التدريب الصيفي2
SUMMER TRAINING 2

التدريب التقني المتقدم
لمعمل إنترنت الأشياء

لصيف ١٤٤١ هـ - ٢٠٢٠

يوم الأحد 2020/06/14

وادي طيبة
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References

- https://www.tinkercad.com/learn/circuits/lessons
- https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law
- http://www.ohmslawcalculator.com/led-resistor-calculator
- https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter

Topics

- Pre-cloud IoT system components.
  - Networks
  - Gateways
  - End nodes
  - Sensors
  - Actuators
- Communication methods, protocols, and technologies.
- Components interfacing
  - Digital
  - Analog
  - Serial protocols (UART, I2C, SPI, …)
  - Wireless protocols (Wi-Fi, Bluetooth, ZigBee, LoRa)
  - Application protocols (HTTP, MQTT).
- Electrical principles and tools (Voltage, Current, Resistivity).
- TinkerCad

- Arduino overview
  - Hardware Overview (Pinout, Models, …)
  - Arduino IDE
  - Review basic programming concepts (loops, conditions, functions, …)
  - Libraries
  - Pins interfacing (digital, analog, …)
  - Timing functions
  - Serial functions (Serial, Wire, SPI, OneWire)
- Raspberry Pi overview
  - Hardware Overview (Pinout, Models, …)
  - Installing Raspberry Pi OS (previously Raspbian)
  - Simple LED controlling
  - CLI basics and software management (install, update, …)
  - Node-RED installing
- ESP8266 (Arduino Based)
  - HTTP Client
  - HTTP Server
  - MQTT Client
- Node-Red
- Miscellanies
  - Using Multimeter
- JSON

Topics (Optional)

- PWM
- PCB design
- ESP8266 (AT command based)
- Datasheets
- Waveforms, Oscilloscope and Logic analyzer
- Pull-Up and Pull-Down
- Raspberry Pi
  - SSH access
  - VNC
  - Python and GPIO
  - Controlling HW (GPIO and other ports) using filesystem
- RFID

AUTODESK® TINKERCAD®

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SUMMER TRAINING

Electrical principles (Ohm’s Law)

Source: VOLTAGE, CURRENT, RESISTANCE, AND OHM'S LAW tutorial from Sparkfun.

https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law/all

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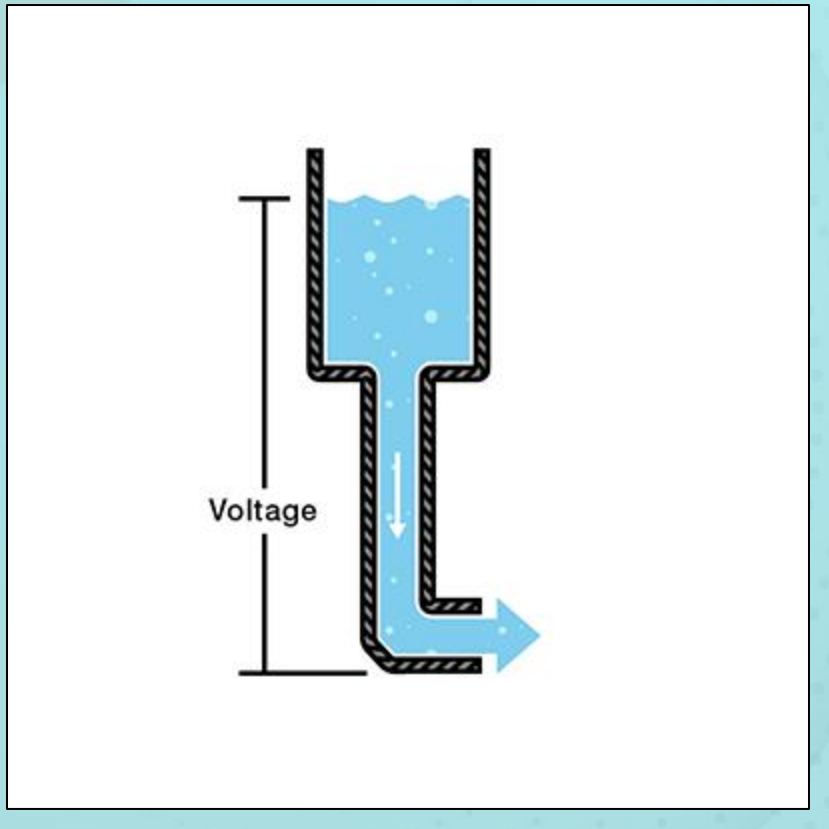
Voltage



Voltage is the difference in charge between two points.

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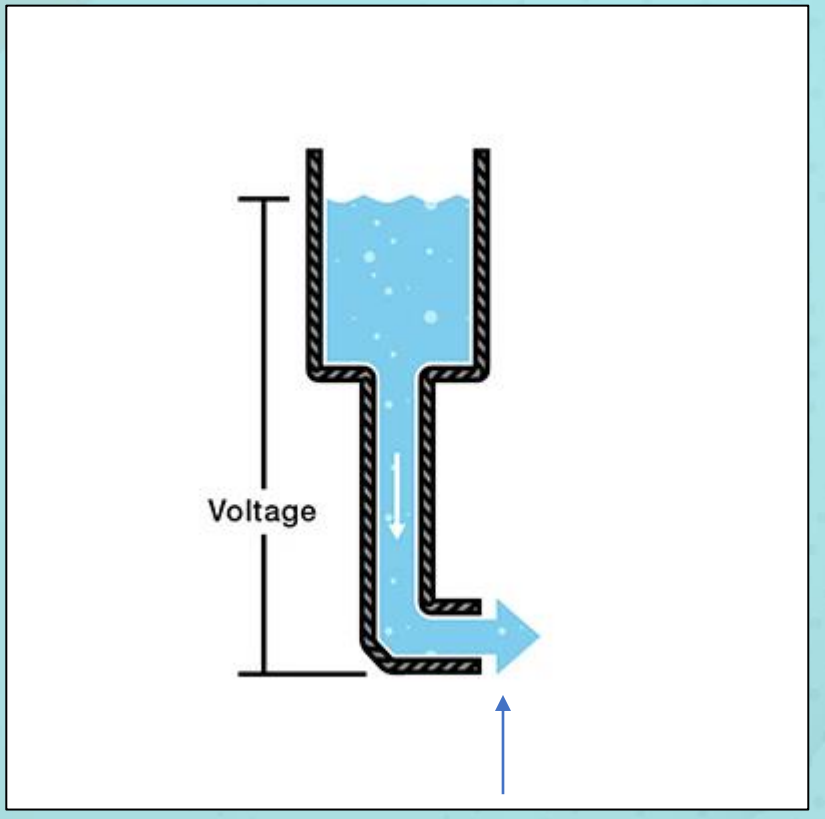
Current (Amperage)



