

# Introduction to Electronics



# Agenda

- Basic electronics Component
- Resistor
- ohm's law
- led
- Relay
- Measurement tools
- Measure Current in closed circuit
- Measure Voltage in closed circuit
- Bread board
- 



# Basic electronics component



Resistor



Capacitor



Inductor



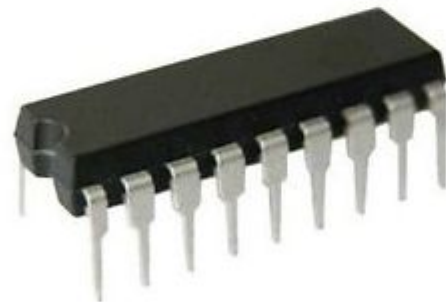
Diode



LED



Transistor



IC



Relay



Battery

Basic Electrical Components used for Circuit Designing

[www.TheEngineeringProjets.com](http://www.TheEngineeringProjets.com)

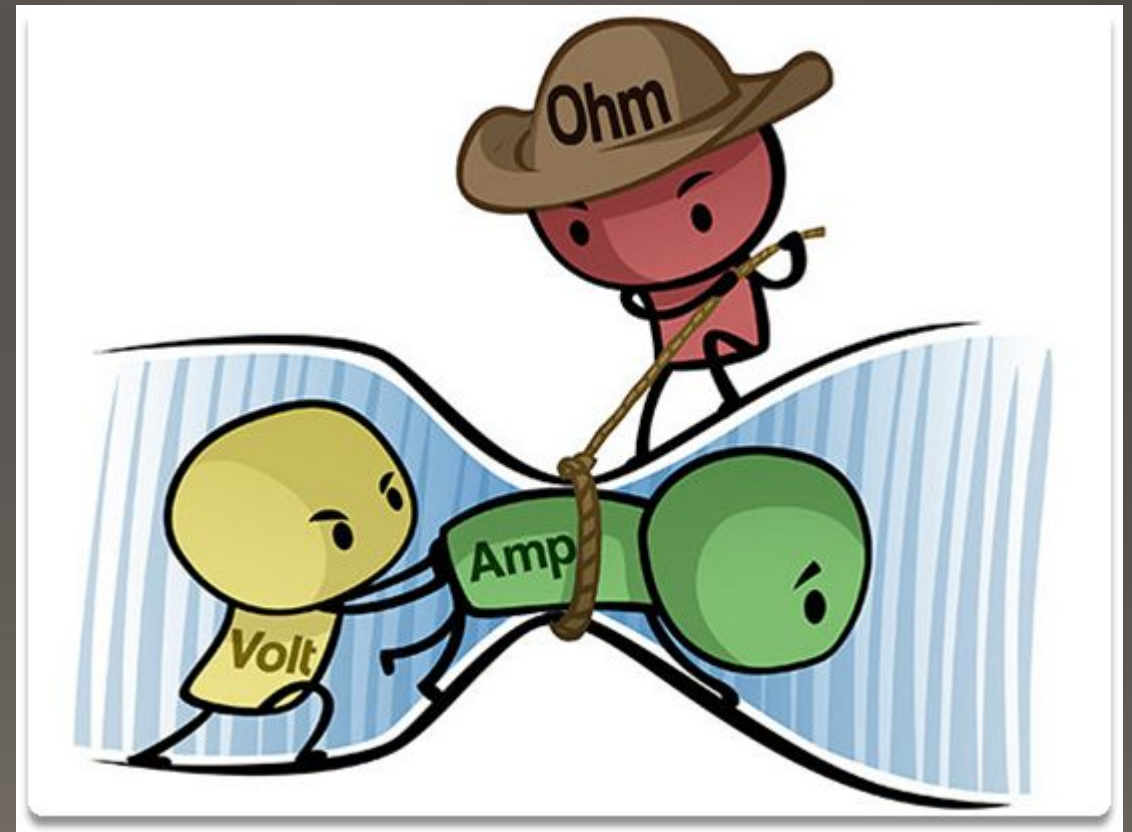


# ohm's law

Ohm's  
Law

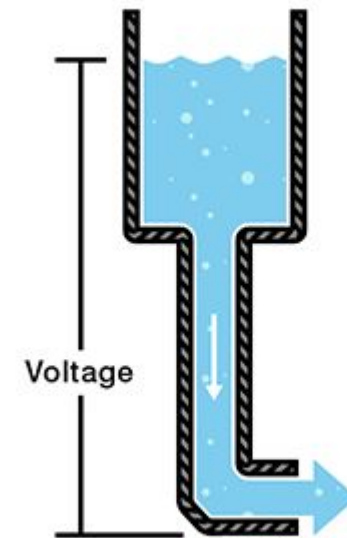
$$I = \frac{V}{R}$$

Electric current = Voltage / Resistance



# Voltage

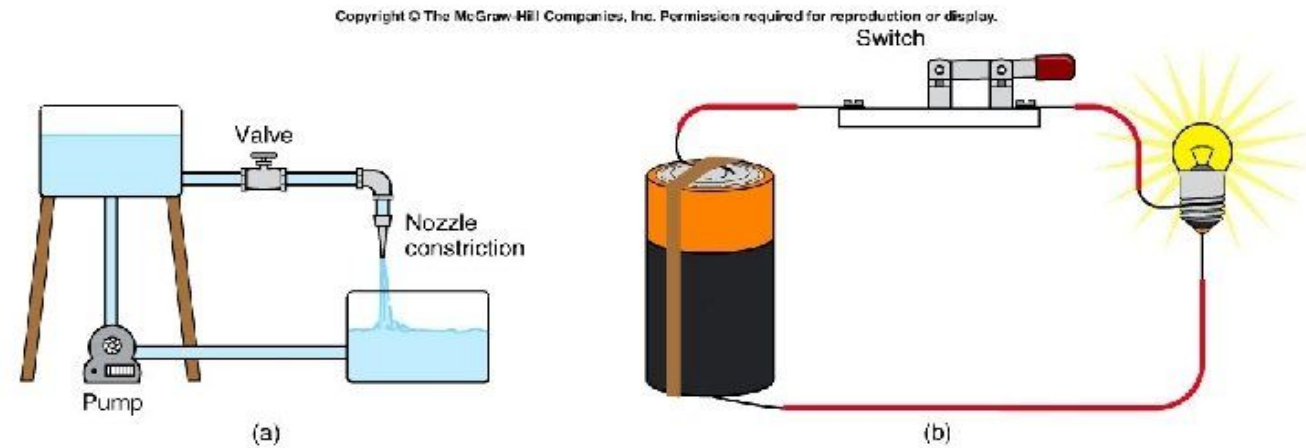
- Electric potential difference between two points.
- (V) Measured in Volts.



# Current

- Charges (Electrons) moving through material.
- (I) Measured in Amps

## Electric Current Is Analogous to Water Flow



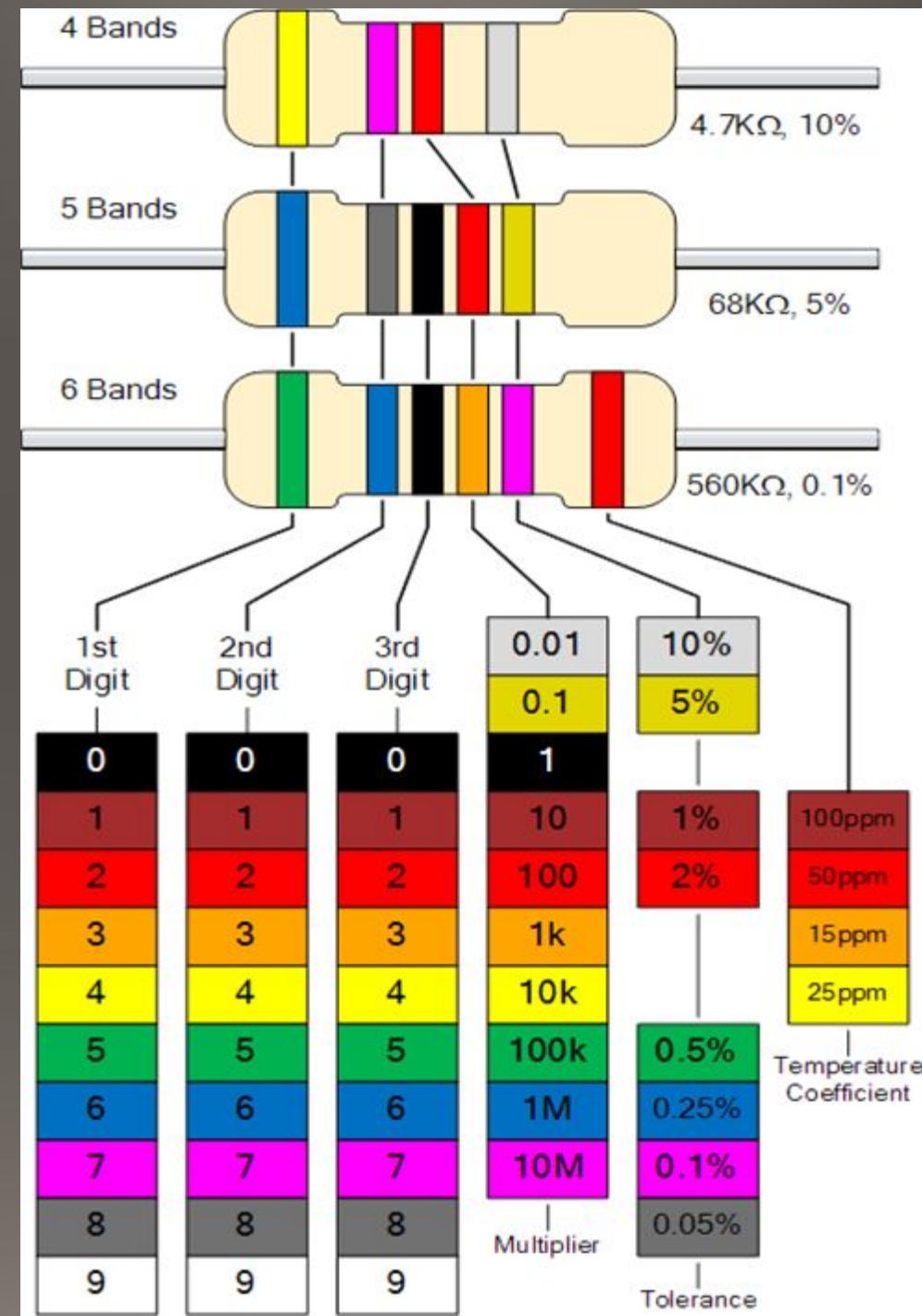


# Resistance

- The ability of the material to slow/stop the flowing of the electrical current.
- (R) Measured in ohms ( $\Omega$ ).
- Application ...



# Resistor Color Code





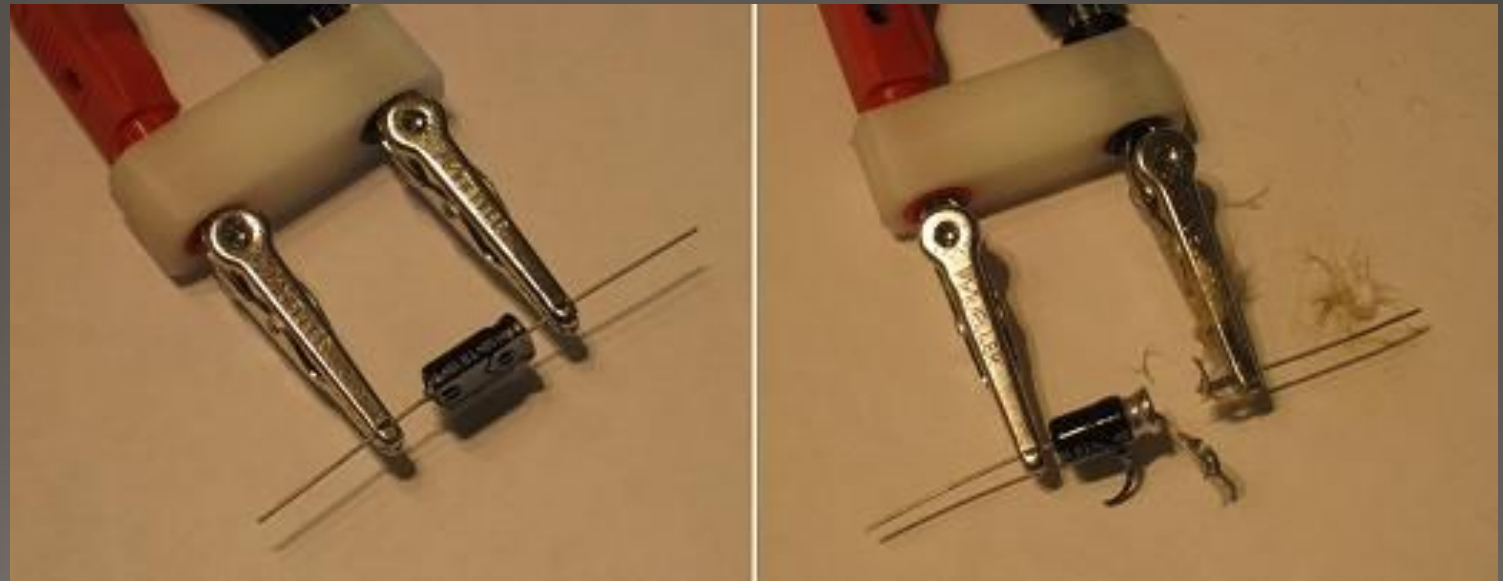
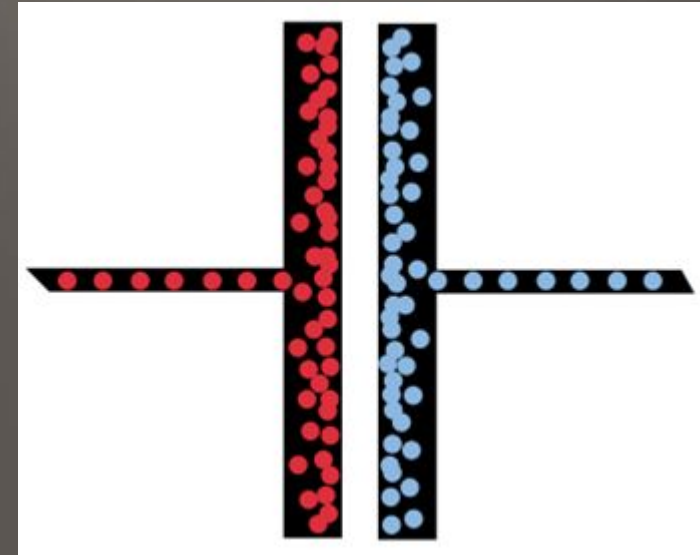
# Variable Resistance



