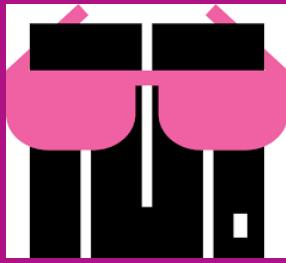
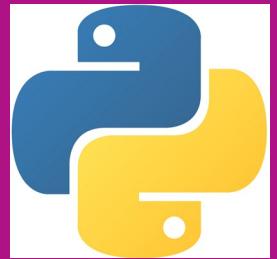
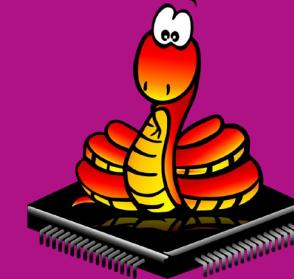


# INTERNET OF THINGS (IOT) PROJECTS USING PYTHON

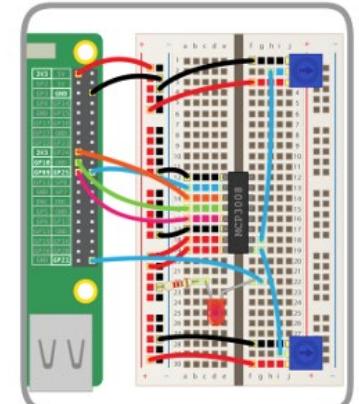
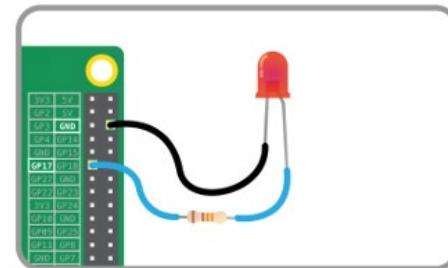
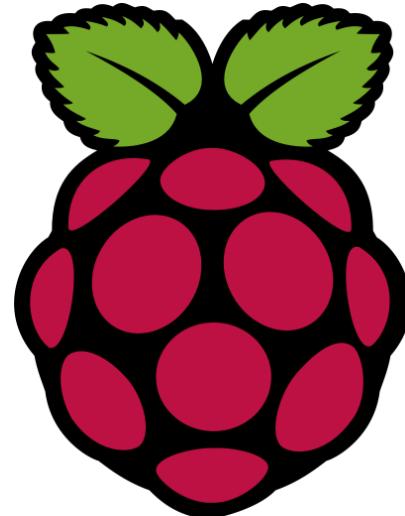


(CSE 4110)

(LECTURE – 2)

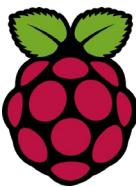


T<sub>h</sub>





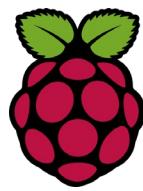
# What Is Outcome-Based Education? OBE Vs Traditional Education System



- Outcome-based education is a system where all the parts and aspects of education are focused on the outcomes of the course. The students take up courses with a certain goal of developing skills or gaining knowledge and they have to complete the goal by end of the course.
  
- There is no specific style or time limit of learning. The student can learn as per their choice. The faculty members, moderators, and instructors guide the students based on the target outcomes.



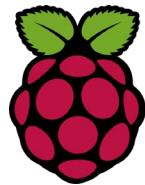
# Benefits Of Outcome-Based Education (OBE) For Students