Current is the rate at which charge is flowing.

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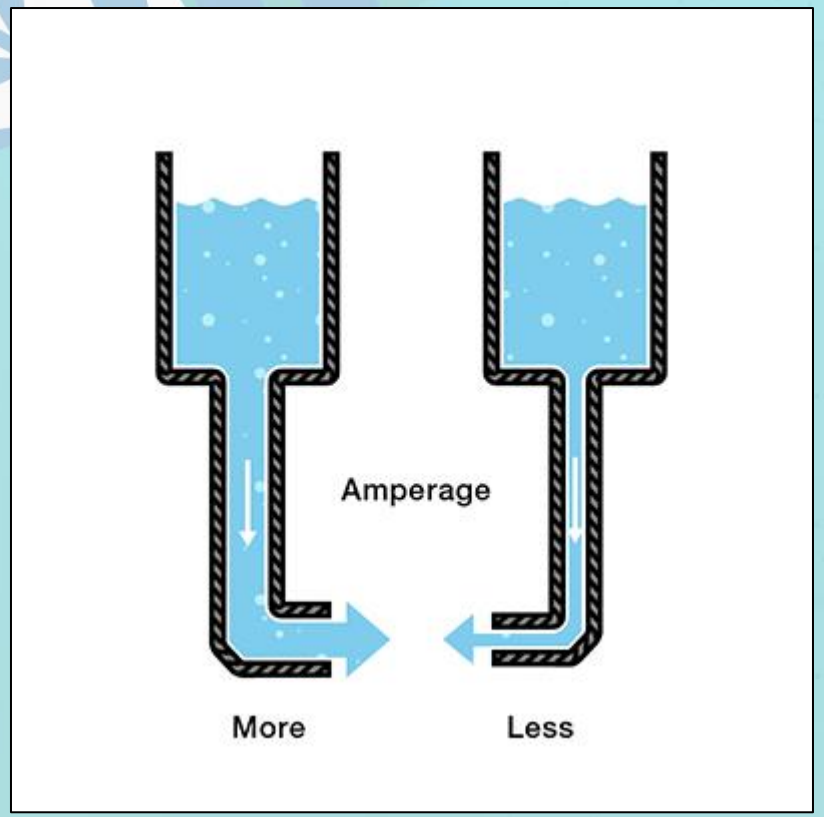
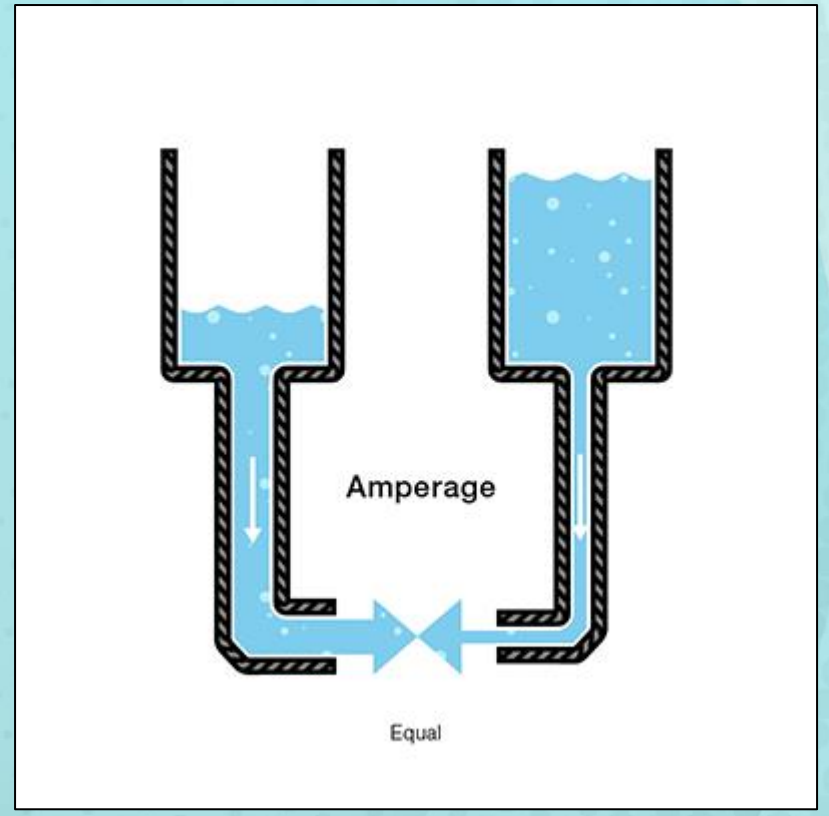
Current (Amperage)