# Batteries

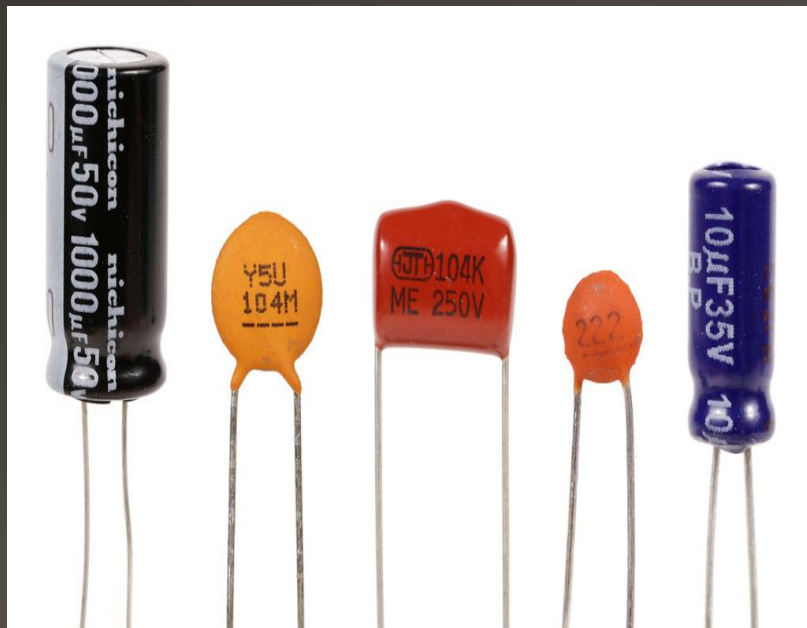


# Capacitors

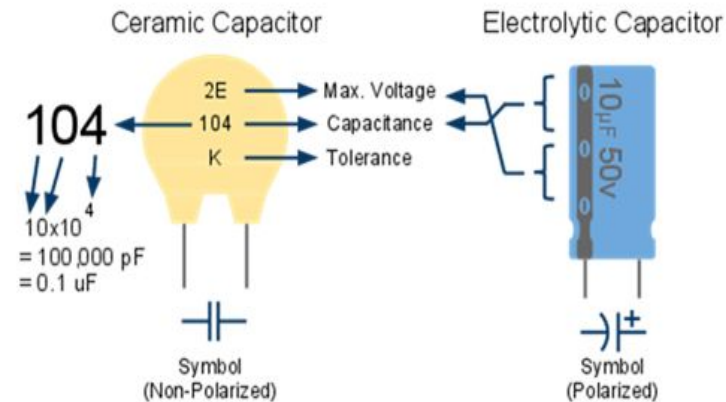




# Capacitors



## Capacitors



### Capacitance Conversion Values

Microfarads ( $\mu$ F)	Nanofarads (nF)	Picofarads (pF)
0.000001 $\mu$ F	0.001 nF	1 pF
0.00001 $\mu$ F	0.01 nF	10 pF
0.0001 $\mu$ F	0.1 nF	100 pF
0.001 $\mu$ F	1 nF	1,000 pF
0.01 $\mu$ F	10 nF	10,000 pF
0.1 $\mu$ F	100 nF	100,000 pF
1 $\mu$ F	1,000 nF	1,000,000 pF
10 $\mu$ F	10,000 nF	10,000,000 pF
100 $\mu$ F	100,000 nF	100,000,000 pF

### Max. Operating Voltage

Code	Max. Voltage
1H	50V
2A	100V
2T	150V
2D	200V
2E	250V
2G	400V
2J	630V

### Tolerance

Code	Percentage
B	$\pm 0.1$ pF
C	$\pm 0.25$ pF
D	$\pm 0.5$ pF
F	$\pm 1\%$
G	$\pm 2\%$
H	$\pm 3\%$
J	$\pm 5\%$
K	$\pm 10\%$
M	$\pm 20\%$
Z	+80%, -20%

# Switches

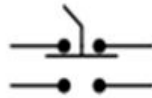
Toggle switch



Pushbutton switch



Selector switch

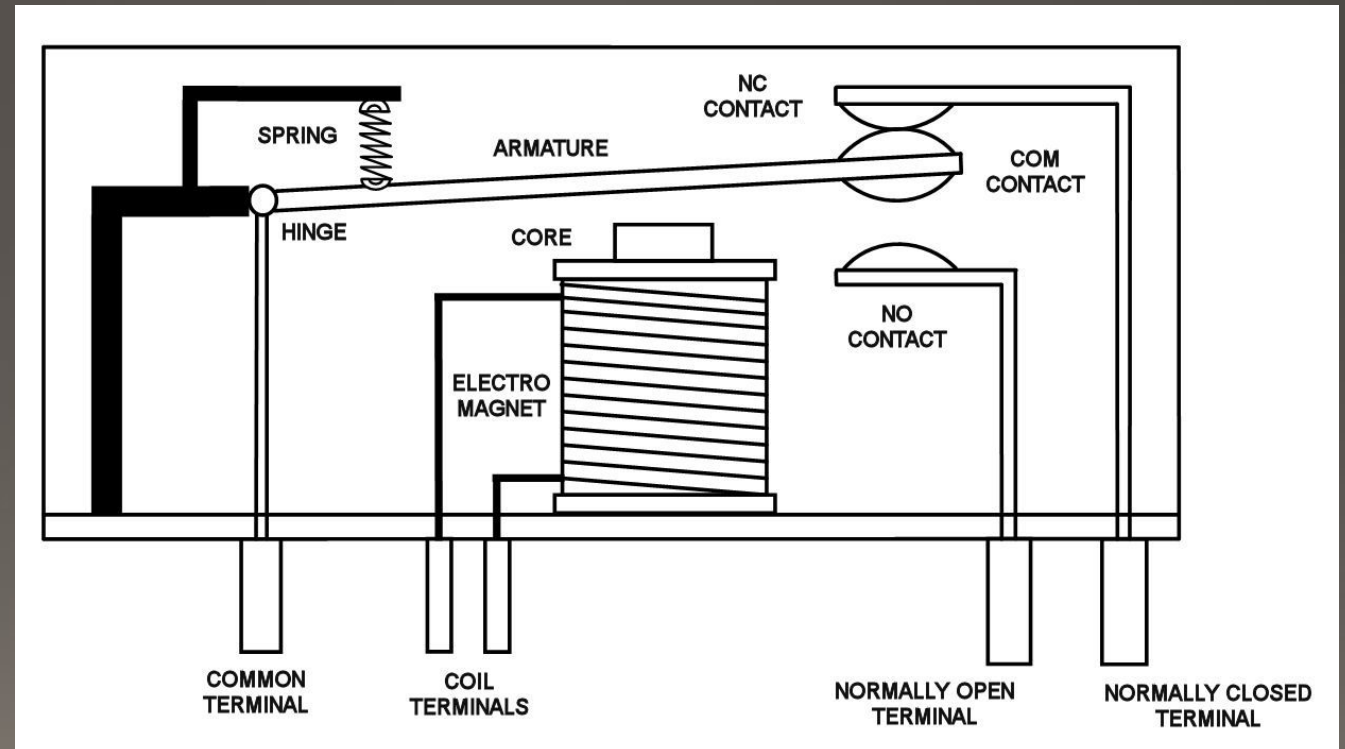


Lever actuator limit switch



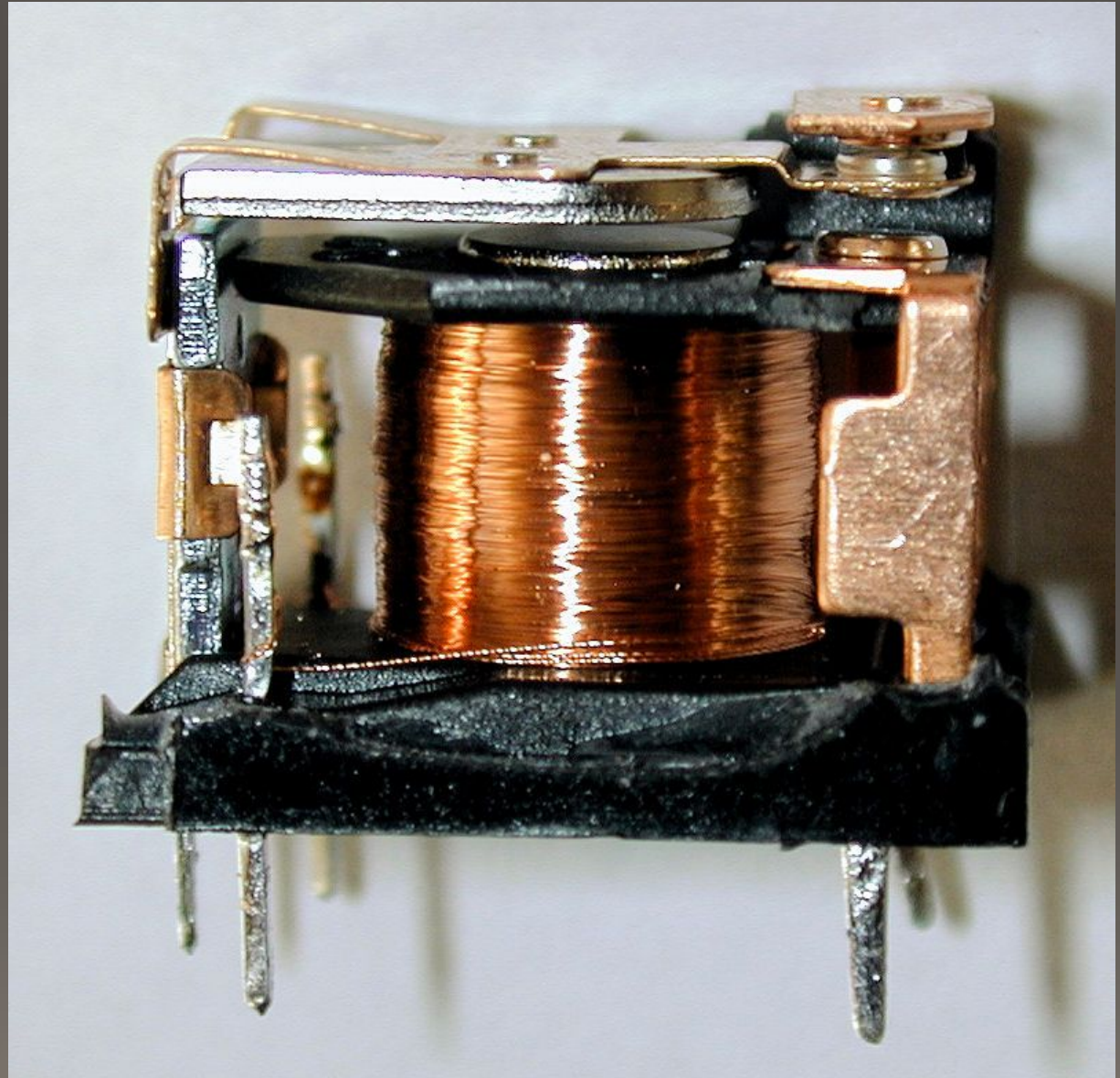
# Electromechanical

- Electromagnet
- Armature that can be attracted by the electromagnet
- Spring
- Set of electrical contacts





