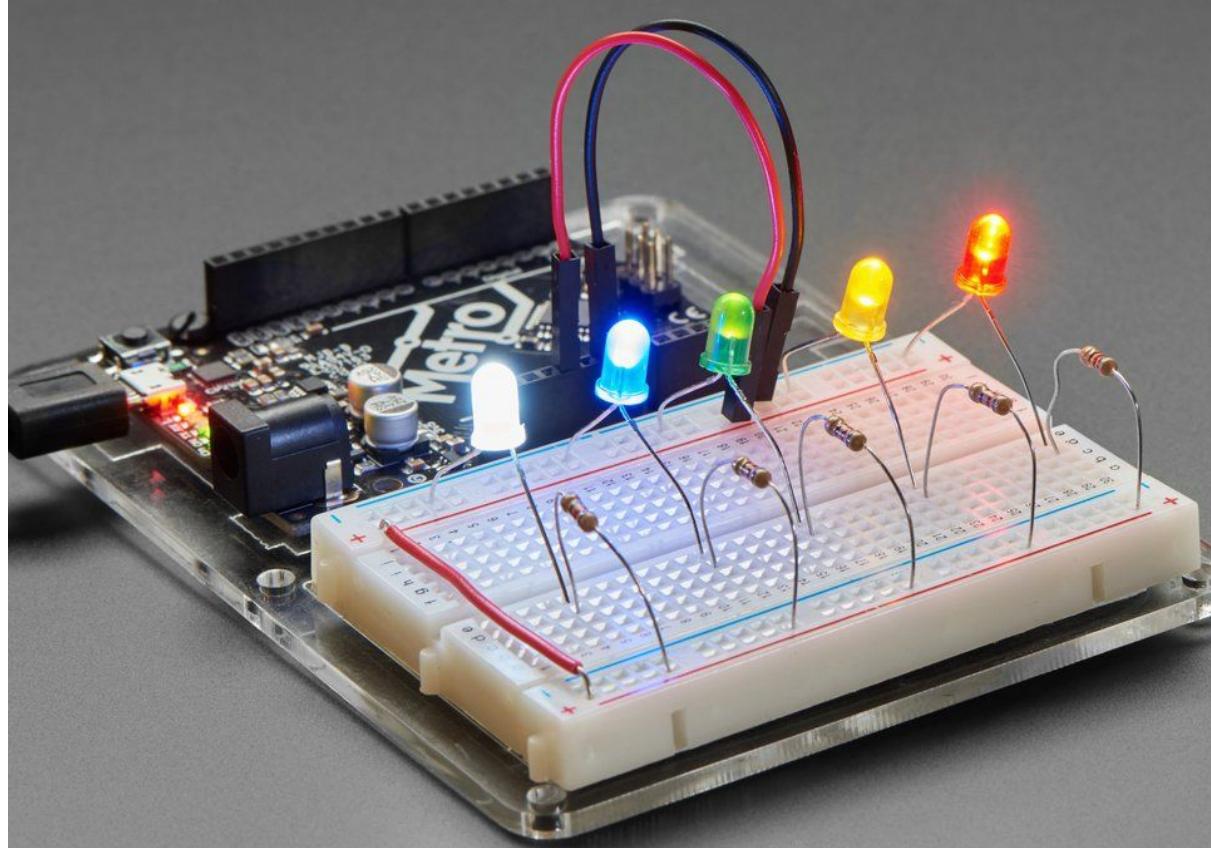
Introduction to Arduino

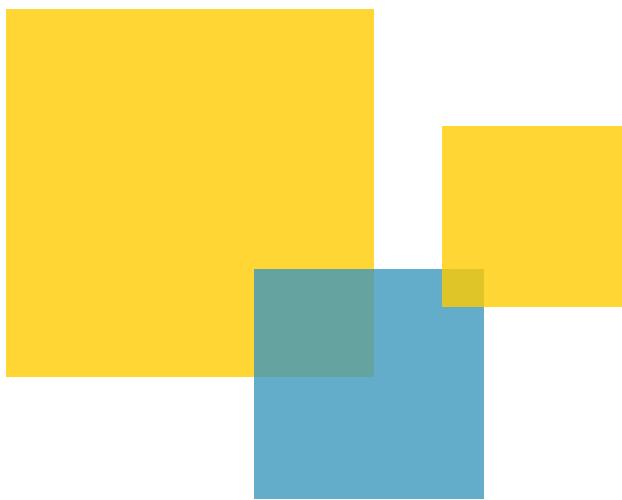


ALLEGHENY COLLEGE COMPUTER AND
INFORMATION SCIENCE DEPT.

Today's Agenda

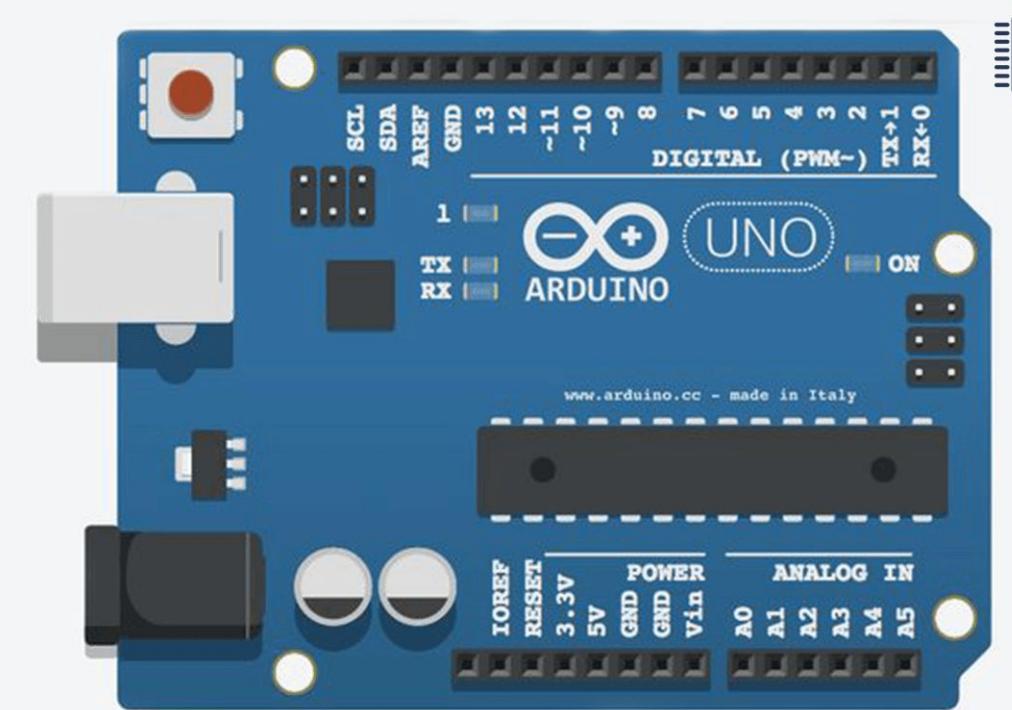
- 01** What is Arduino?
- 02** Arduino UNO Breakdown
- 03** First Arduino Project