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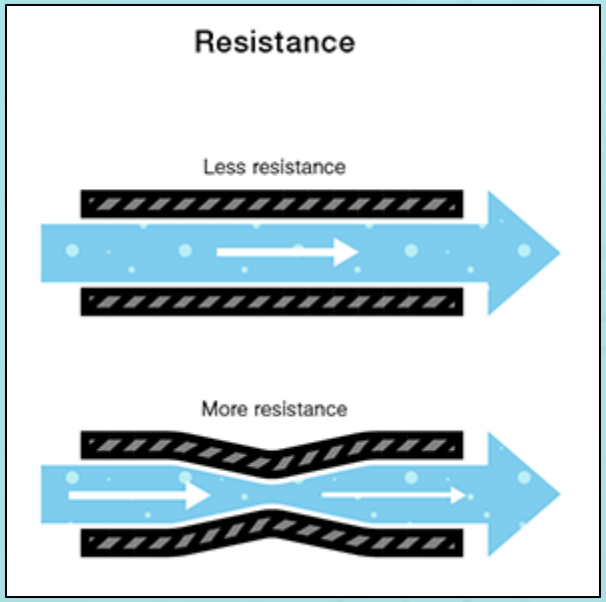
Resistance



Resistance is a material's tendency to resist the flow of charge (current).

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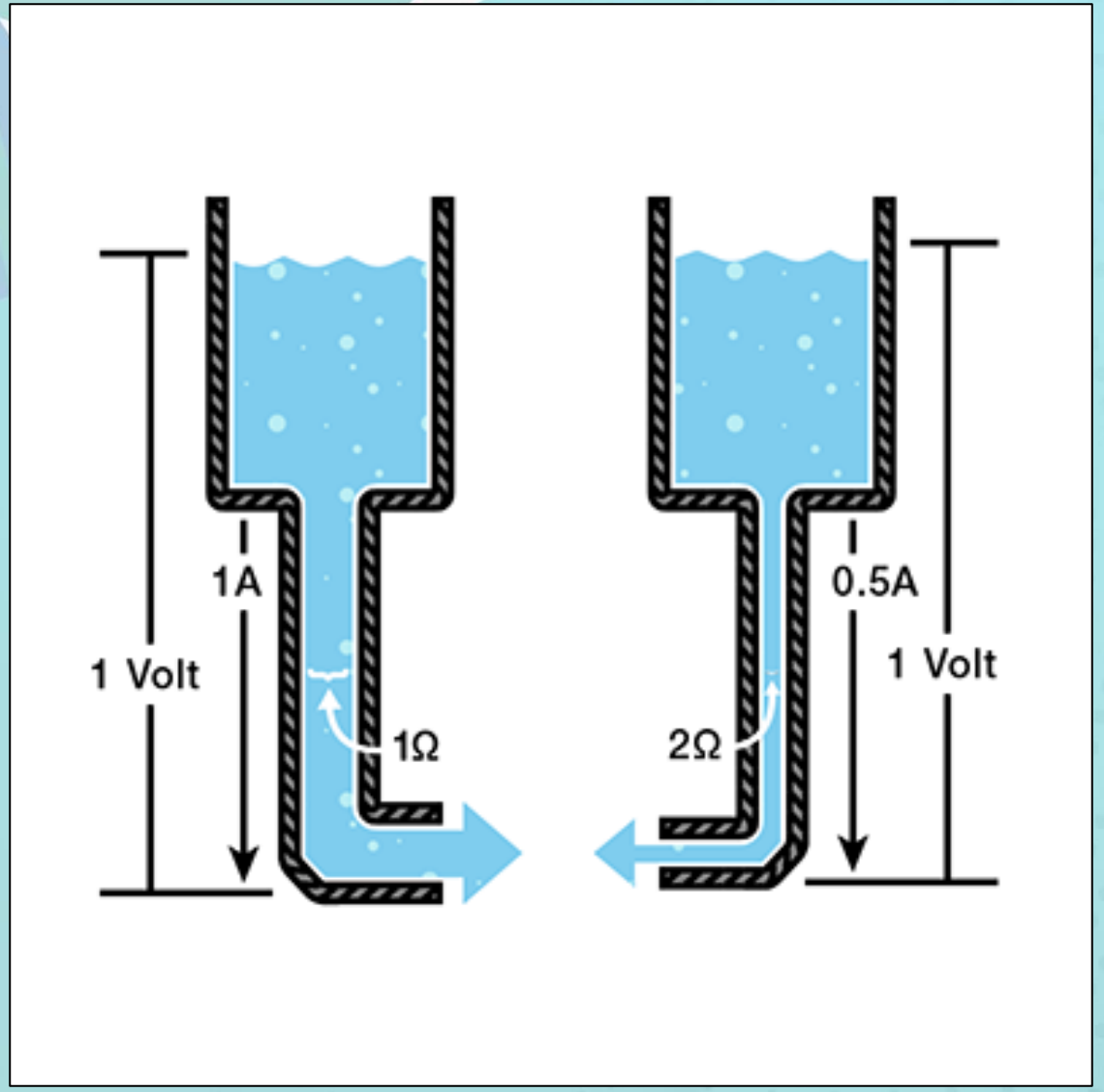