# Relay body



# Multimeter (AVO Meter)

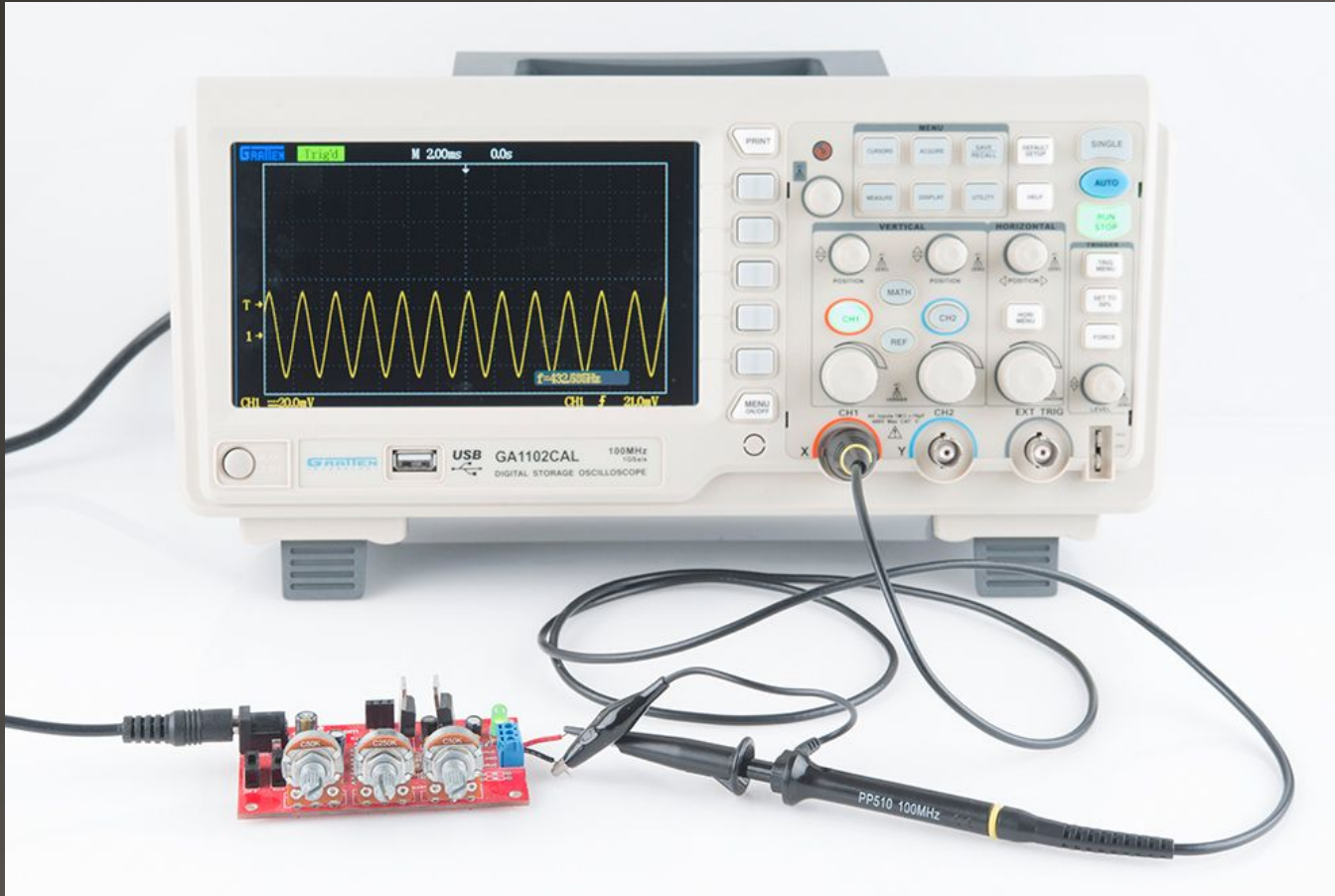


<https://youtu.be/TdUK6RPdIrA>



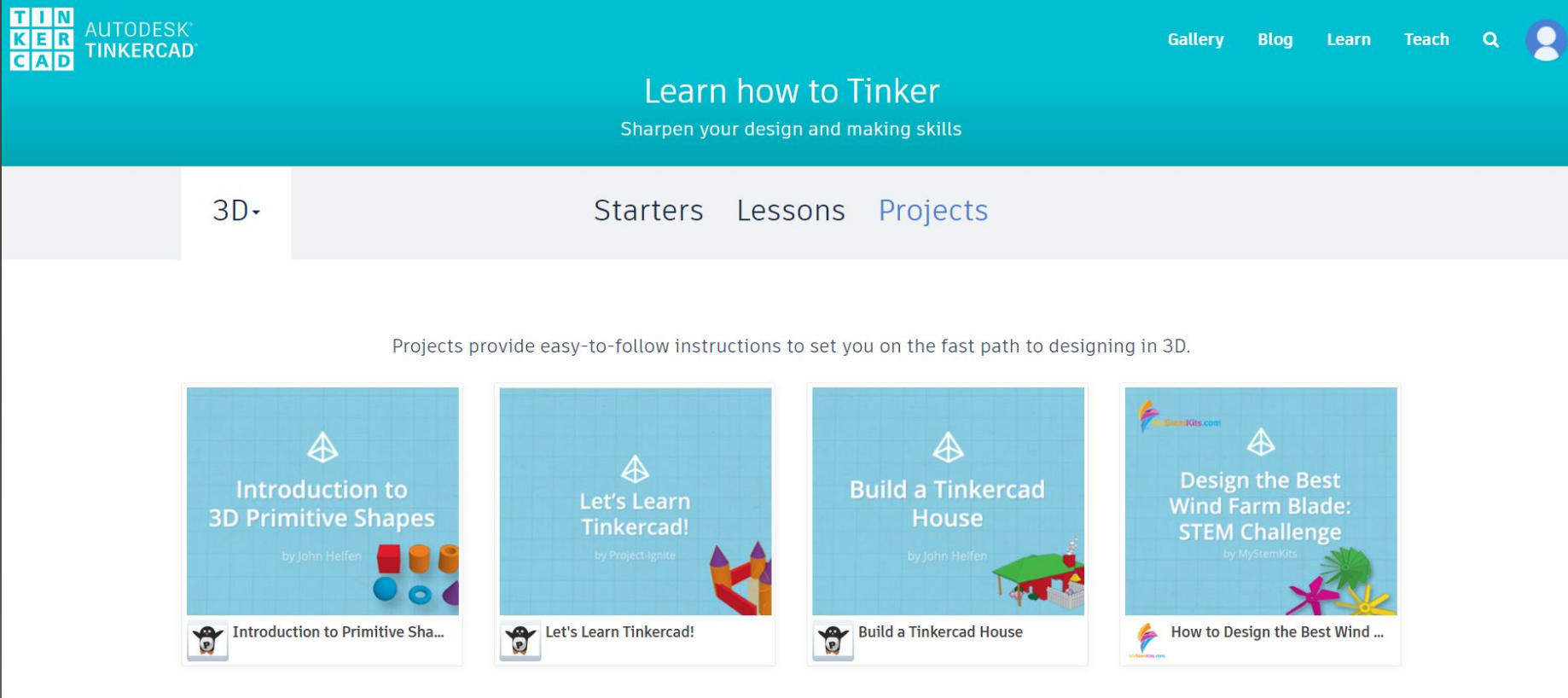


# oscilloscope



# Tinker cad

## Dashboard | Tinkercad



The screenshot shows the Tinkercad dashboard interface. At the top is a teal header with the Tinkercad logo (a grid of 'T', 'I', 'N', 'K', 'E', 'R', 'C', 'A', 'D' letters) and 'AUTODESK TINKERCAD' text on the left. On the right of the header are links for 'Gallery', 'Blog', 'Learn', 'Teach', a search icon, and a user profile icon. Below the header, a teal banner contains the text 'Learn how to Tinker' and 'Sharpen your design and making skills'. Underneath this is a navigation bar with '3D' selected, and links for 'Starters', 'Lessons', and 'Projects'. The main content area features a heading 'Projects provide easy-to-follow instructions to set you on the fast path to designing in 3D.' followed by four project cards. Each card has a blue background with a white Tinkercad icon, a title, the author's name, and a small image of the project. The cards are: 'Introduction to 3D Primitive Shapes' by John Heifen, 'Let's Learn Tinkercad!' by Project-Ignite, 'Build a Tinkercad House' by John Heifen, and 'Design the Best Wind Farm Blade: STEM Challenge' by MyStemKits.

**TINKERCAD** AUTODESK TINKERCAD

Gallery Blog Learn Teach

Learn how to Tinker  
Sharpen your design and making skills

3D Starters Lessons Projects

Projects provide easy-to-follow instructions to set you on the fast path to designing in 3D.

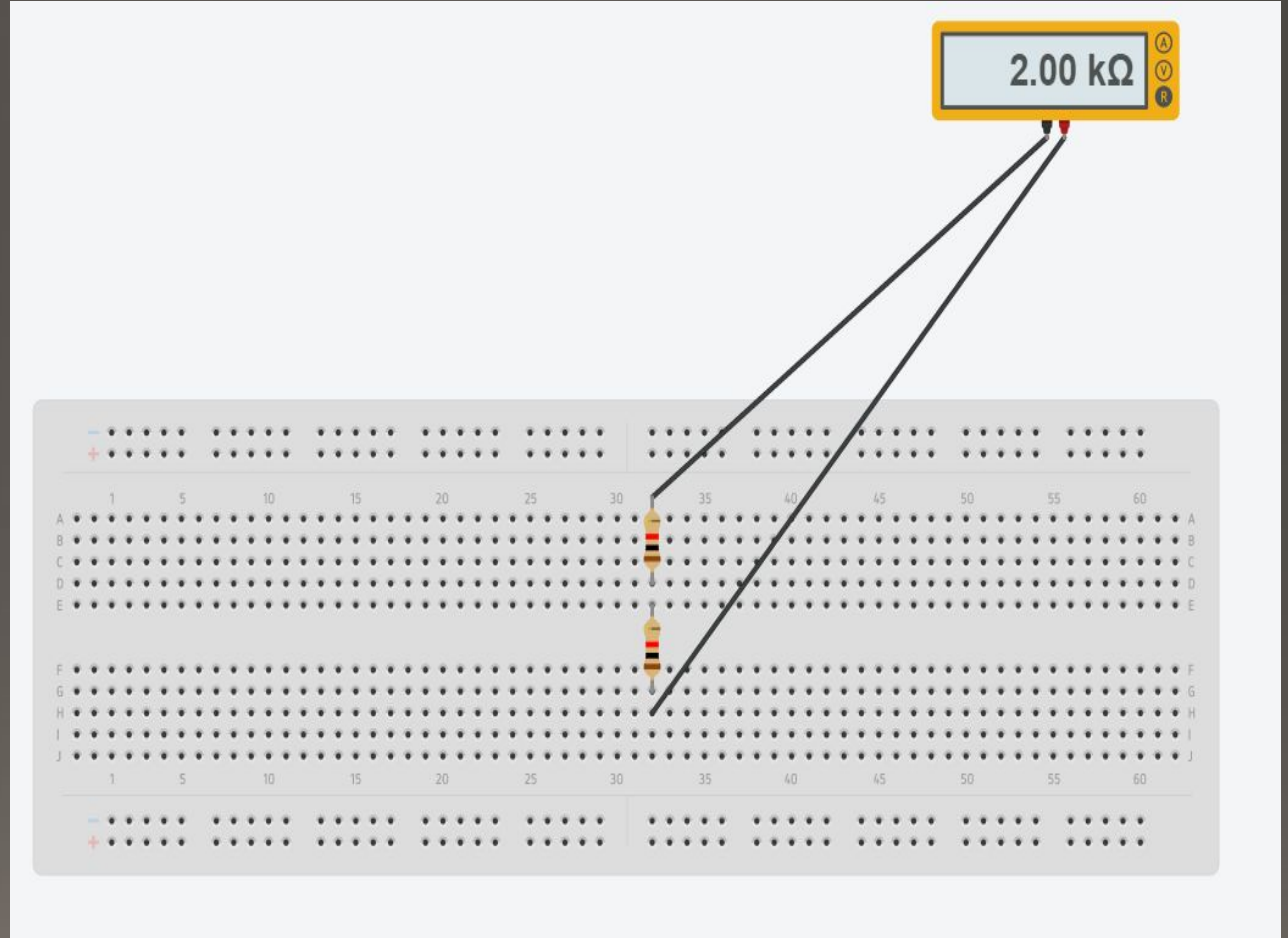
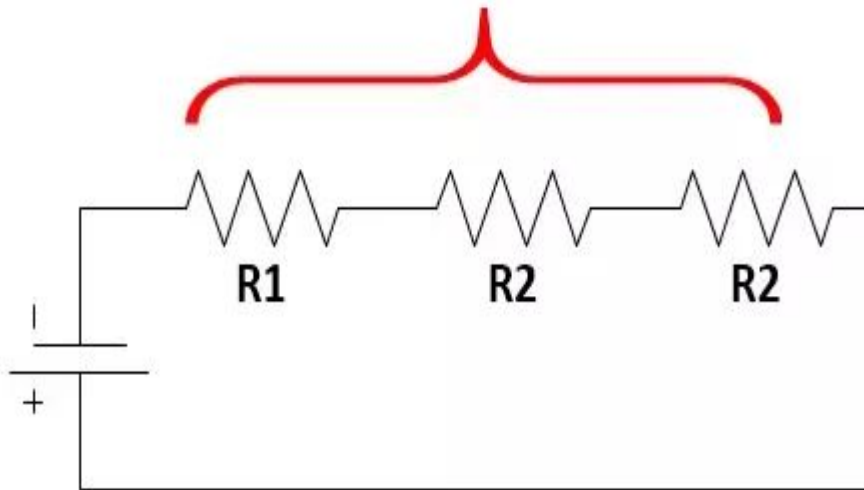
- Introduction to 3D Primitive Shapes  
by John Heifen
- Let's Learn Tinkercad!  
by Project-Ignite
- Build a Tinkercad House  
by John Heifen
- Design the Best Wind Farm Blade: STEM Challenge  
by MyStemKits



# Resistor in series

Resistances arranged in **series**

$$R_{\text{total}} = R_1 + R_2 + R_3 \dots R_n$$



# Task



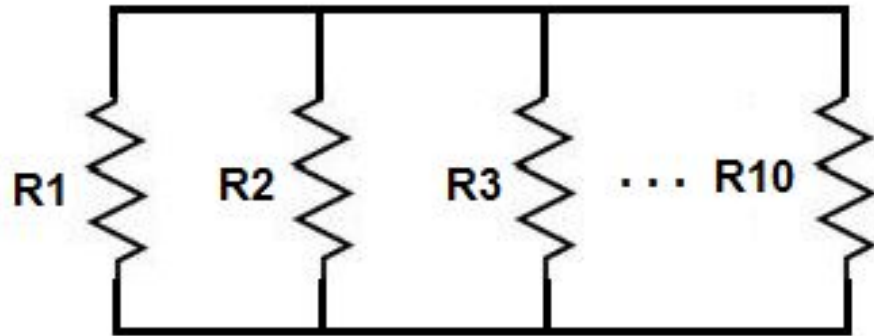
create a combined resistors of 4.5k ohm using 5 resistor.