*What is
Arduino?*

- Arduino is an open-source (free to use) electronics platform
- Arduino microcontrollers are programmable circuit boards
- Arduinos can be connected to sensors, lights, or motors to make them turn on and off
- Code is written in a language similar to C++
- Code is uploaded using a USB
- Arduinos are useful for prototyping electronics and gadgets

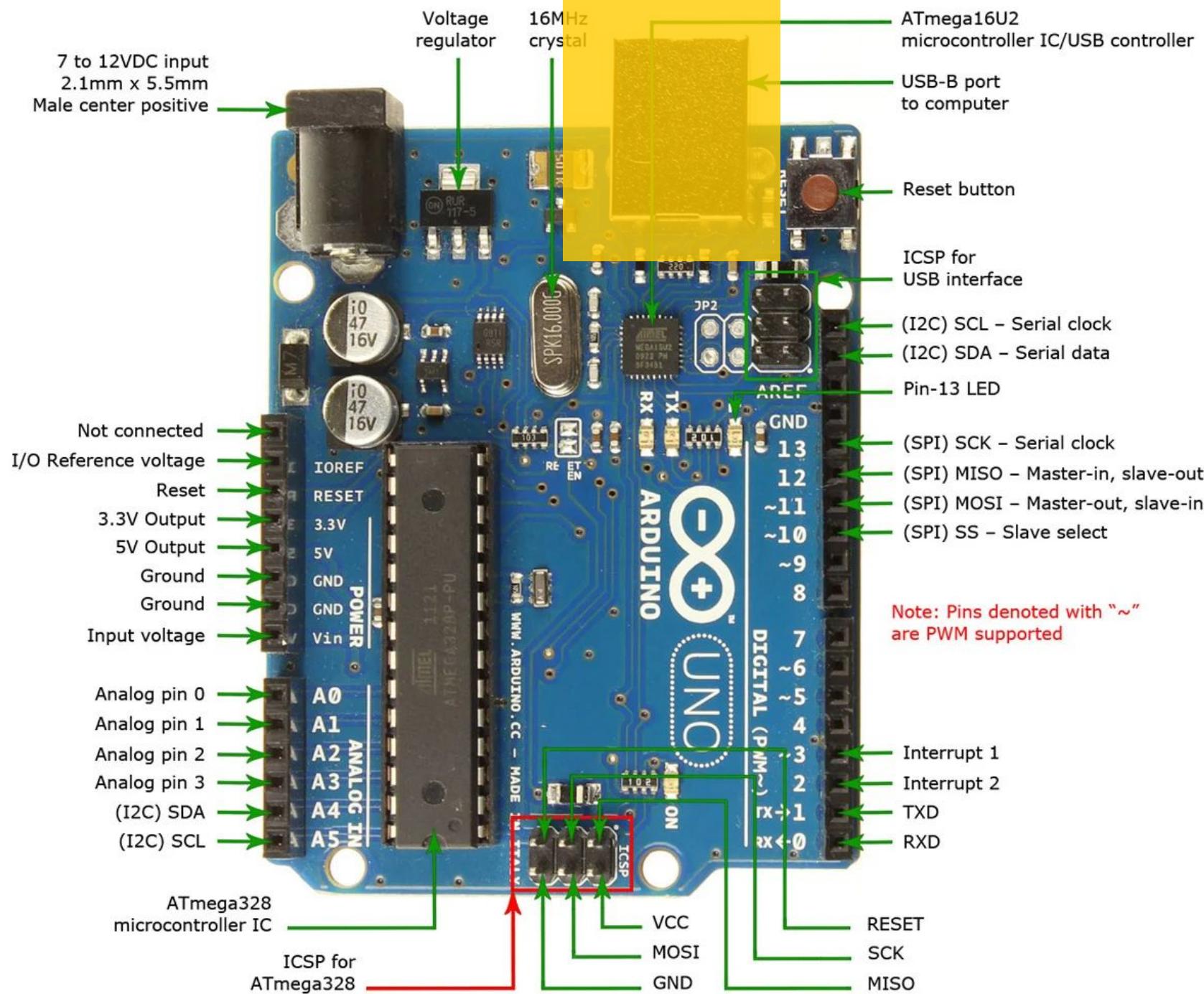




Arduino UNO

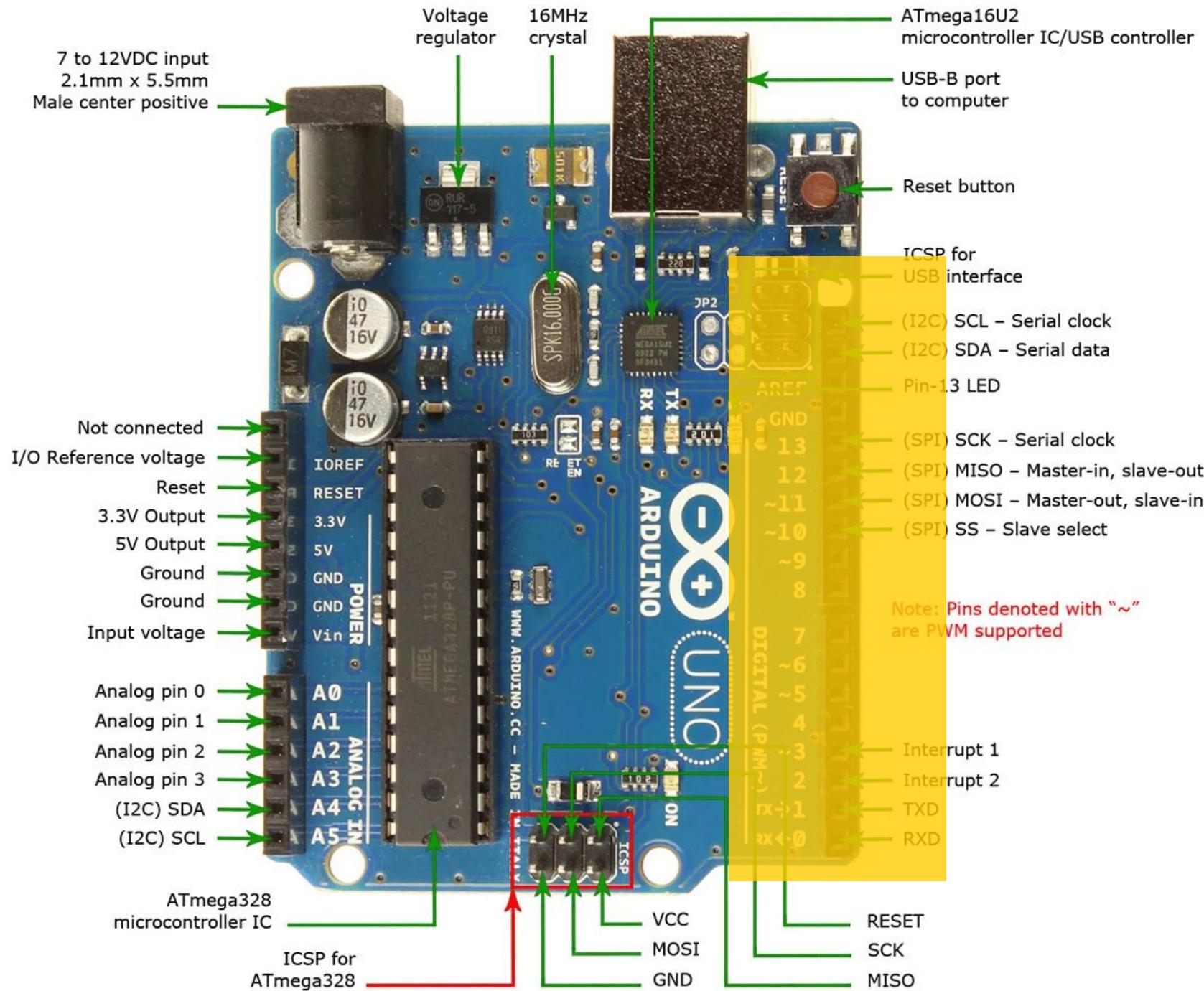