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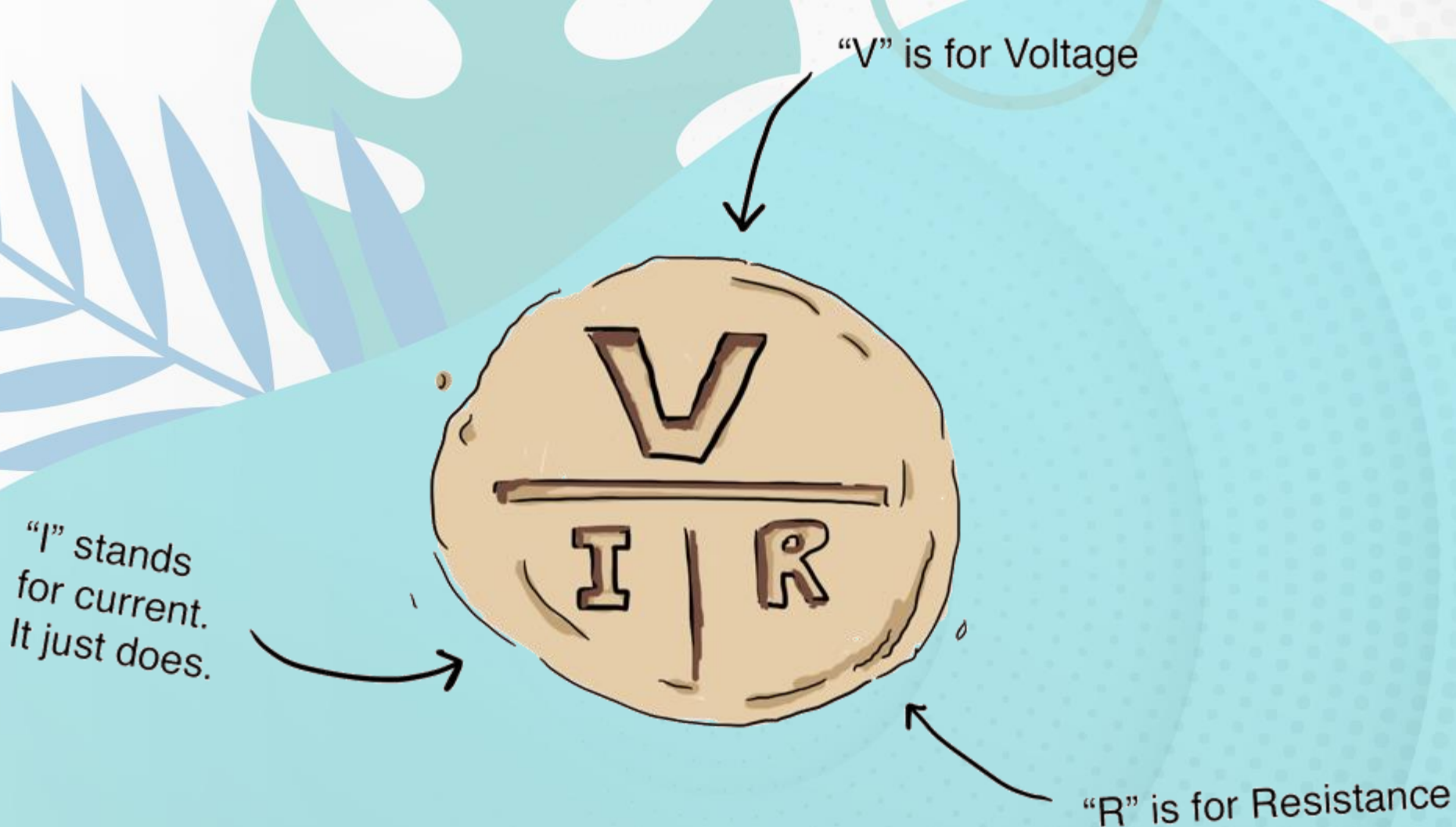

- **Voltage**, measured by **volts[v]** (V)
- **Current**, measured by **amps[I]** (A)
- **Resistance**, measured by **ohms[R]** (Ω)

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IR

??

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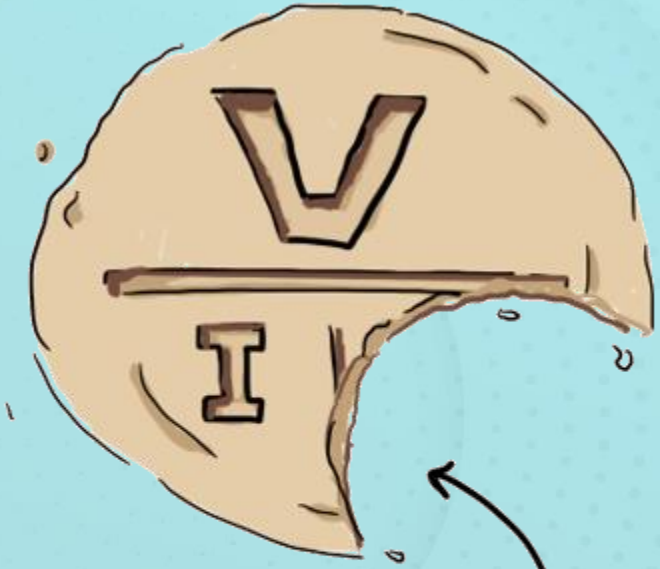
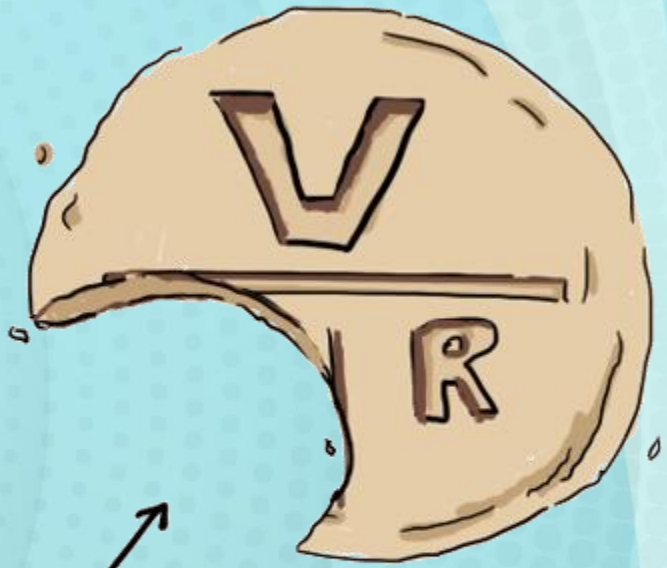
How I memorize it

$$V = IR$$

Voltage = Current x Resistance



Resistance = Voltage / Current



Current = Voltage / Resistance

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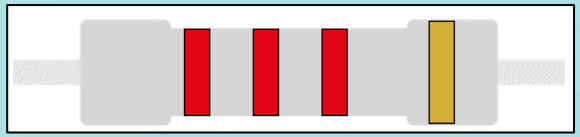
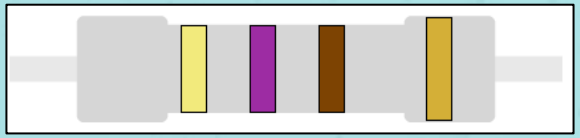
Resistors

Resistors

- The resistor is the real-world component that has resistance.
- Resistors comes in many values, and its values are marked using color bands (4, 5 or 6 bands).