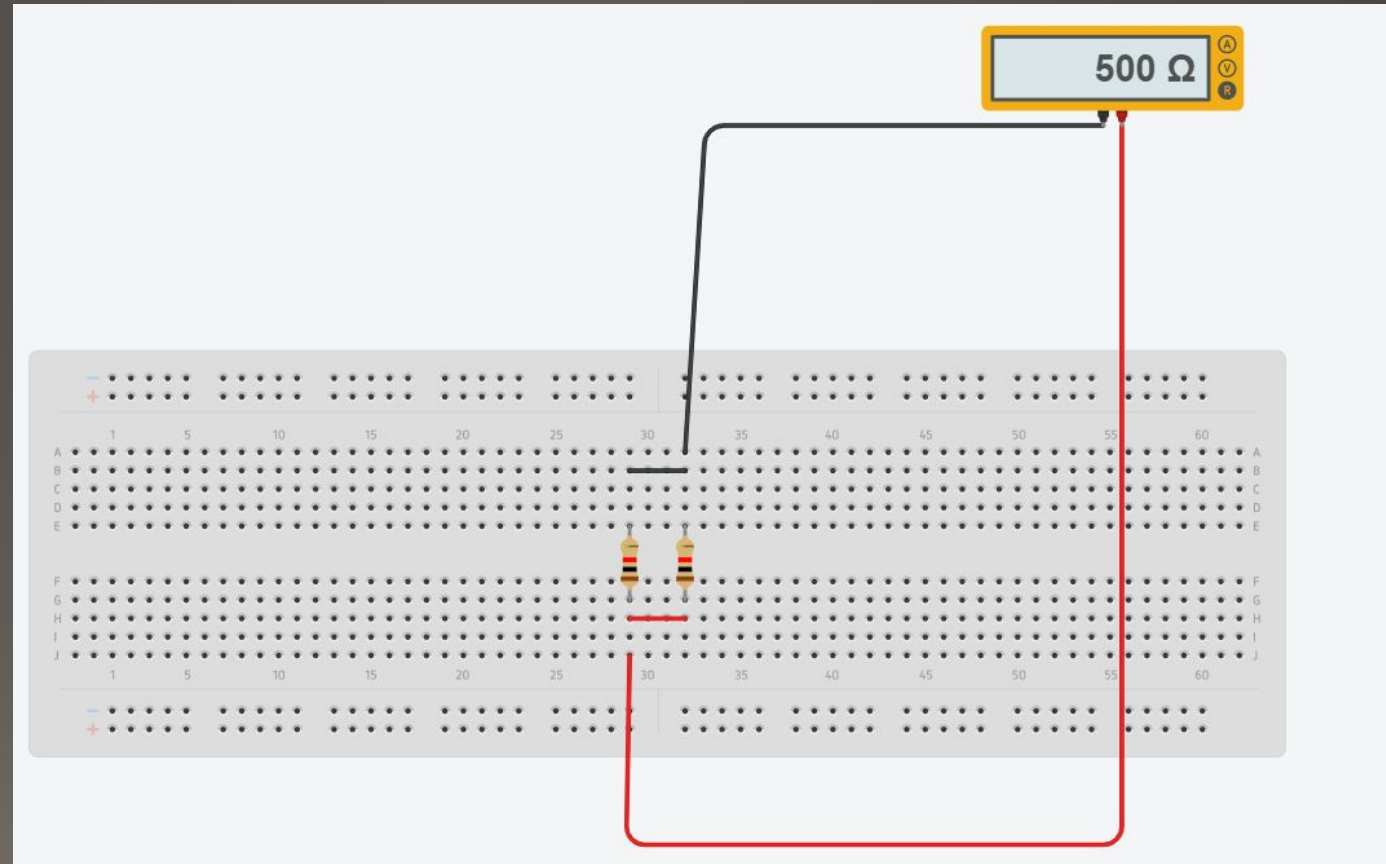


# Resistor in parallel

## Parallel Resistor Calculator



$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \text{etc.}}$$

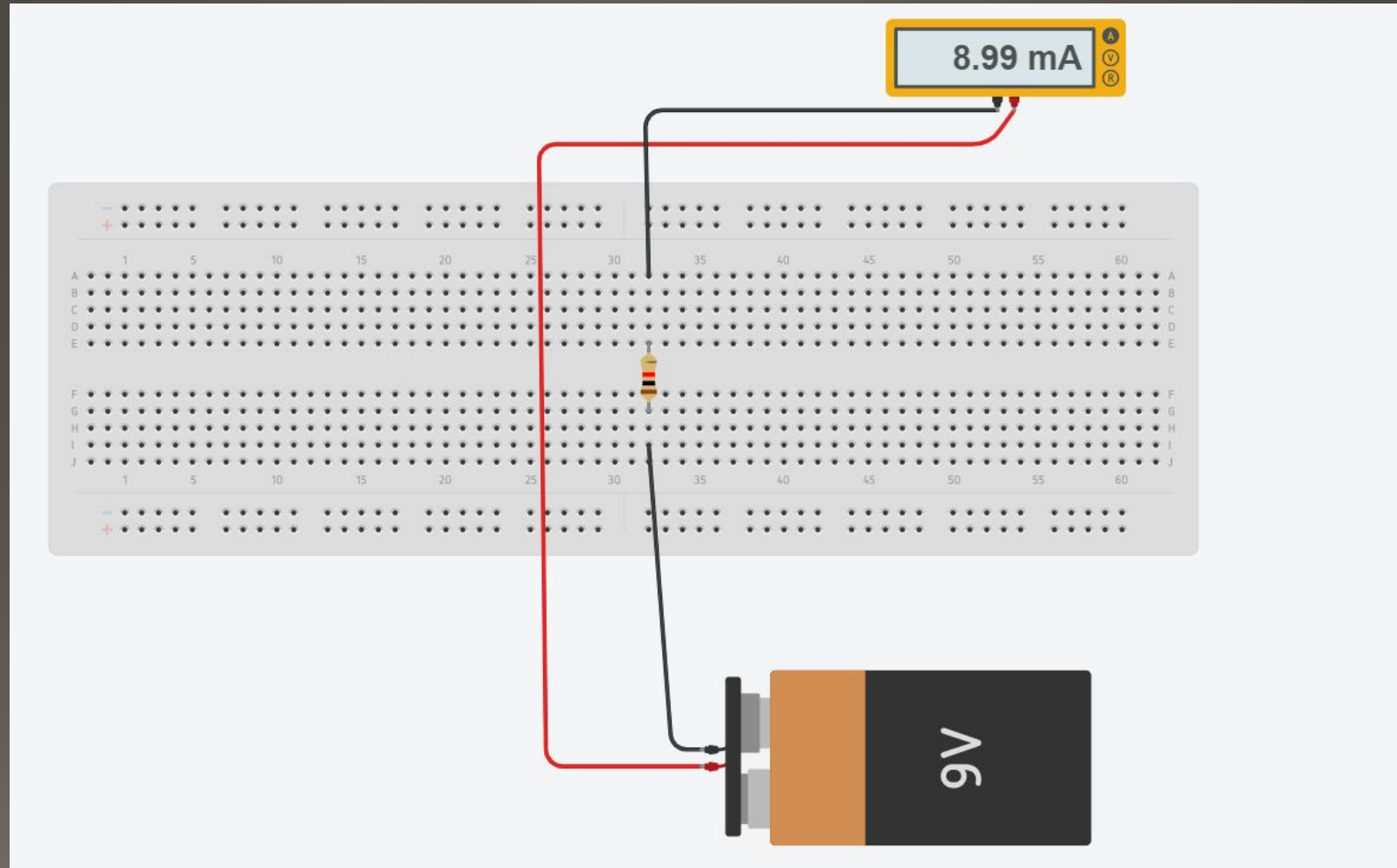


# ohm's law

Ohm's  
Law

$$I = \frac{V}{R}$$

Electric current = Voltage / Resistance



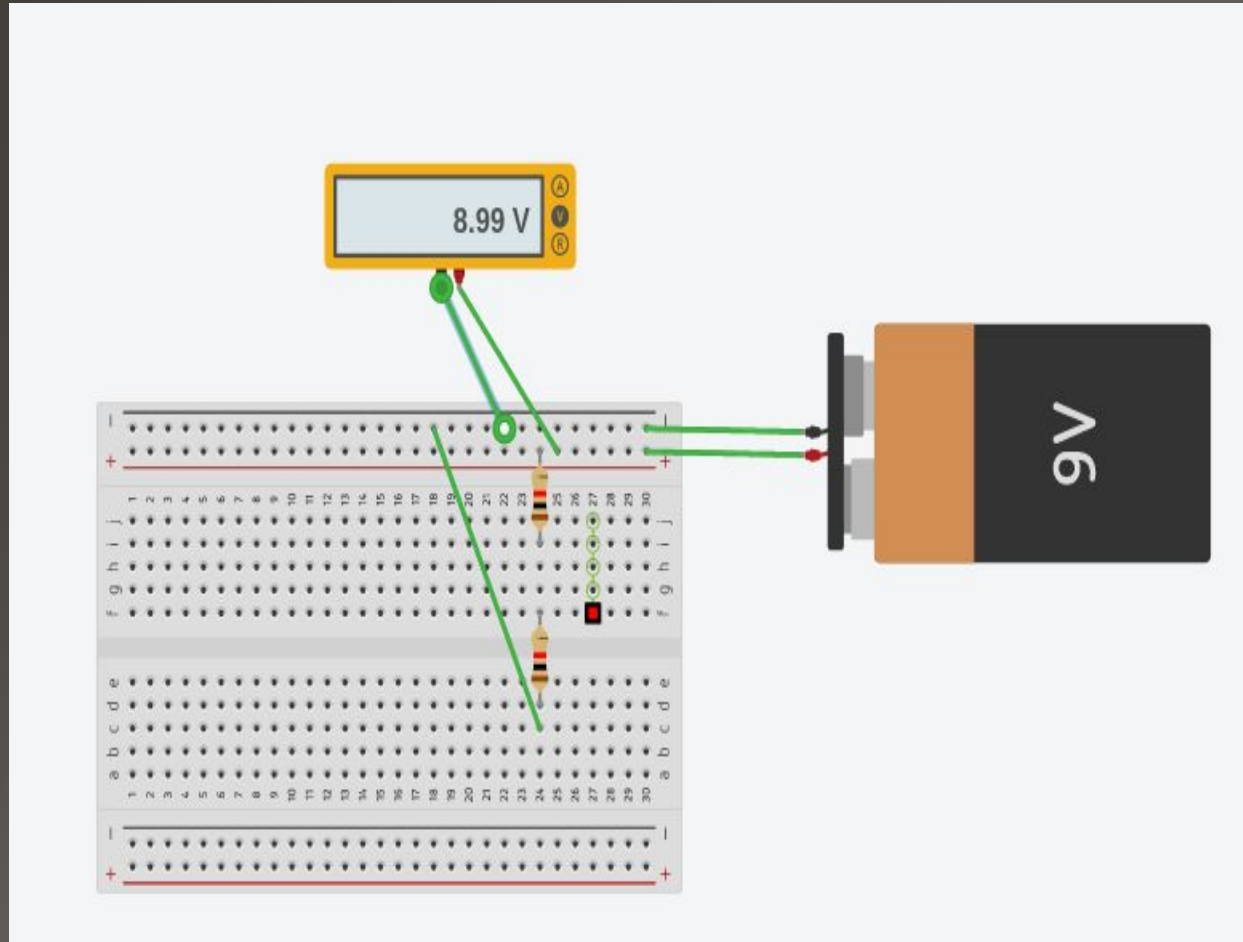
# Task



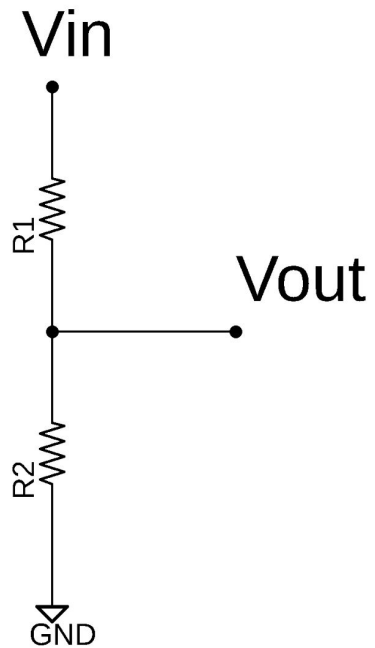
change the resistance value to create a current of 20m Amp.