Breakdown





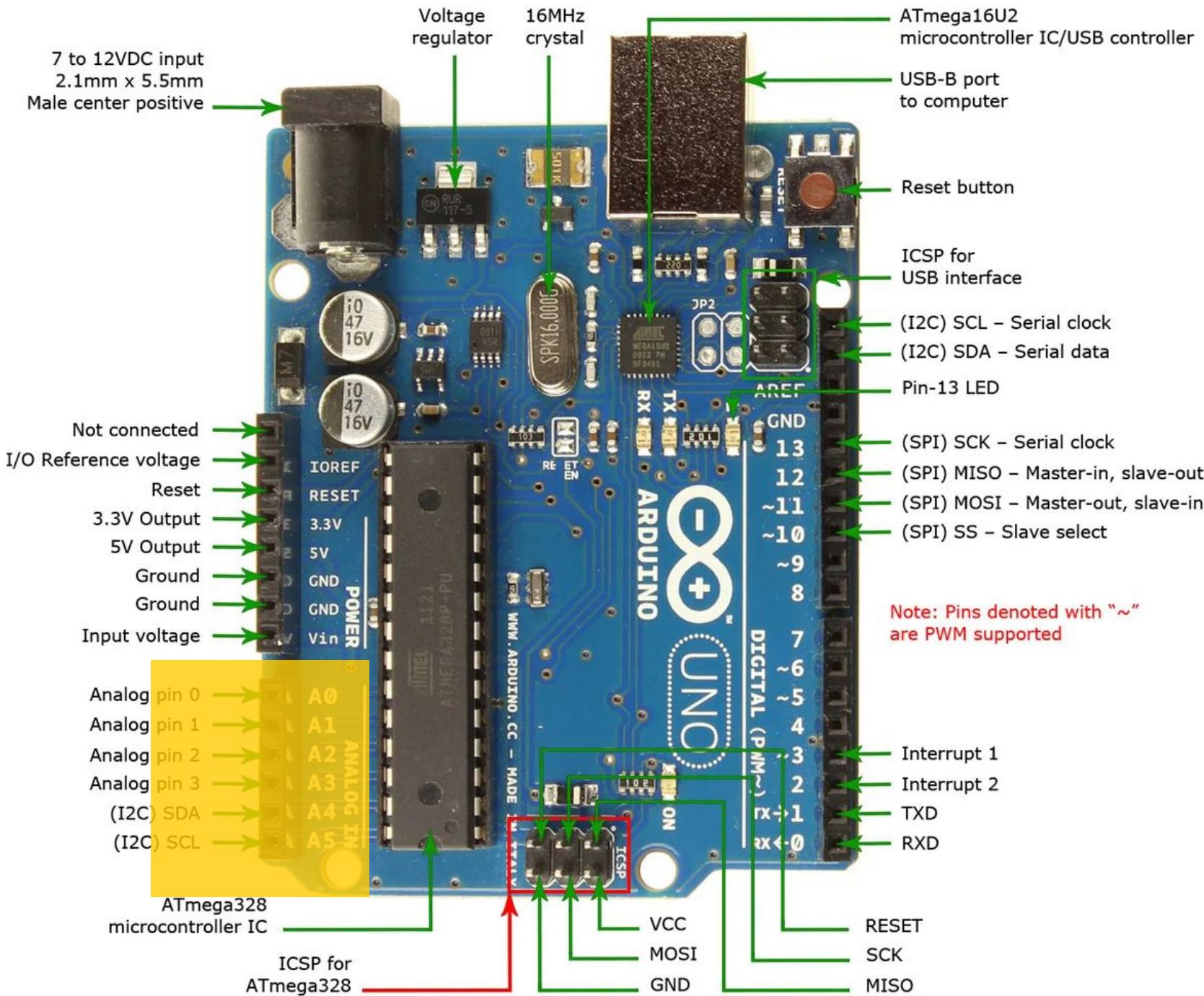
Parts Breakdown

- The top is the USB-B port to connect to the computer
 - How code is sent to the Arduino Microcontroller



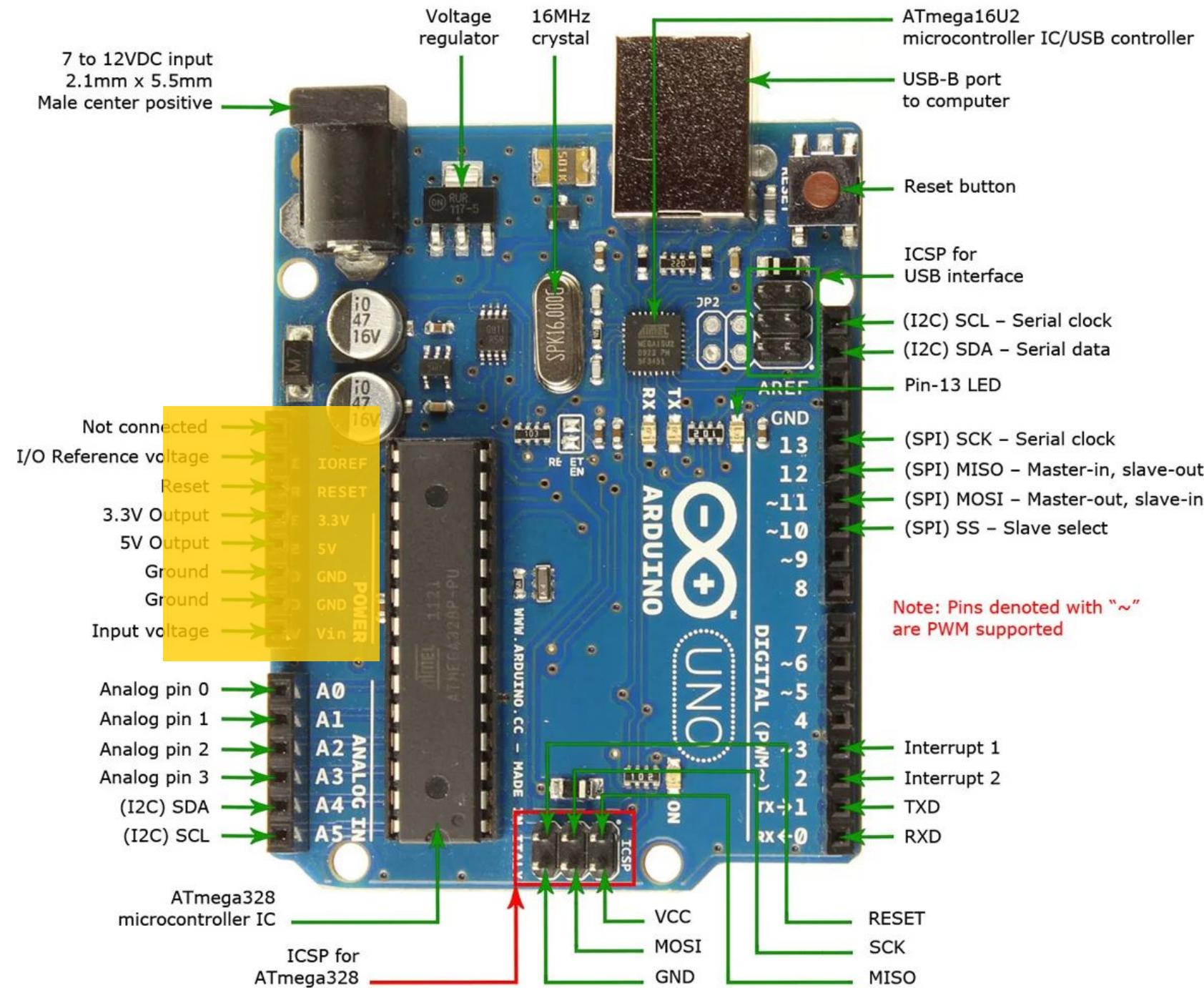
Parts Breakdown

- The left side is for digital pins - inputs and outputs
 - Usually on or off
 - The Arduino can turn on the pin every 10 seconds to make a light blink (output from Arduino)
 - The Arduino can collect data from a sensor to see if it is wet or not (input to Arduino)



Parts Breakdown

- The bottom left is for analog inputs and outputs
- Can be a range of values!
- Good for sensors with a wide range of output values. Ex. a depth sensor



Parts Breakdown

- The top left pins are for power and ground
- 5V and 3.3V are the HIGH, power pins
- GND represents ground, LOW pins
- Circuits go from LOW to HIGH to complete the circuit (we will work with that more soon!)