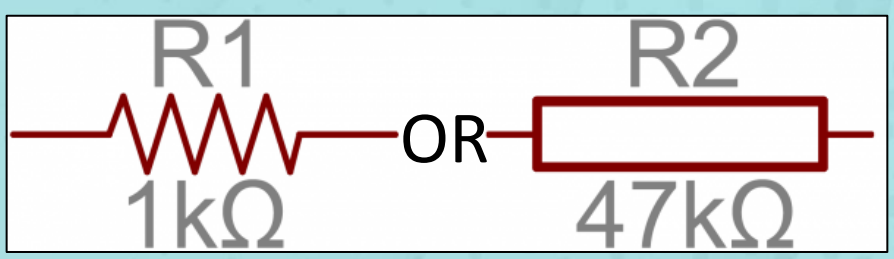
2.2 KΩ = 2200 Ω



470 Ω

10 KΩ = 10 000 Ω

- It is represented by the symbol



Experiment time!

P = IV

<- leave that in your mind

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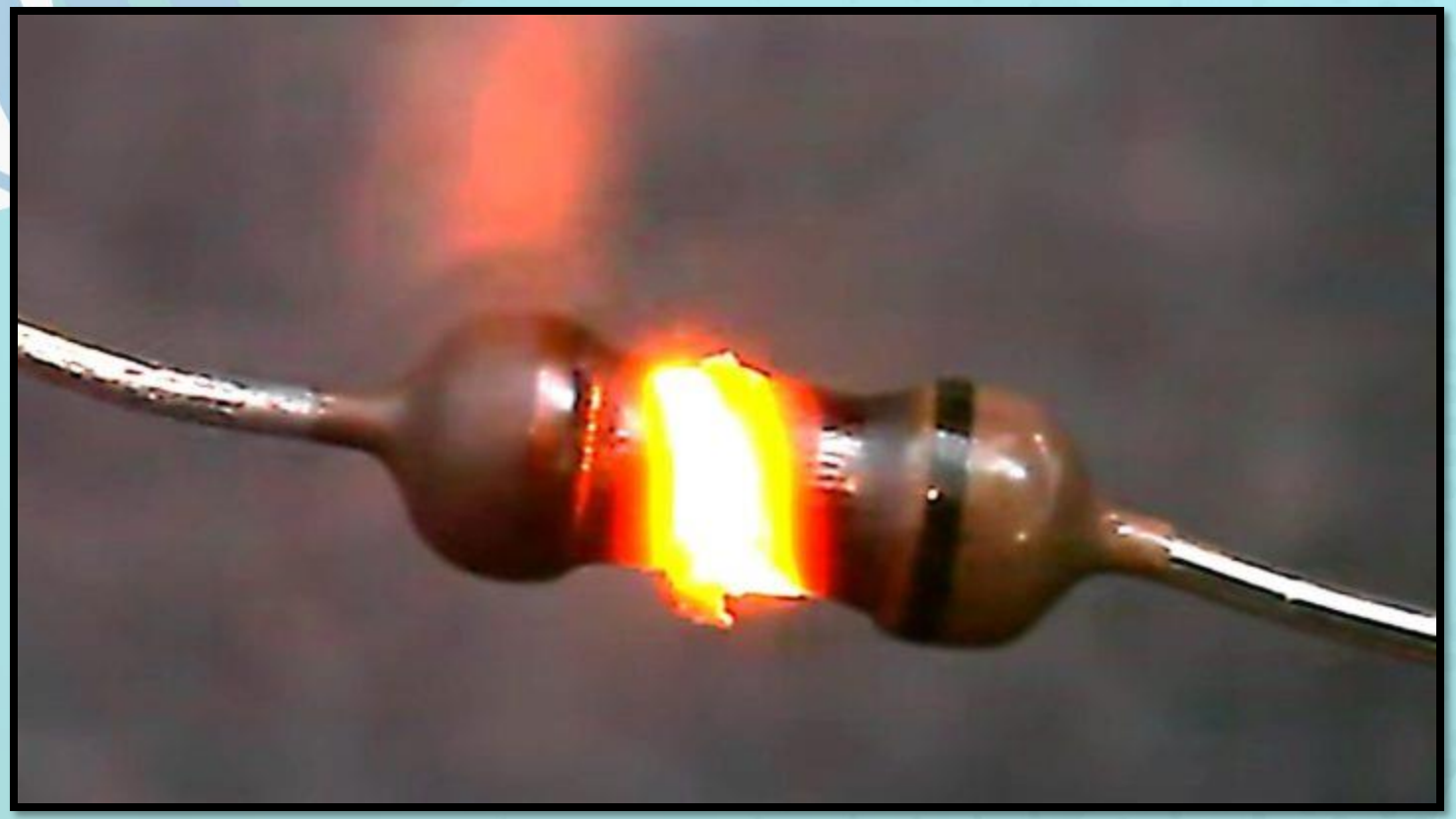
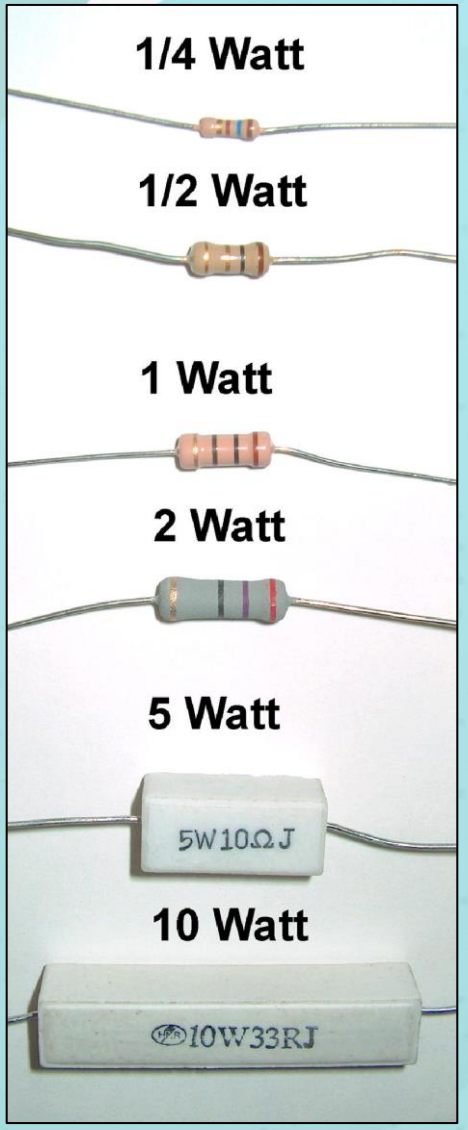
What happened?