# Voltage measurement

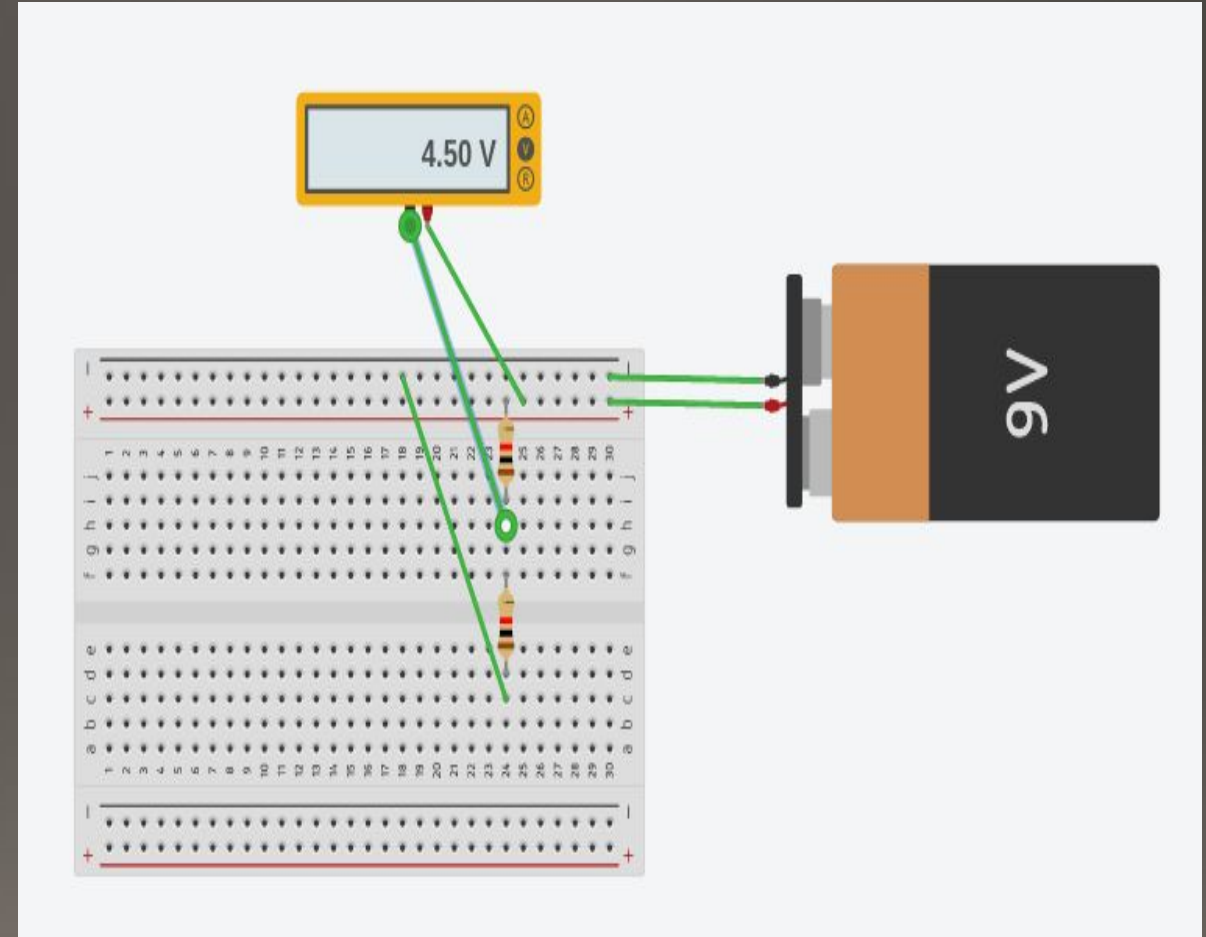


# Voltage divider

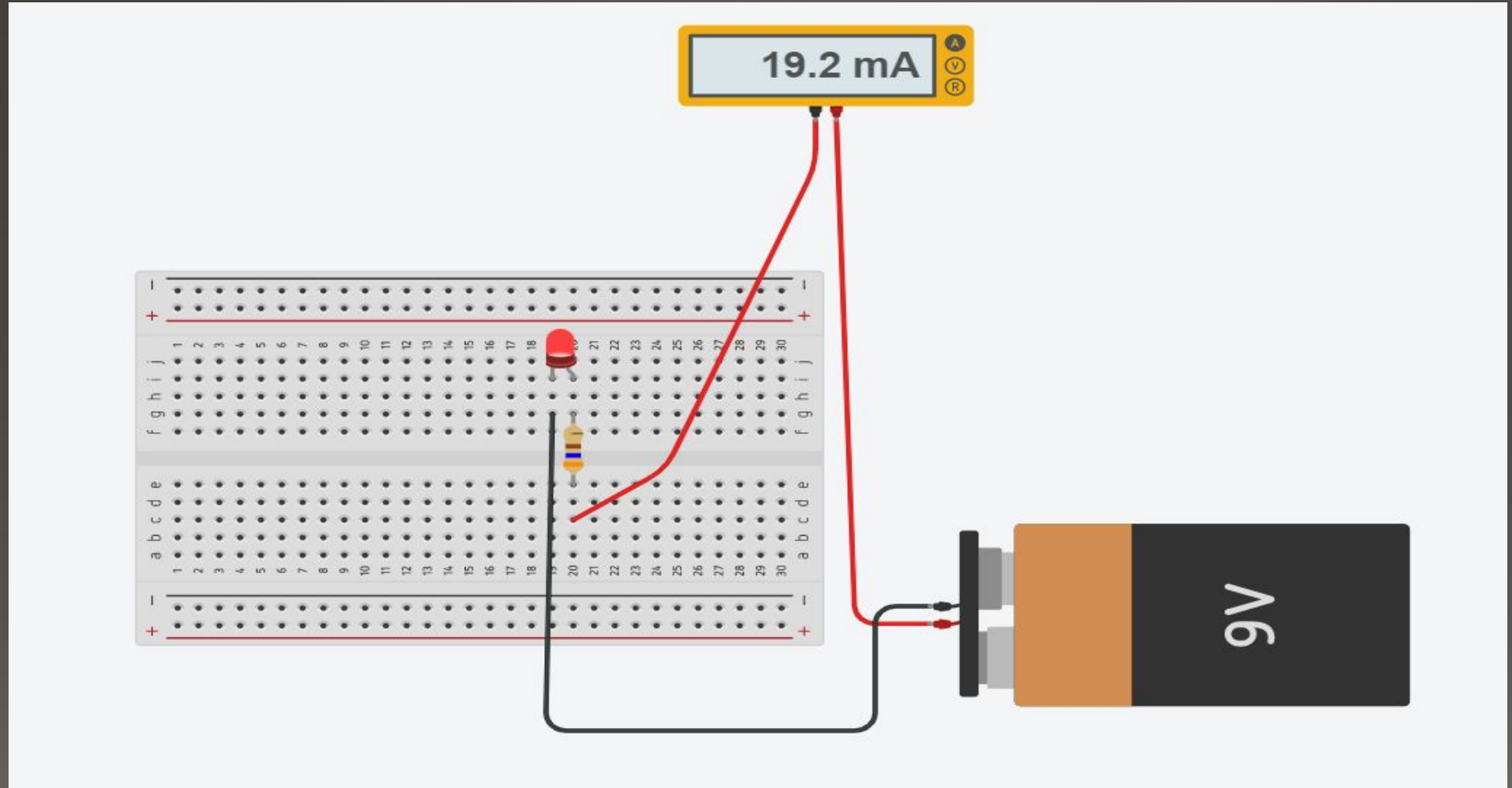


Voltage/Potential Divider

$$V_{out} = \frac{R_2}{R_1 + R_2} V_{in}$$

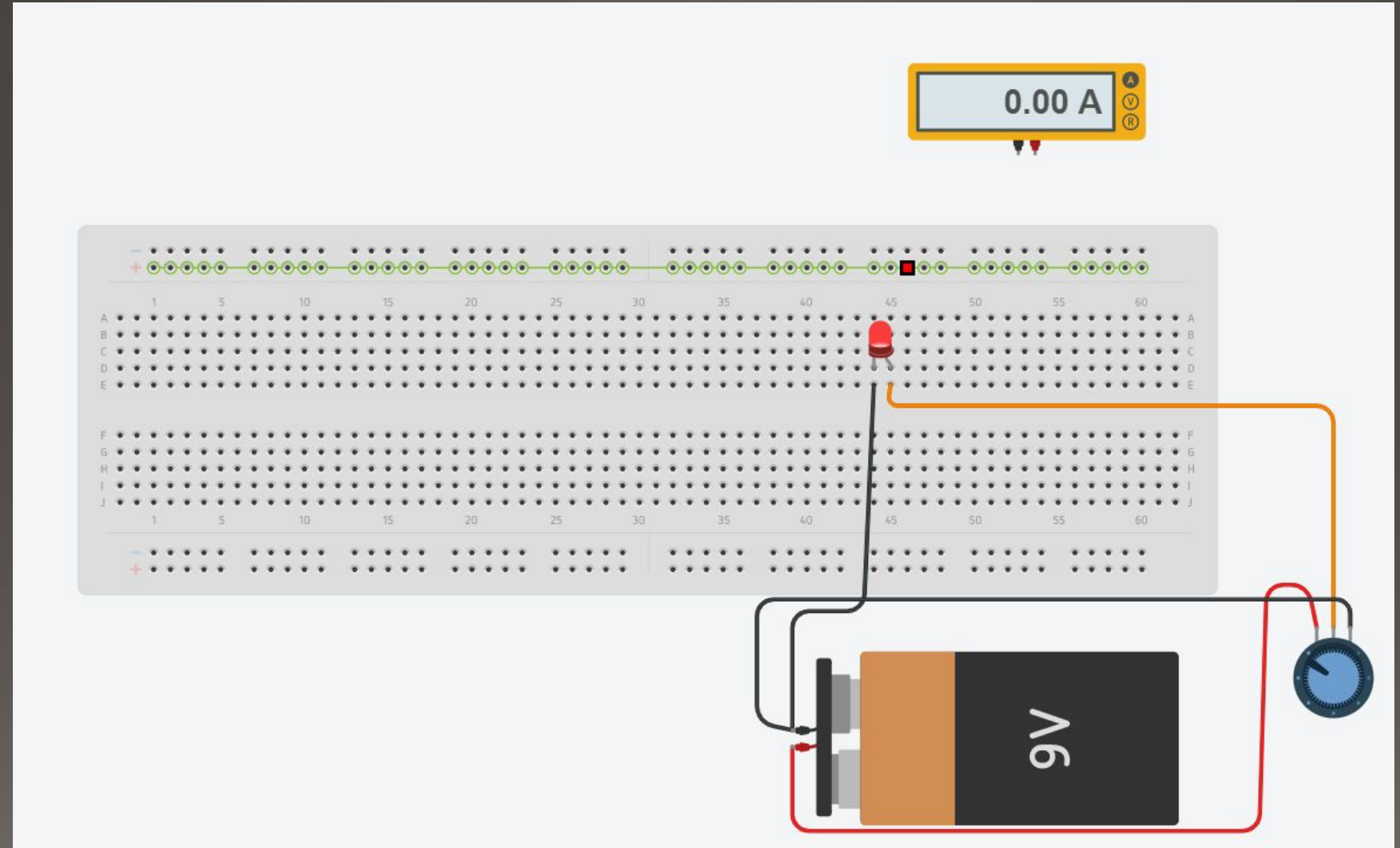


# current measurement

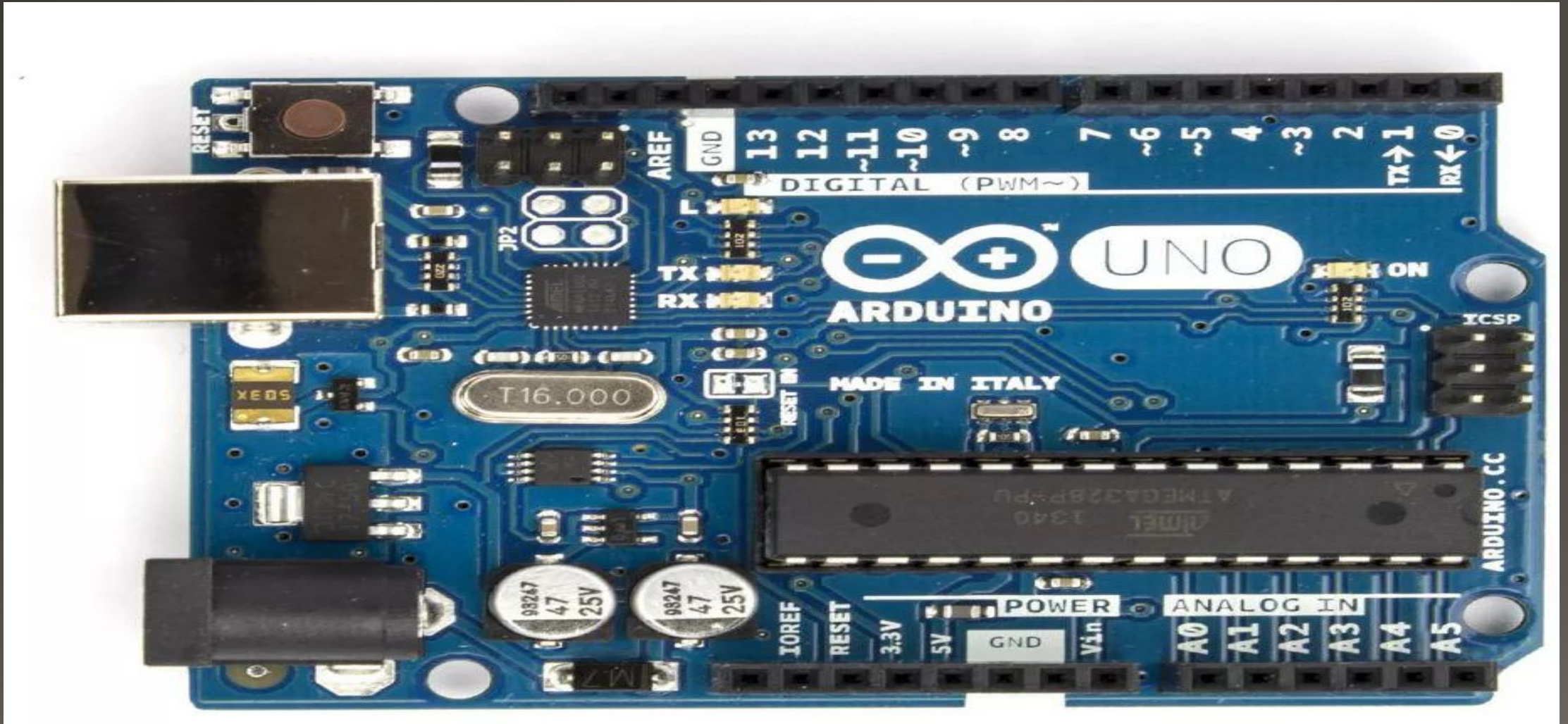