First Arduino Project



Breadboards

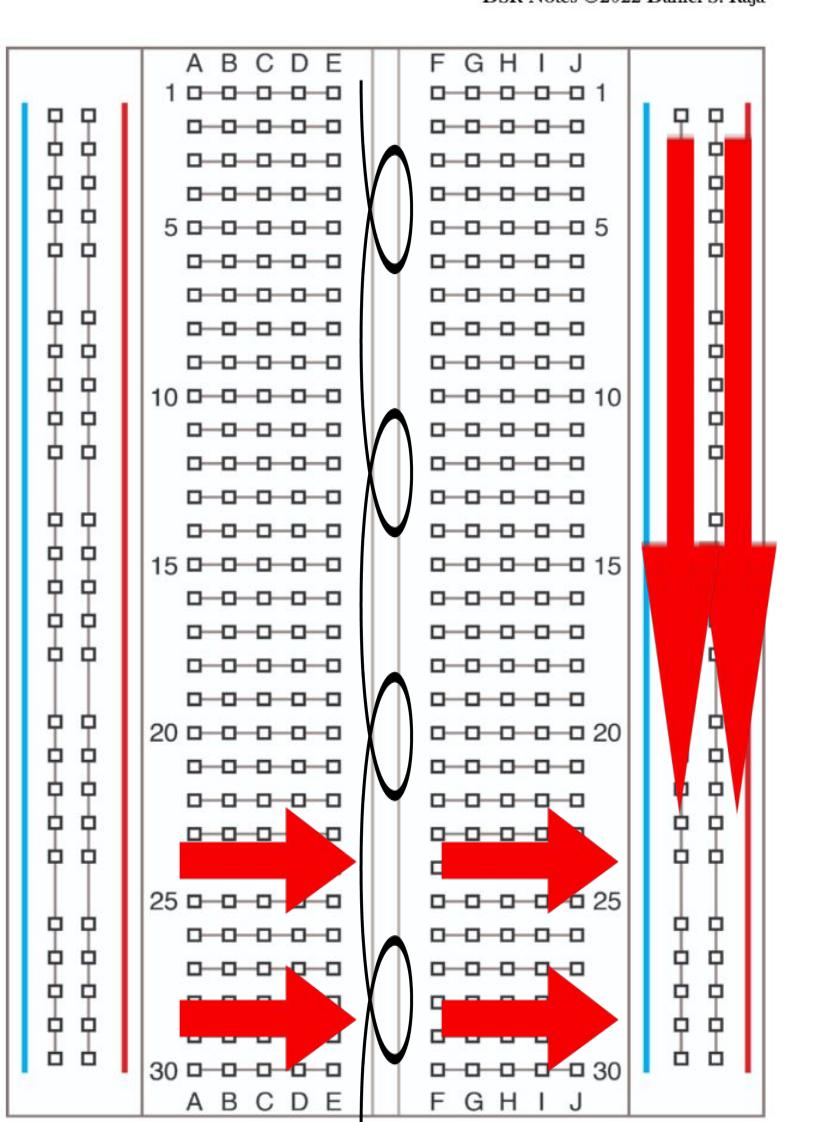
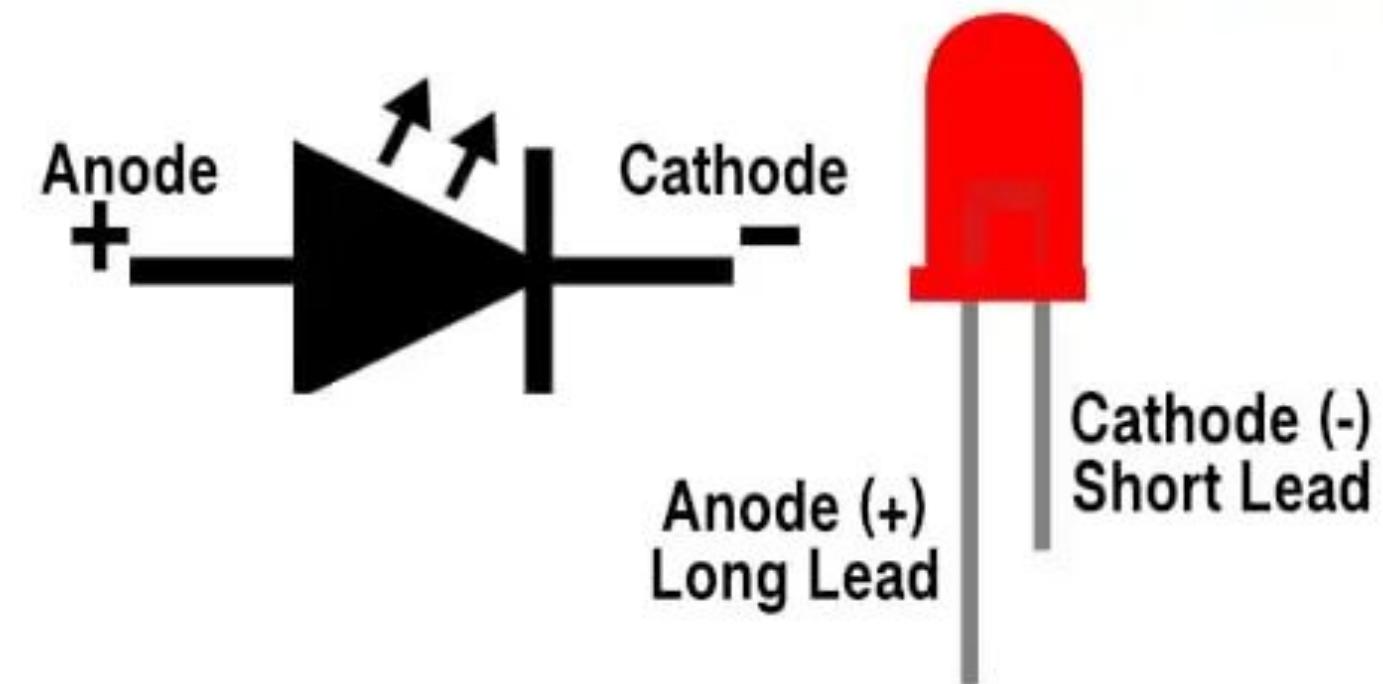