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Quick tips to save your time

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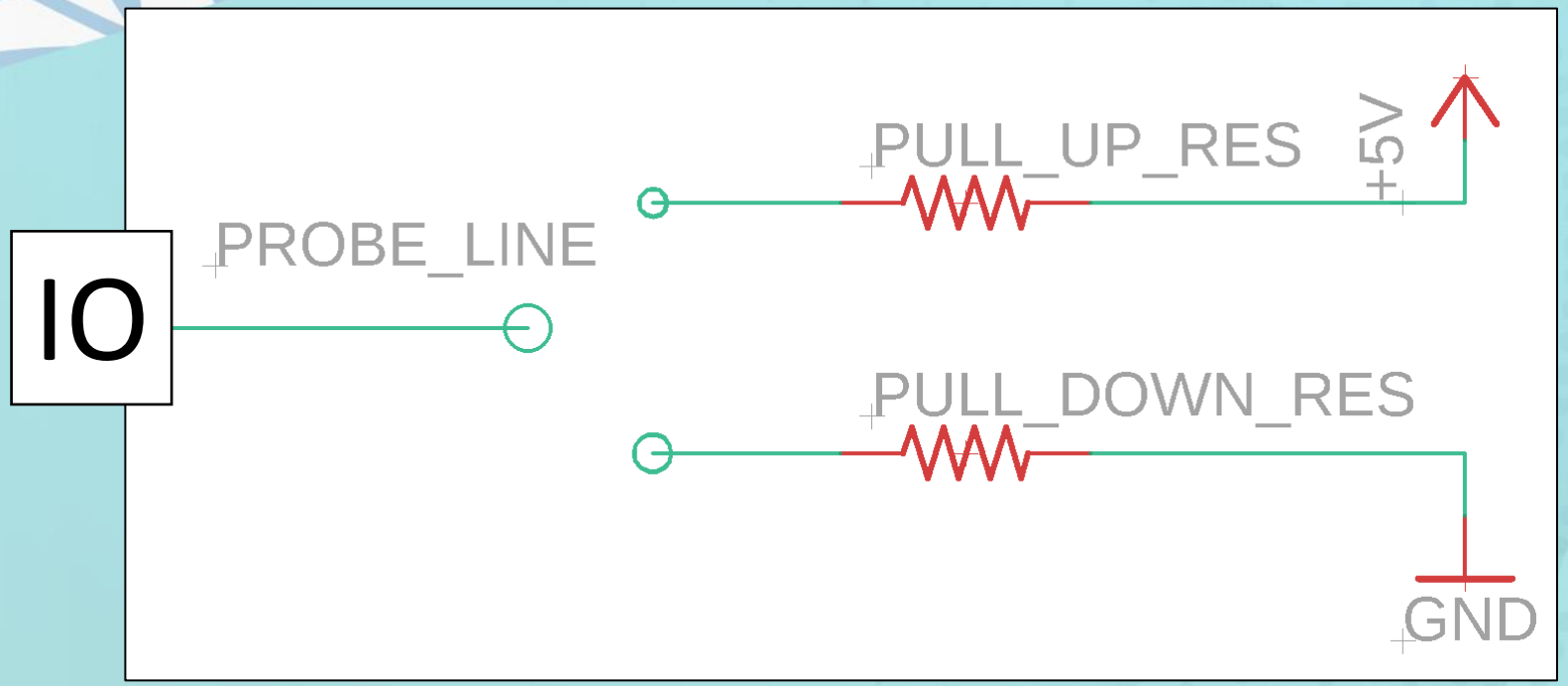
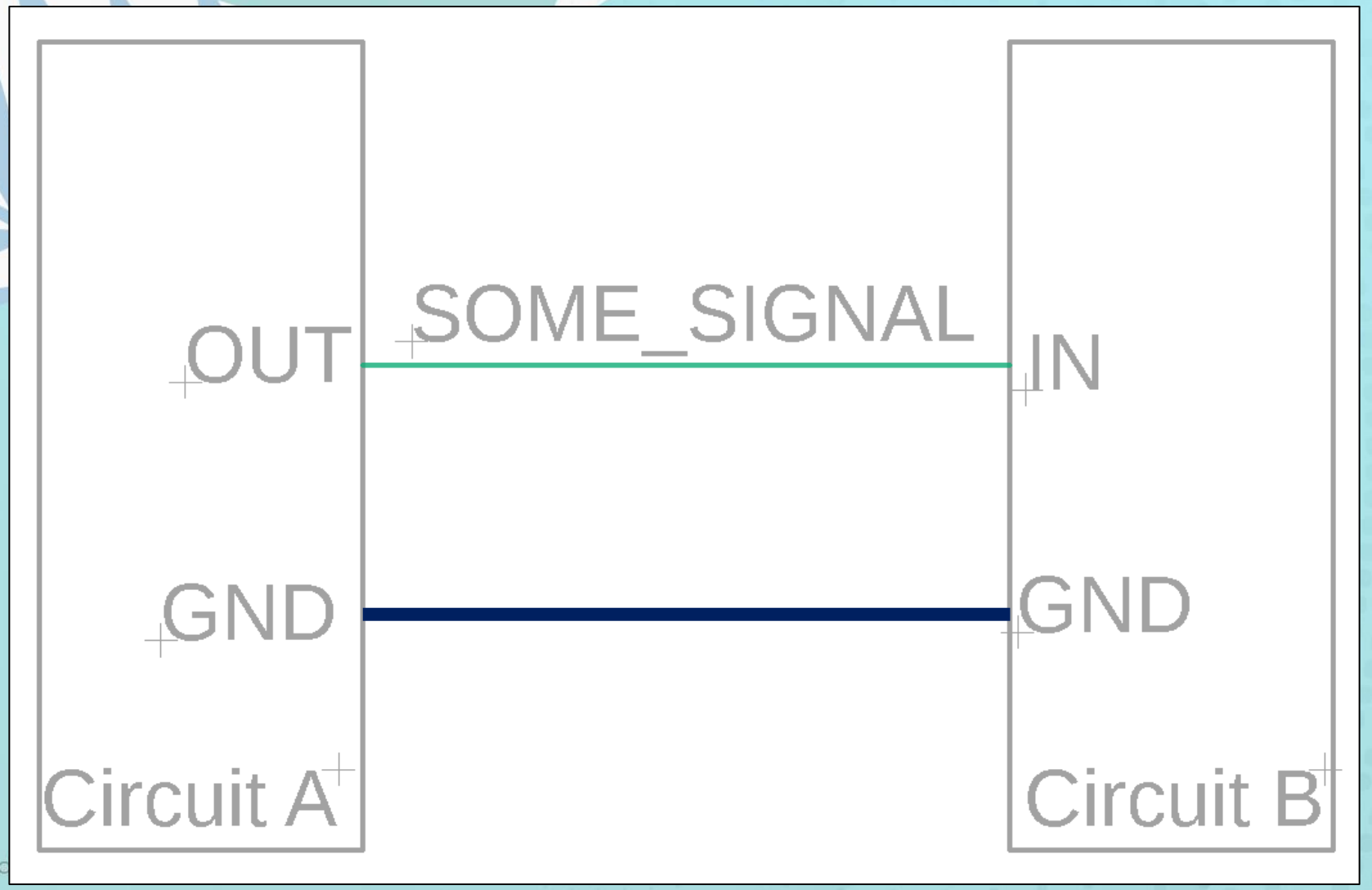
Pull-up Pull-down