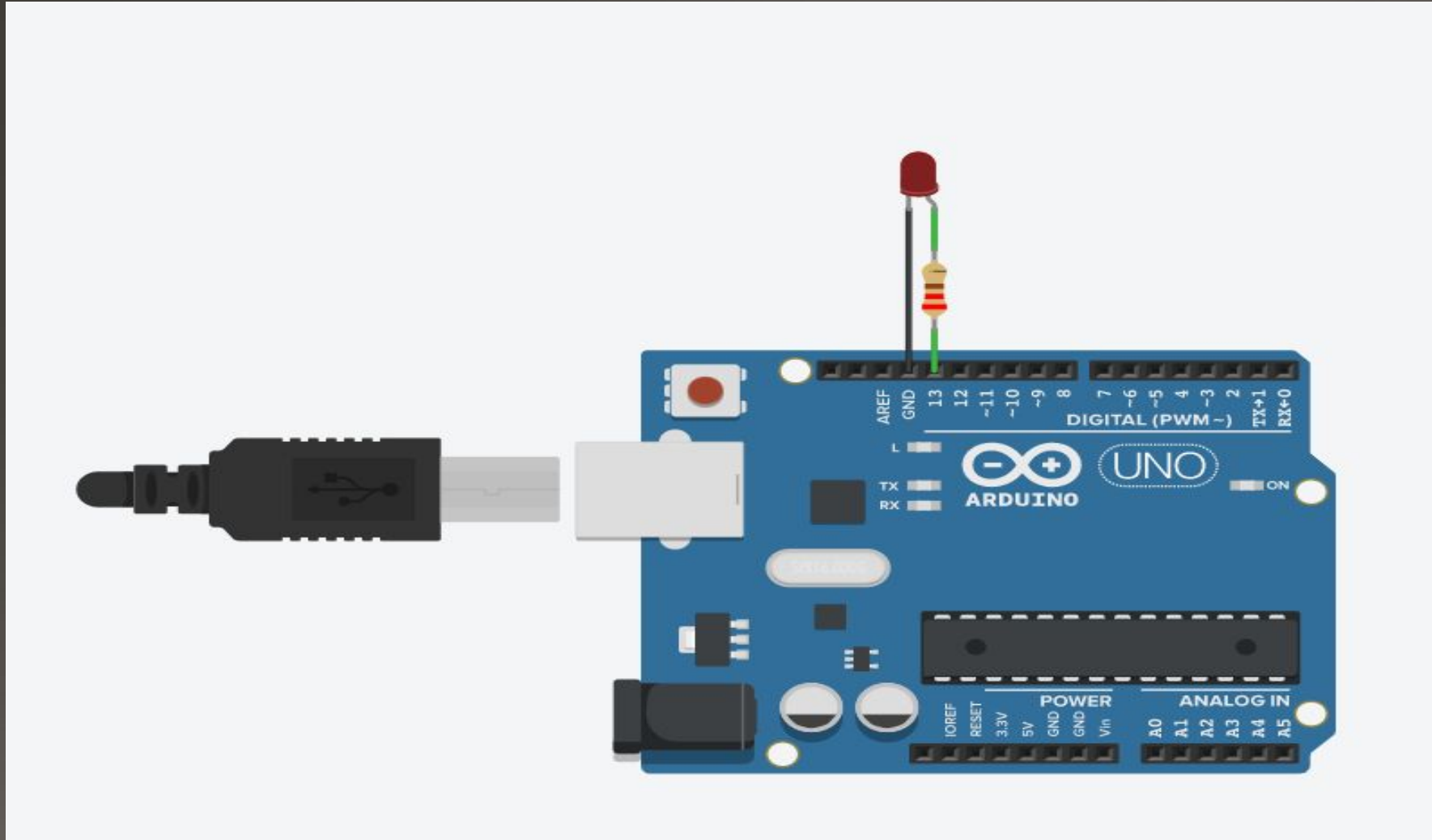
# variable resistor



# Arduino



# blinking

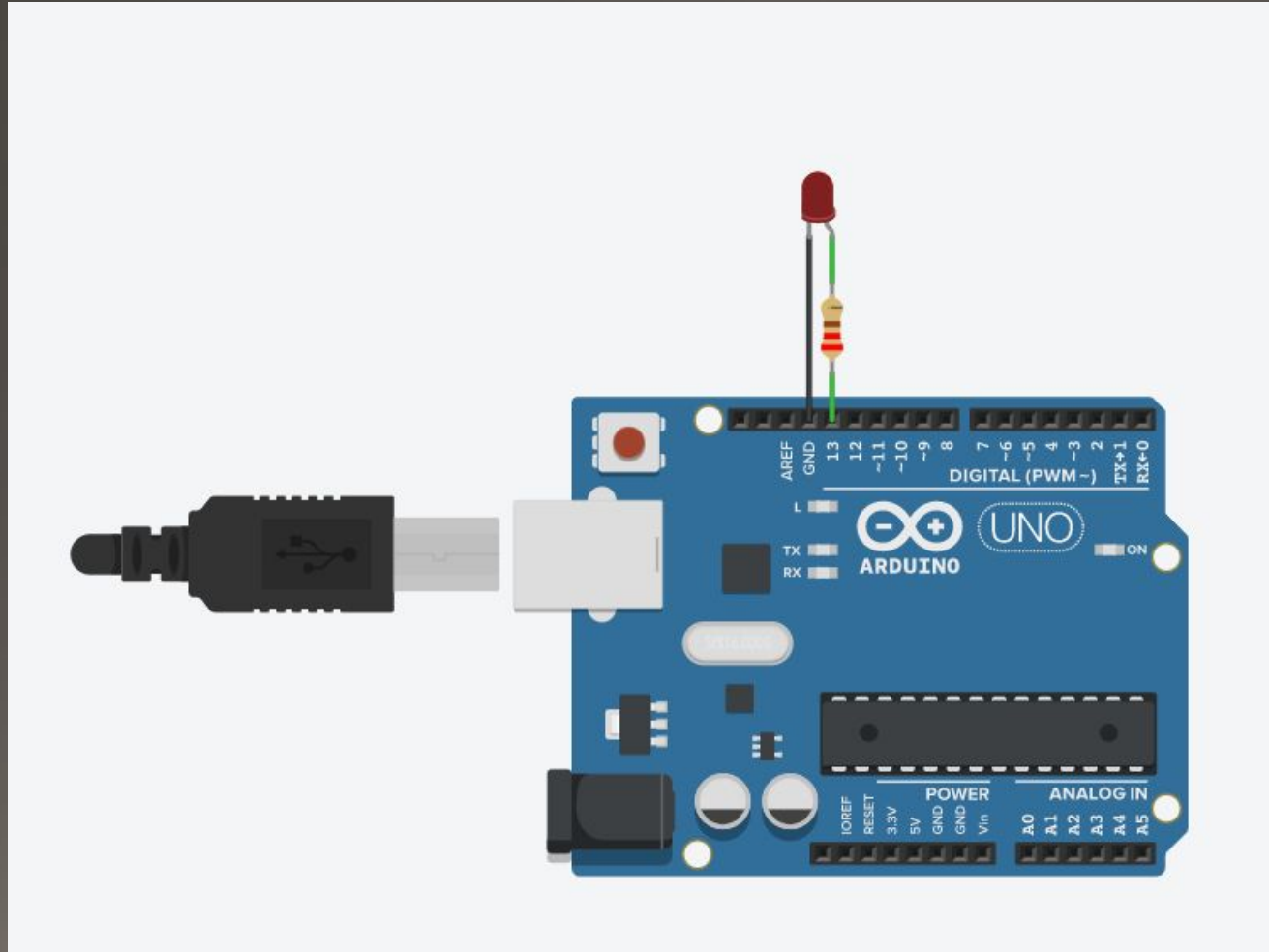


# Task blinking 2 led

add led to another digital pin to be blinking every 2 second

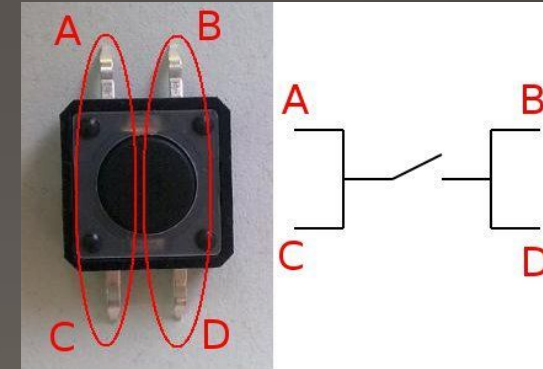
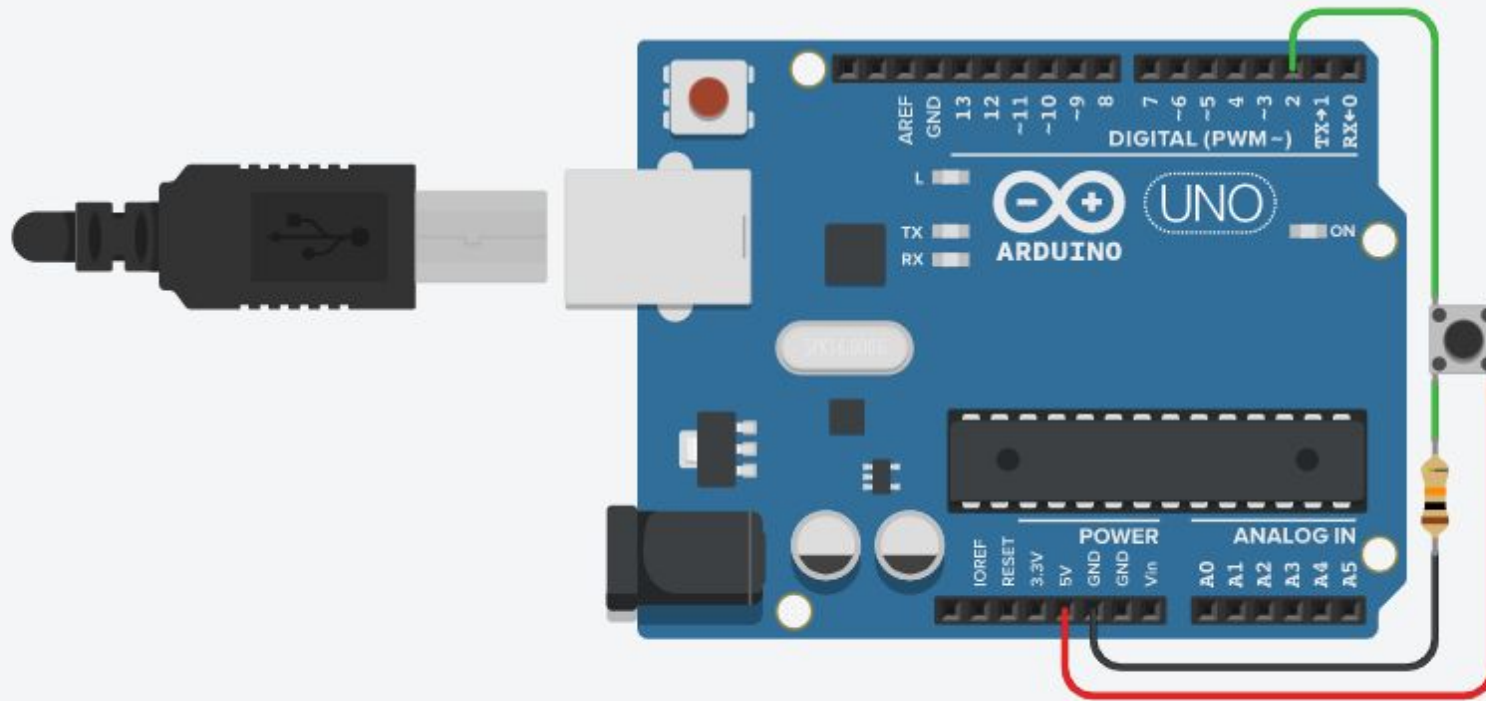