Figure 8: Breadboard Circuit Diagram for NOT Gate Using IC-7400

- Breadboards are used for prototyping and projects not meant to stay long term
- Parts can be moved easily and interchanged
- Breadboards electrically connect VERTICALLY for the GND (blue) line and for the PWR (red) line - the lines are not connected on opposite sides of the board
- The middle rows are connected ACROSS but the middle separates them
- Ex. Everything in 1 half of row 10 is electrically connected
- Ex. Everything in the first blue bus is connected but not to the second blue bus

- Light up when electricity goes through them in the right direction
- The long leg is positive and should ALWAYS face the HIGH end of the circuit (5V or 3.3V)
- The short leg is negative and should ALWAYS face the LOW end of the circuit (GND)
- Most mistakes are because the LED is facing the wrong direction

Light Emitting Diode (LED)



Resistors



- Literally a piece of wire used to reduce the flow of current
- Come in different ratings determined by the color code it has, rated in ohms Ω
- Used to protect the LED from having too much current through it. LED will break if there is too much current over its regulation.
- Can be used to make the LED brighter or dimmer. The more resistance to current the more dim. The less resistance the brighter it will be.

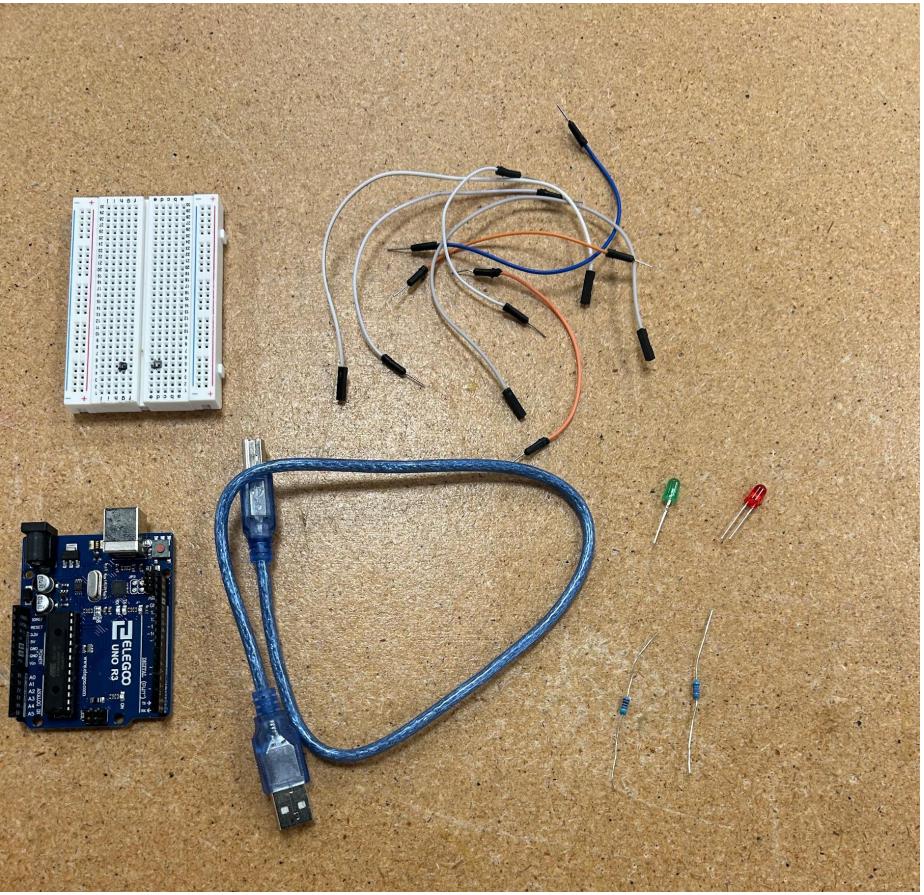


Getting a Light to Turn On



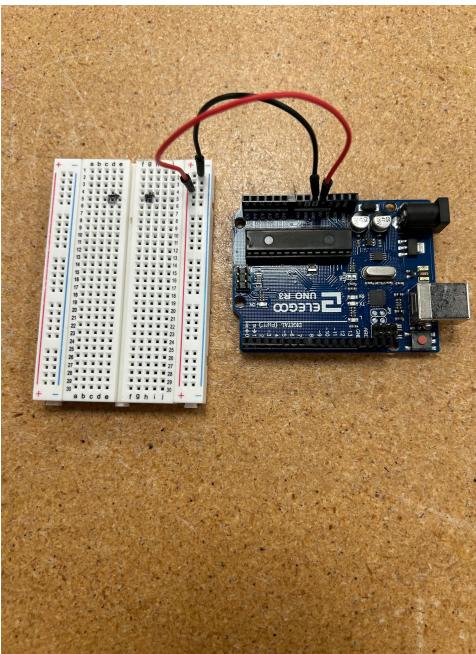
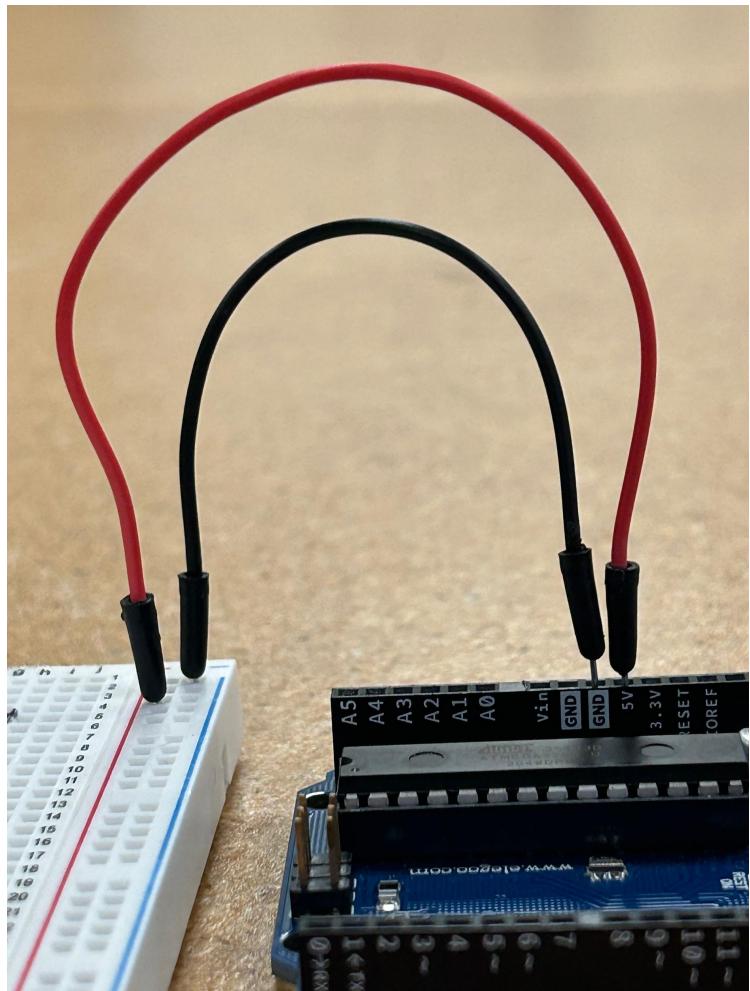
(No Programming Required)