When a line is **Floating**, you can't guarantee its reading, which may cause problems for the sensitive devices or increase power consumption.

GND



If there are circuits that share signals, mostly likely it is necessary to share the same GND (ground) between both circuits.

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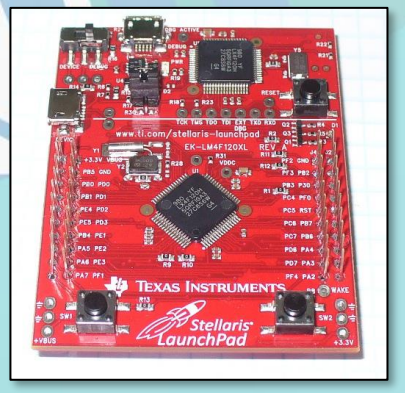
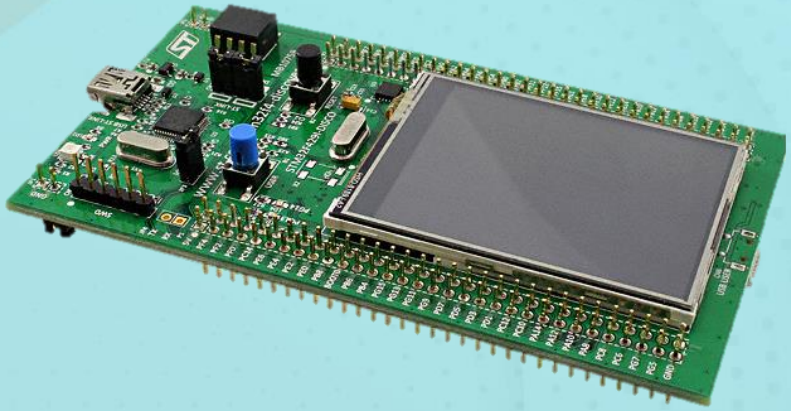
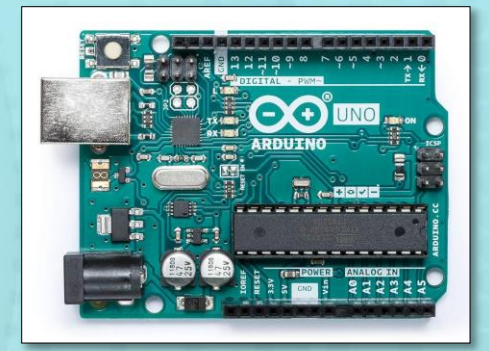
Multimeter

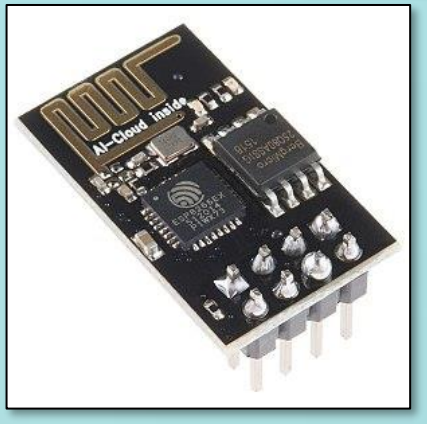
- A device to measure basic electrical quantities
- Essential tool when working with electronics
- Can be used in circuits diagnosing and verifying components.