# Variable light (PWM)



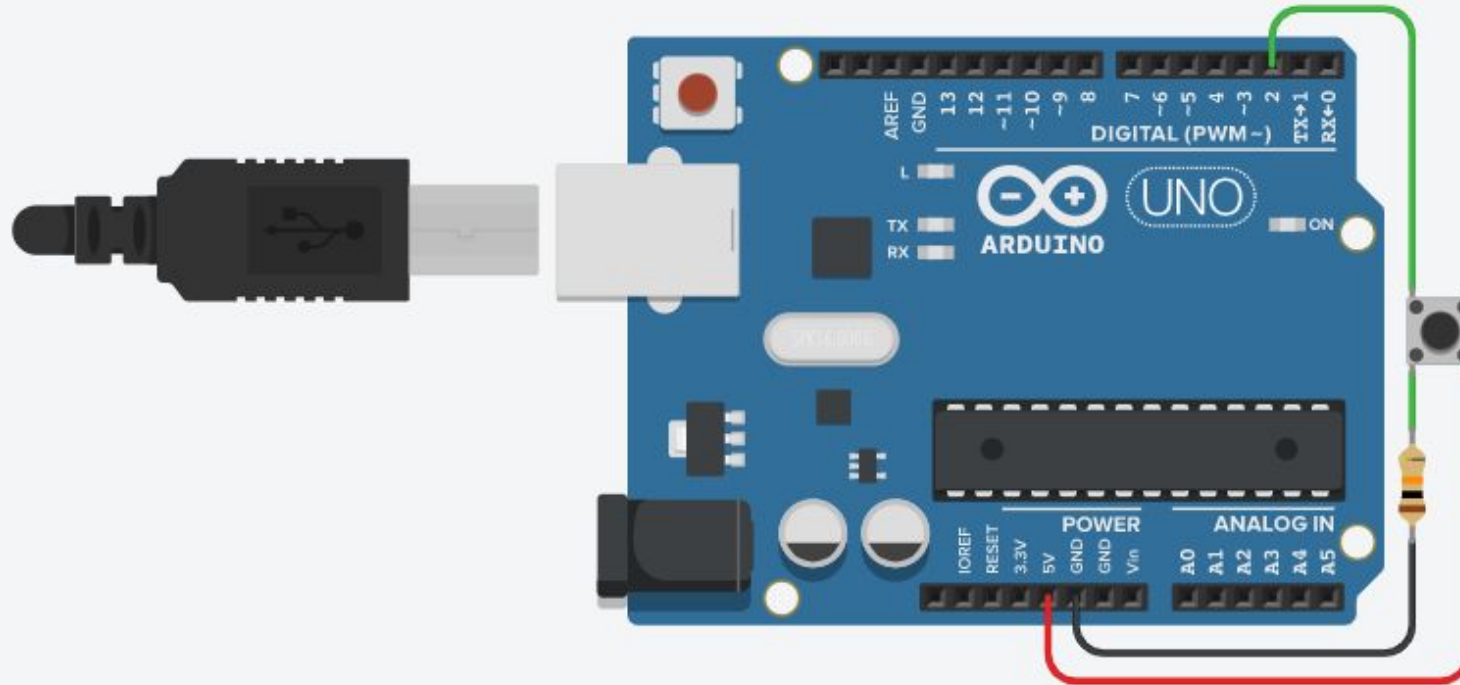


# Blinking with push button

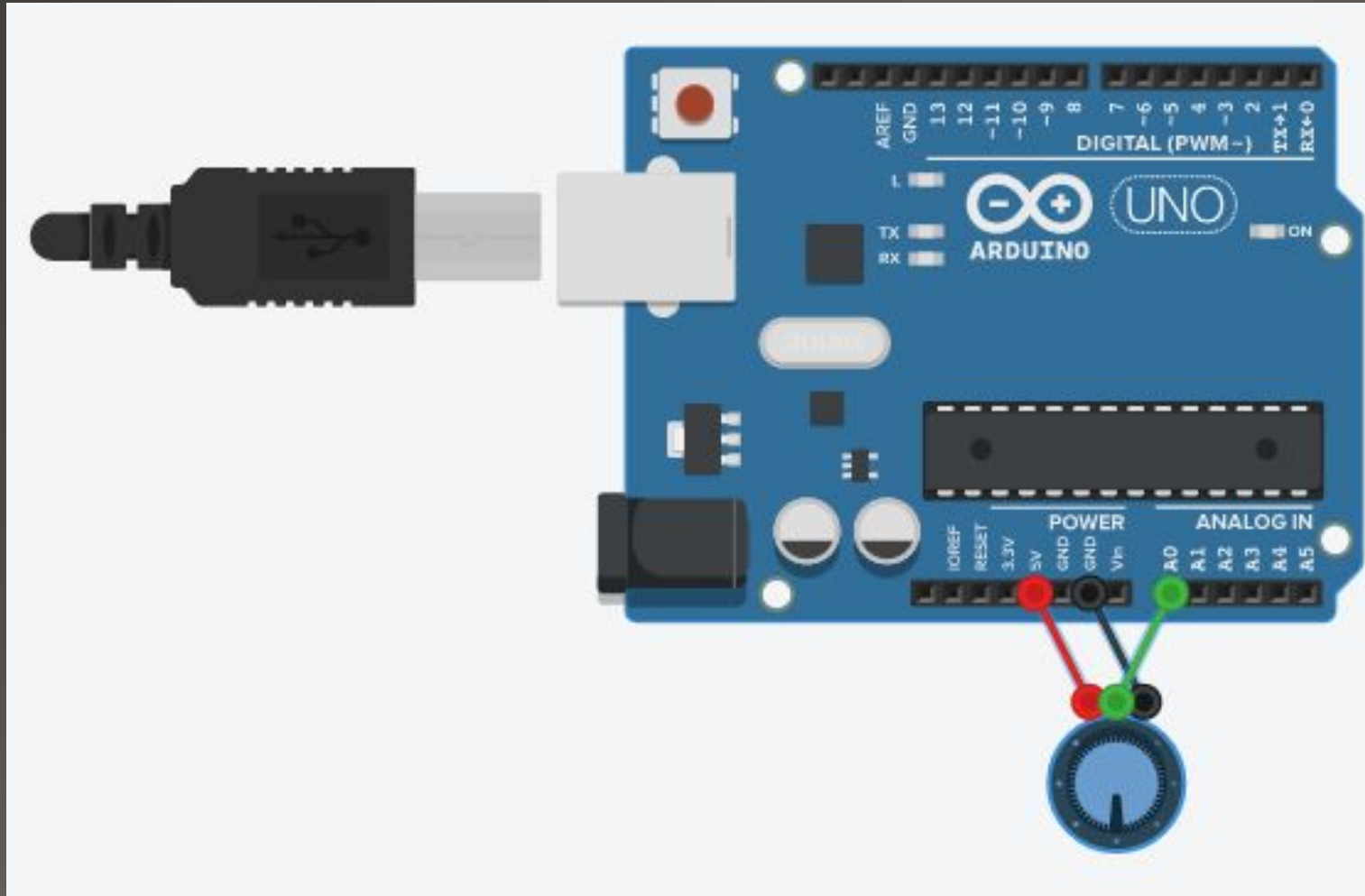




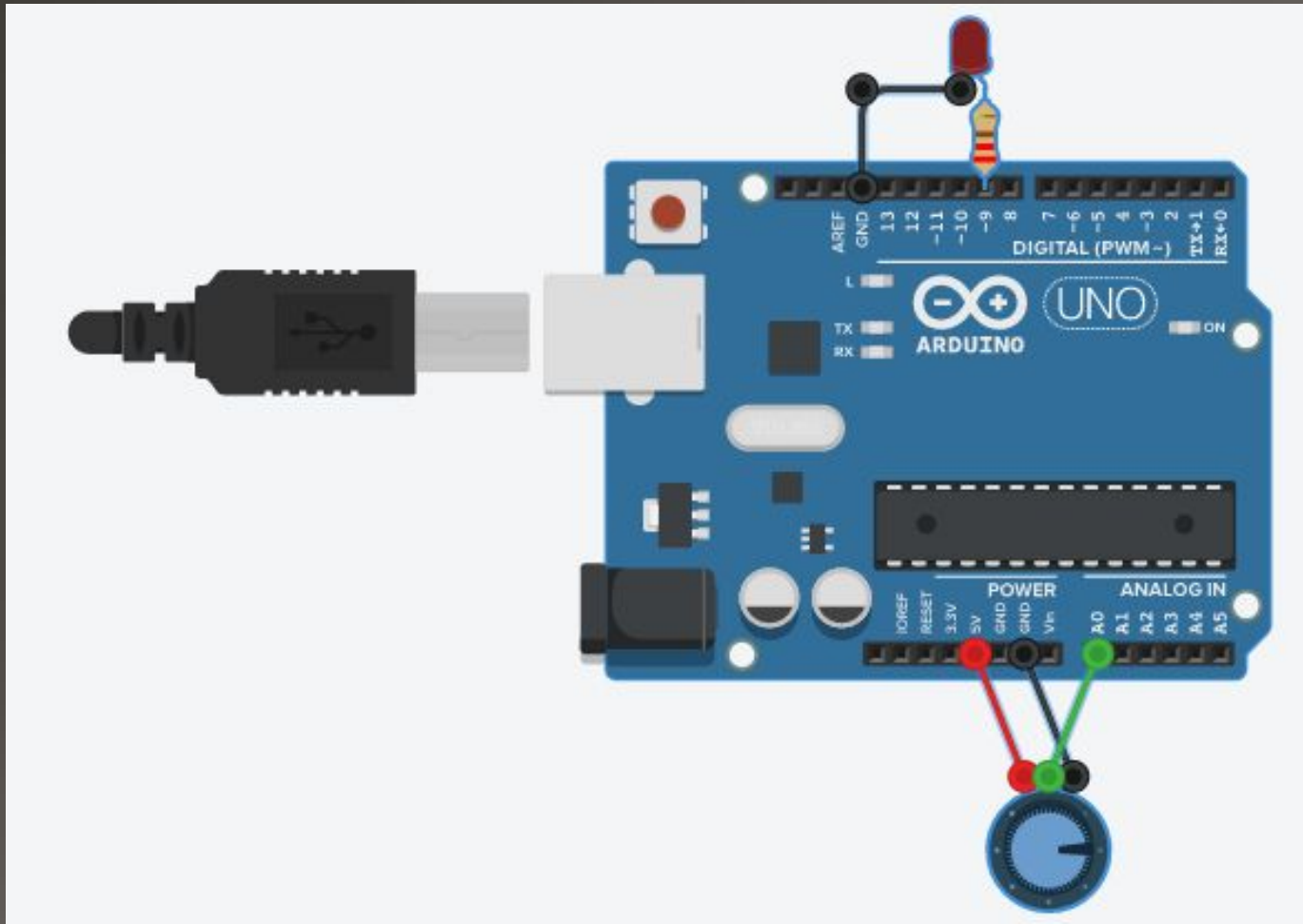
# Digital read serial



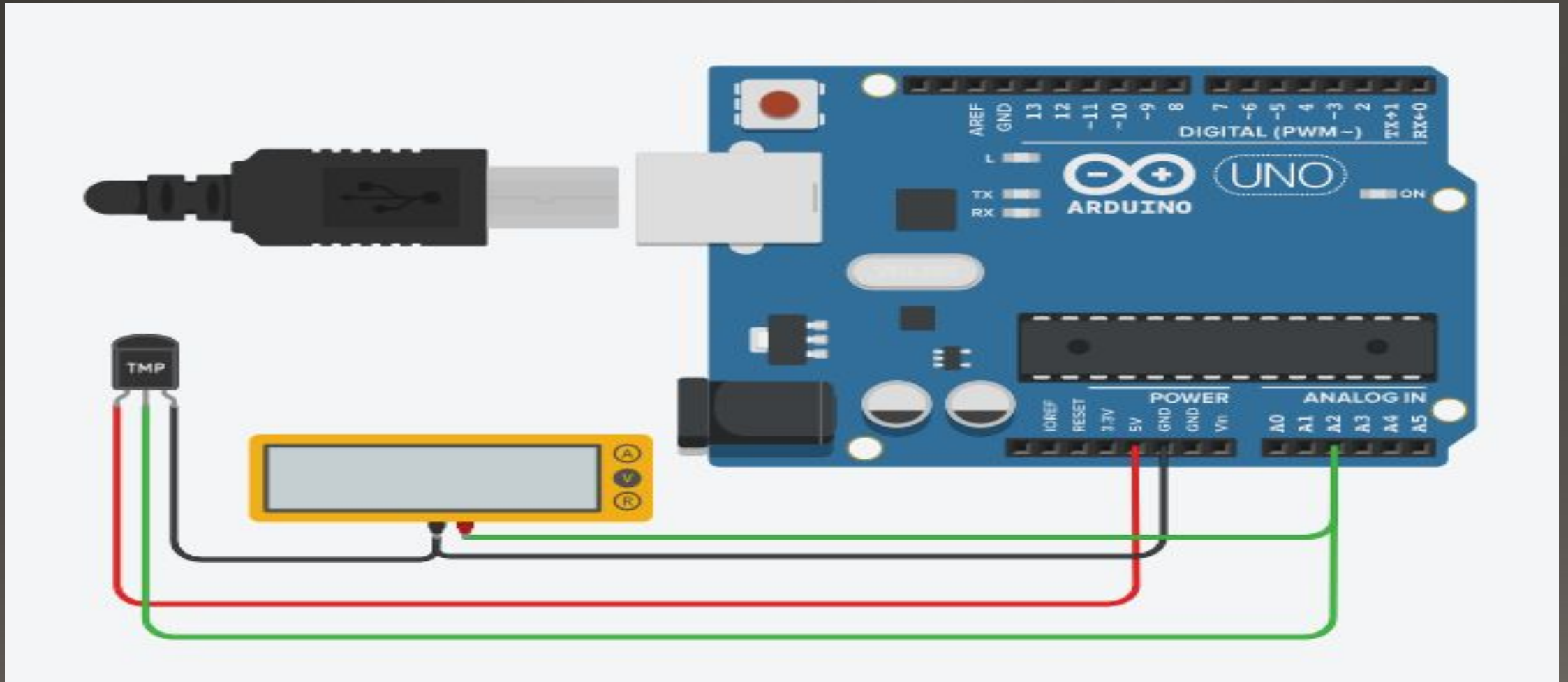
# Analog input



# Dimmer



# Temperature Sensor



# Task 1

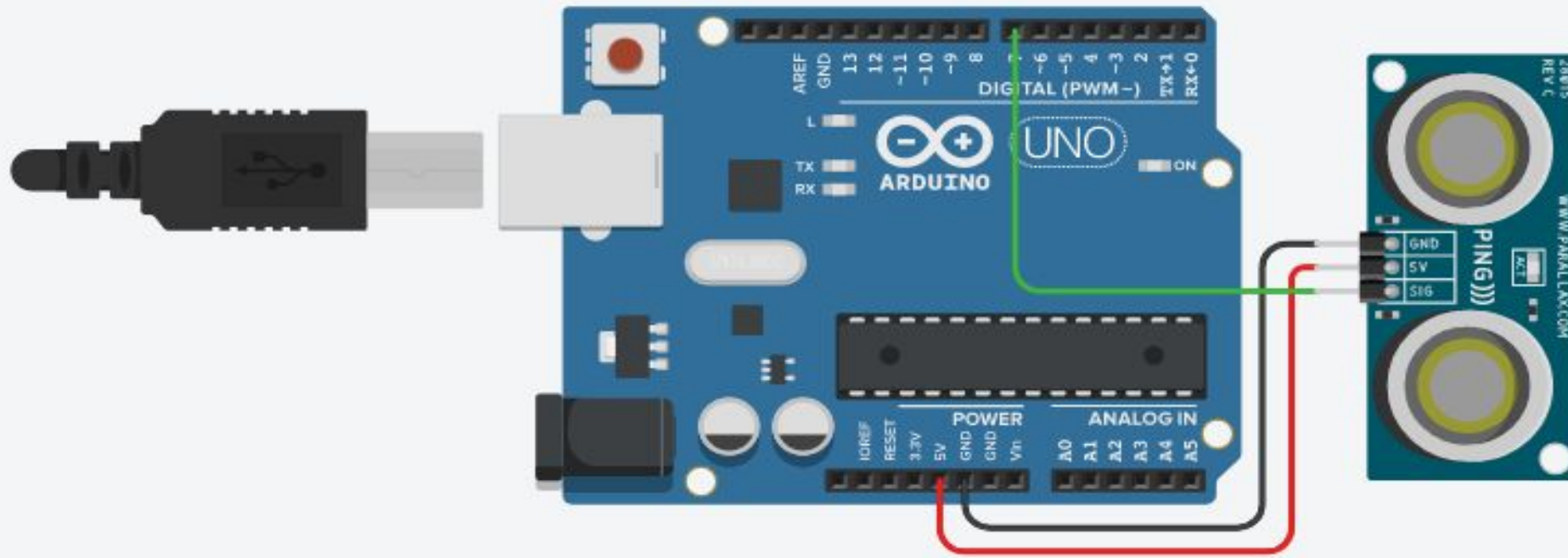
use the following formula to find the temperature .