Step 1: Gather Materials



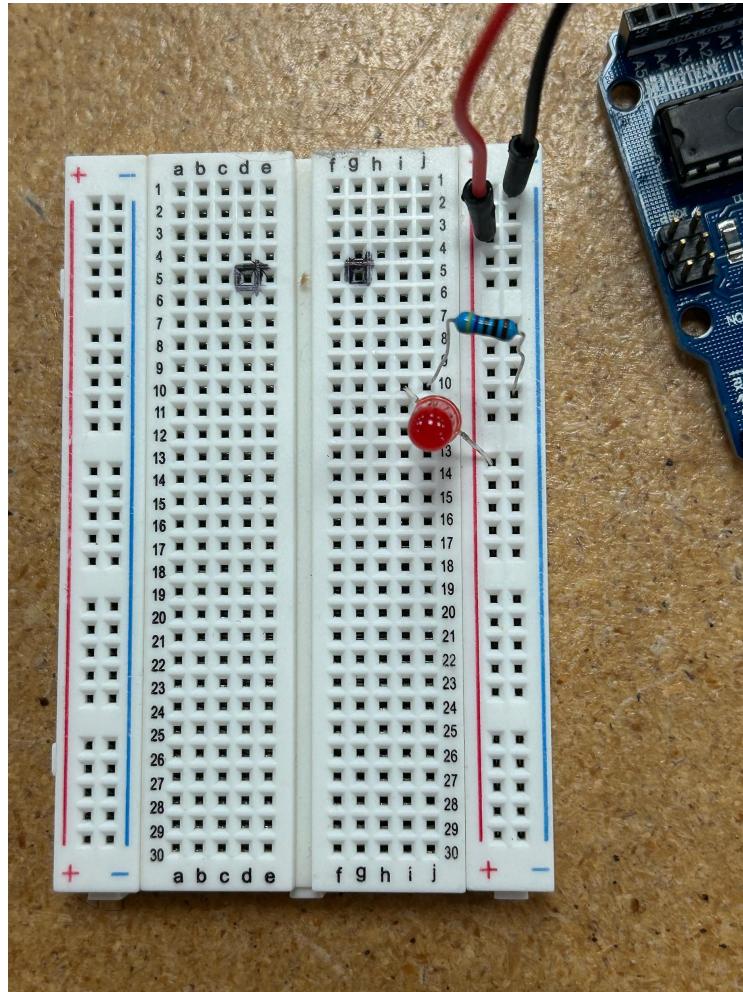
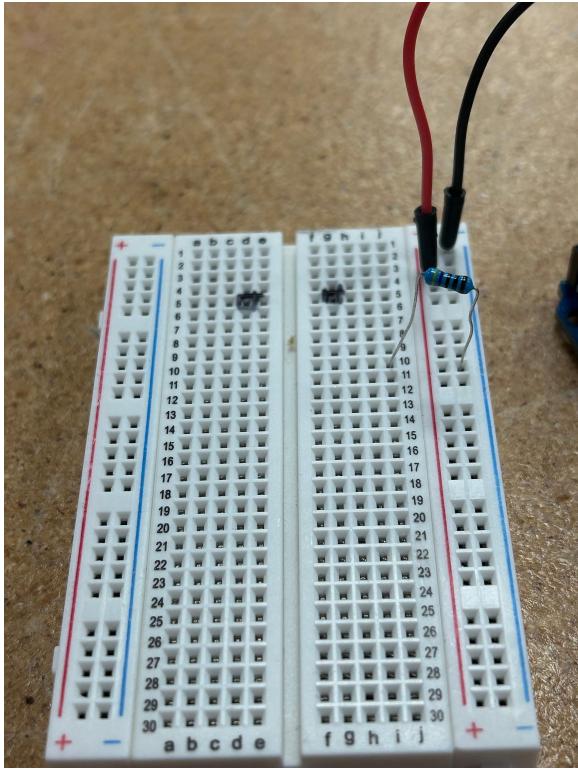
- 1 Arduino UNO
- 1 Breadboard
- 2 LEDs of any color
- 1 $470\ \Omega$ resistor (Yellow - Violet - Brown - Golden)
- 1 $100k\Omega$ resistor
(brown-black-yellow-gold)
- Hookup wire
- 1 Arduino USB cord