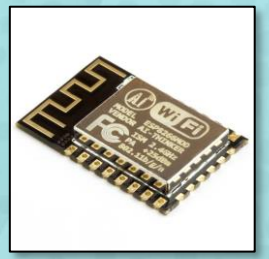
Microcontrollers











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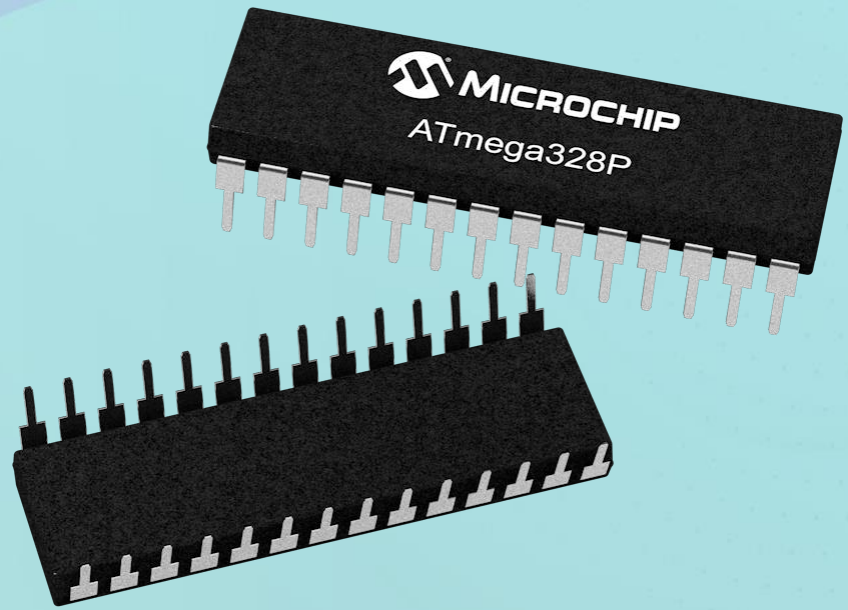
But,

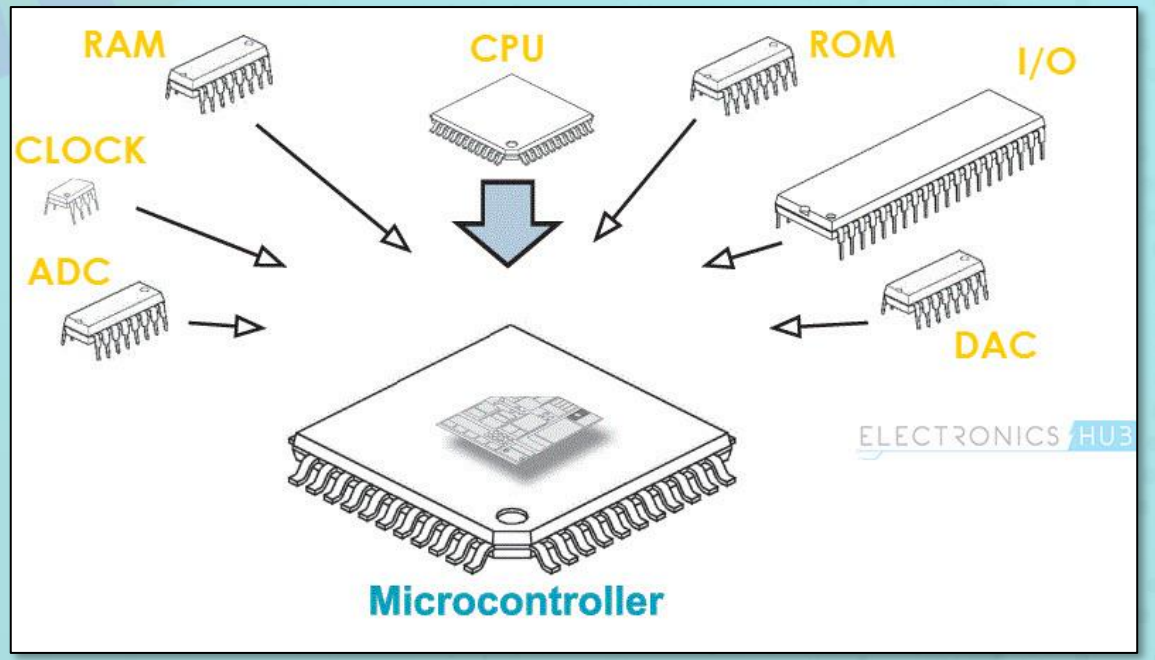
- What exactly is MCU?



It is this one

NOT this one!

Microcontrollers (MCU)



Tasks

- DC Motor circuit
  - Connect directly to power source
  - Connect using transistor (2N2222 or TIP120)
- LED and DC motor circuit using push buttons
  - One push button turns on both of Motor and LED
- Resistors Identification
  - What are the colors of the following resistors (4-Colors)?
    - 220Ω
    - 470Ω
    - 1KΩ
    - 1.2KΩ
    - 4.7KΩ
    - 100KΩ