$$\text{temperature} = (\text{Sensor\_voltage} - 0.5) * 100$$

print the output in Serial Monitor



# Ultrasonic Sensor



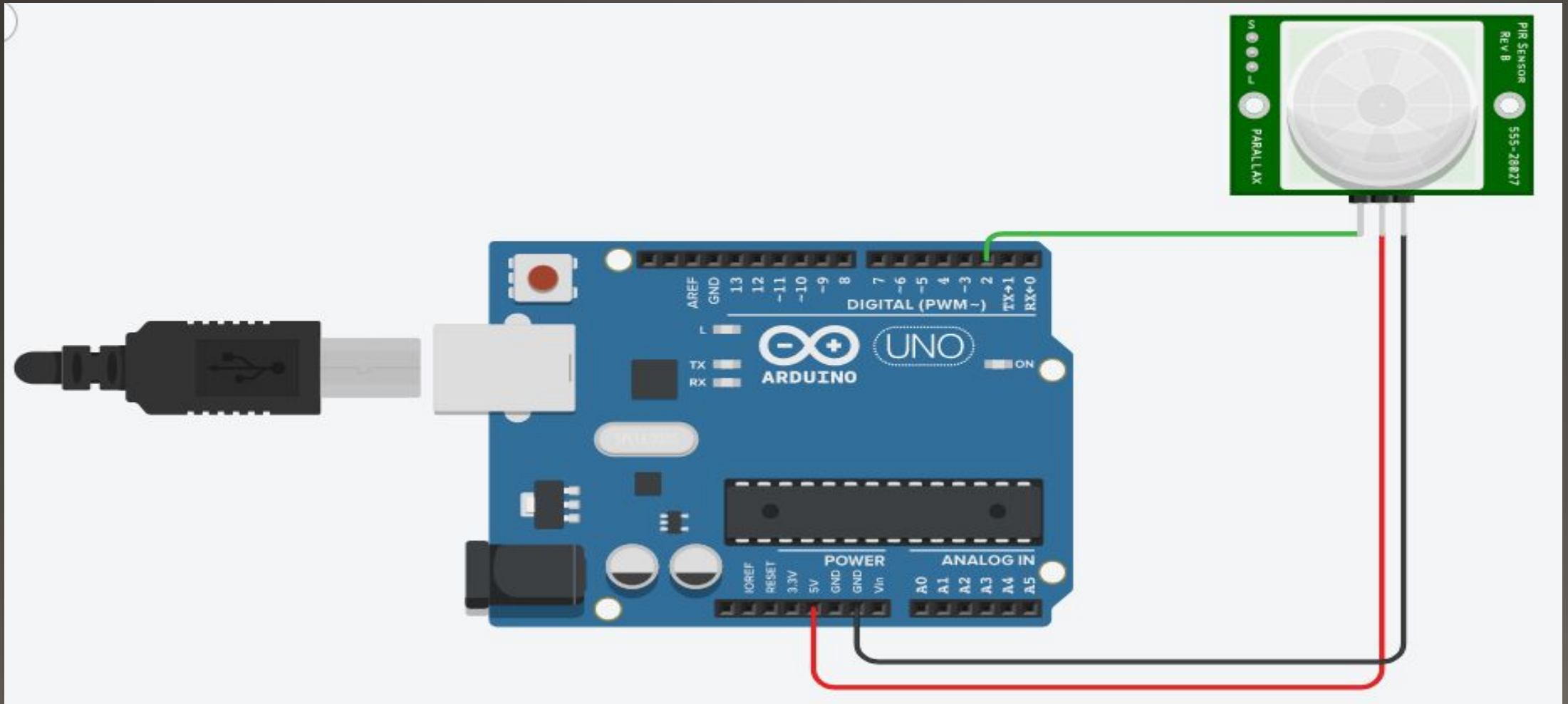


# Task 2

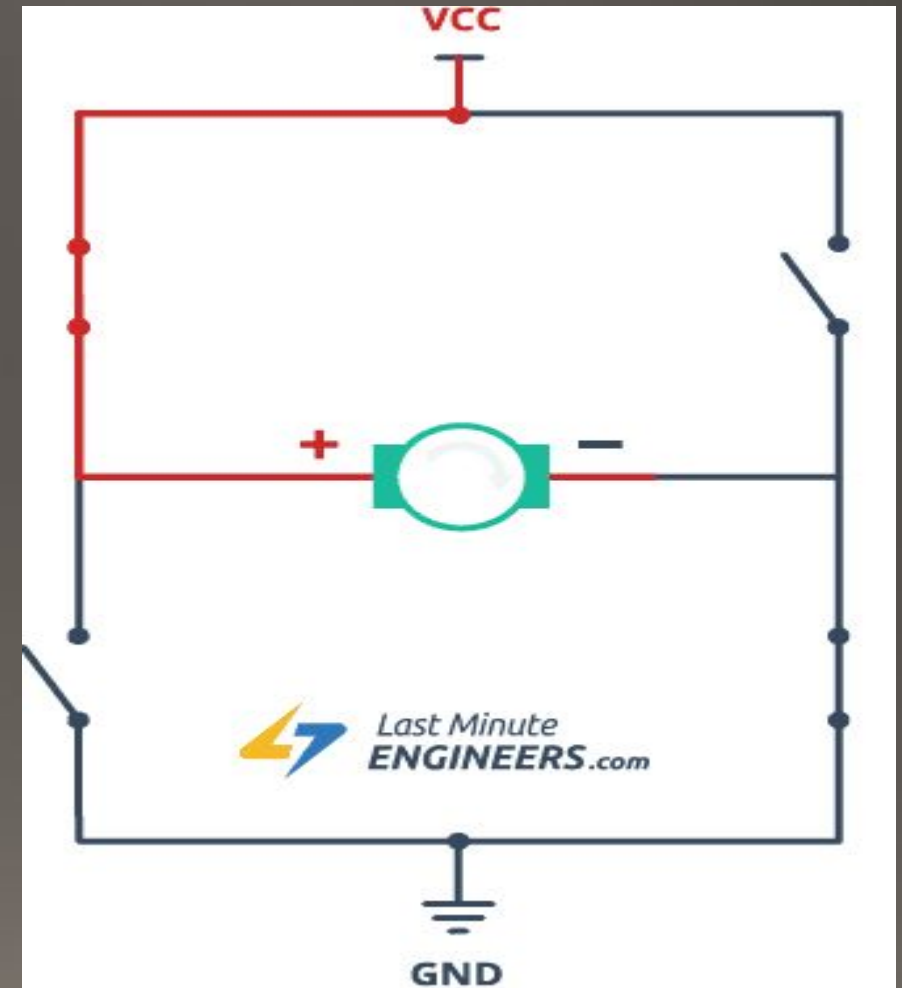
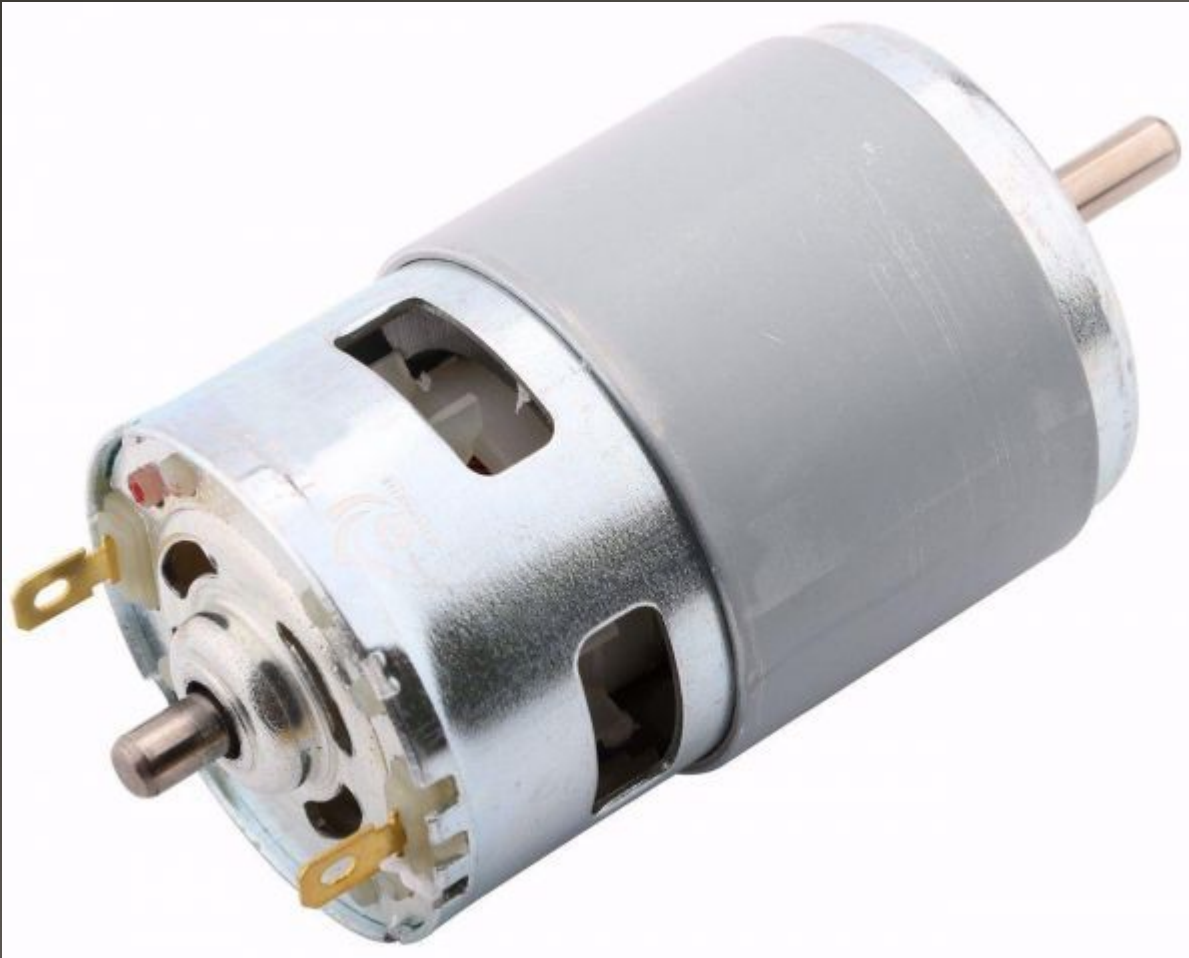
use ultrasonic sensor to get distance of the moving object.  
if the distance  $< 60$  print "Warning -----"



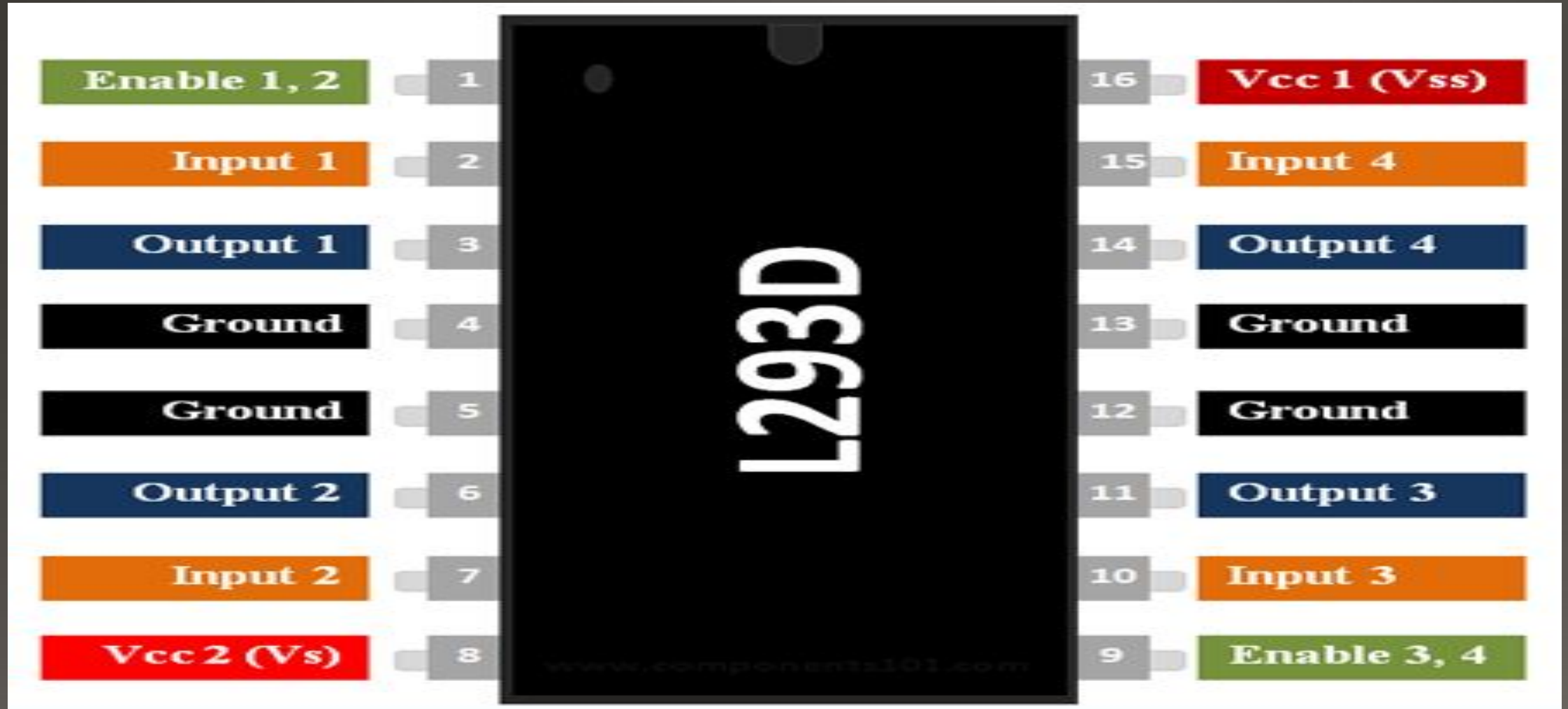
# PIR Sensor



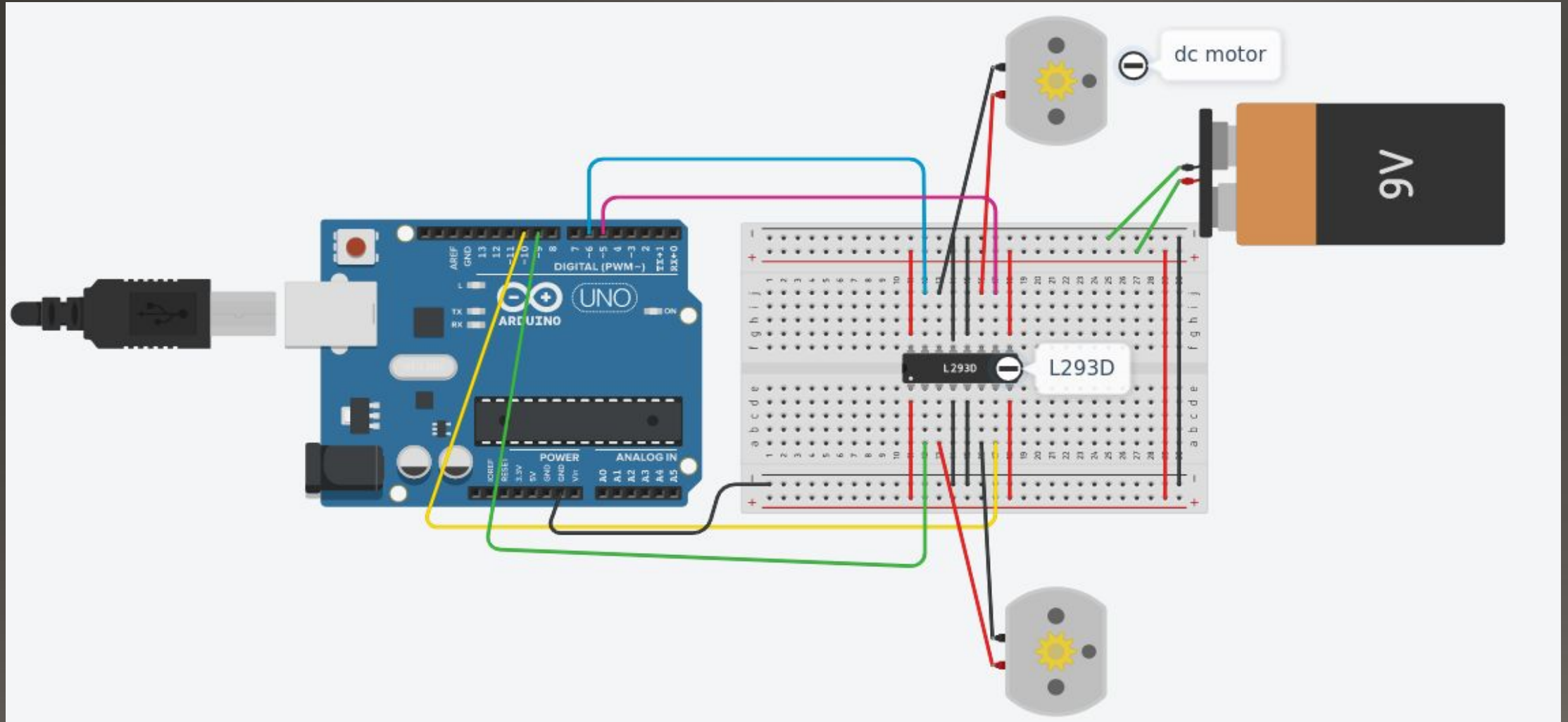
# DC Motor - H bridge



# H- bridge



# DC with L293D H bridge





# Task 3

add two push button to control dc motor direction ,first one to rotate motor clockwise and other to rotate it counter clockwise.