Step 2: Make Connections



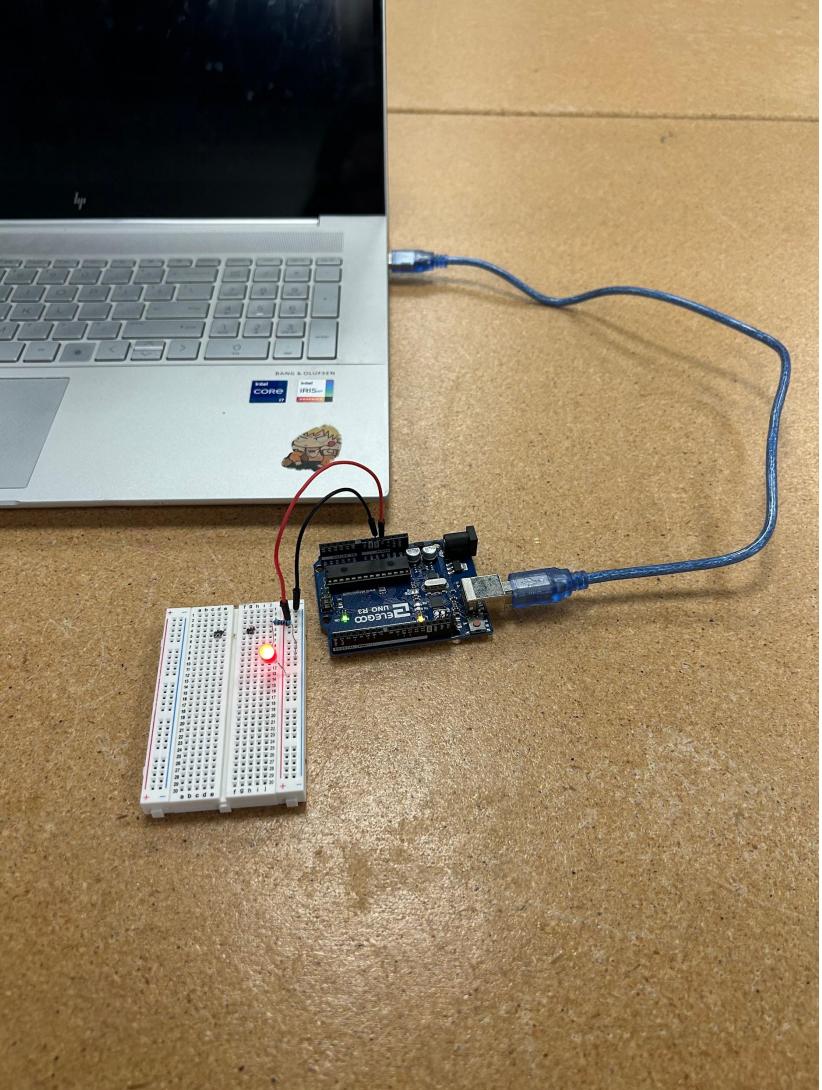
1. Connect 1 piece of hookup wire to the GND pin on the Arduino and the blue bus on the breadboard
2. Connect a second piece of wire to the 5V pin on the Arduino and the red bus on the breadboard

Step 2: Make Connections Cont.



1. Connect the $470\ \Omega$ resistor (Yellow - Violet - Brown - Golden) to the blue bus and to row 10
2. Connect the SHORT leg of one LED to row 10 and the LONG leg to the red bus

Step 3: Plug it in



1. Connect the USB cord to the Arduino into the computer
2. Check that the LED has turned on! If not check :
 - a. Is the LED in the right direction
 - b. Are the wires firmly planted in the holes
 - c. Are the wires in the correct buses?



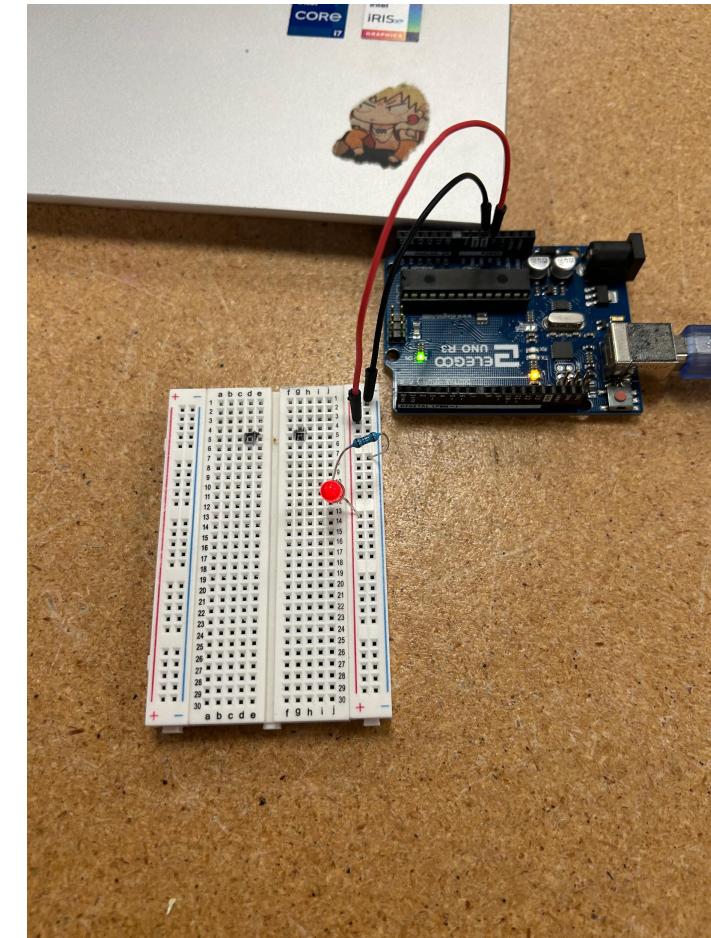
Experimentation Time



(No Programming Required)

- Can you trace the path of electricity in the circuit in other words what is the order of parts starting with GND going to PWR?
- What happens to the light if you replace the resistor with a $100\text{k }\Omega$ resistor(brown-black-orange-gold)? Why?
- Is every color of LED the same brightness when put into the circuit?
- Can you find a way to put a second LED into the circuit without adding any other parts? (Hint: there are 2 ways)(Note: Work with the same color LED)

Questions



*Congratulations on
Completing your first
Arduino project! Next time
we will learn to code the
Arduino!*