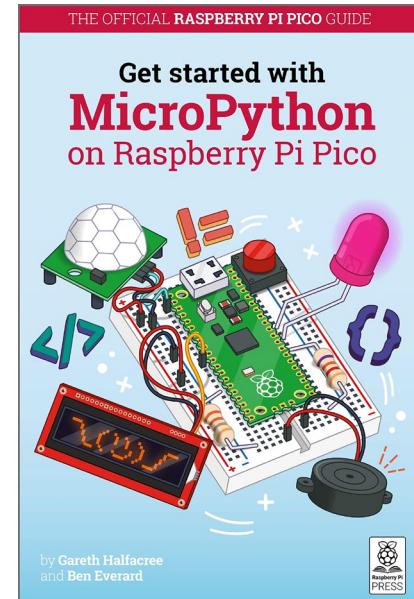
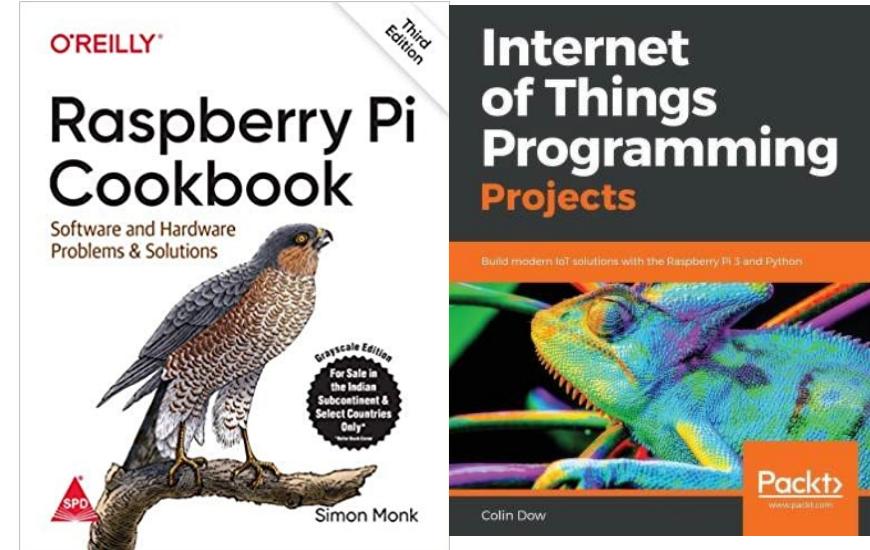
- Brings clarity among the teachers and students
- Every student has the flexibility and freedom of learning in their ways.
- There is more than one method of learning
- Reduces comparison among the students as everyone has a different target
- Completely involves students taking responsibility for their goals



# About your subject

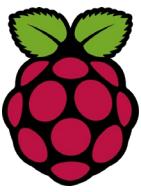


- Grading Pattern : 3
- Credit : 4
- TextBook:
  - 1) Raspberry Pi Cookbook by by Simon Monk, shroff/O'Reilly
  - 2) Internet of Things Programming Projects by By Colin Dow, Packt,
- Reference : 3) Get started with Micro-Python





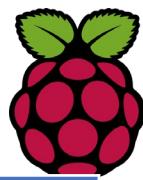
# Evaluation Scheme



- ATTENDANCE : 5
- WEEKLY ASSIGNMENTS / QUIZZES : 20 MID-TERM
- MID TERM : 15
- TOTAL INTERNAL : 40
  
- FINAL ASSIGNMENT : 40
- ASSIGNMENT PRESENTATION : 20 END-TERM
- TOTAL EXTERNAL : 60



# Course Outcomes

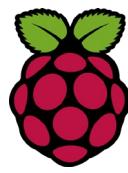


## Course Outcomes

CO1	Understand general concepts of Internet of Things (IoT), the working of Raspberry Pi and its features.
CO2	Recognize various components, sensors, actuators, devices and their applications.
CO3	Analyze various python programs to interface with sensors, actuators, LED's, cloud and camera using Raspberry pi.
CO4	Measure physical parameters using sensors.
CO5	Demonstrate the ability to transmit data wirelessly between different devices to build simple IoT systems using Raspberry Pi.
CO6	Create IoT devices and systems through a variety of interfaces, including web apps and mobile apps.

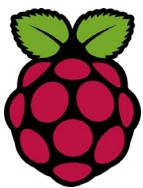


# What Students will learn?

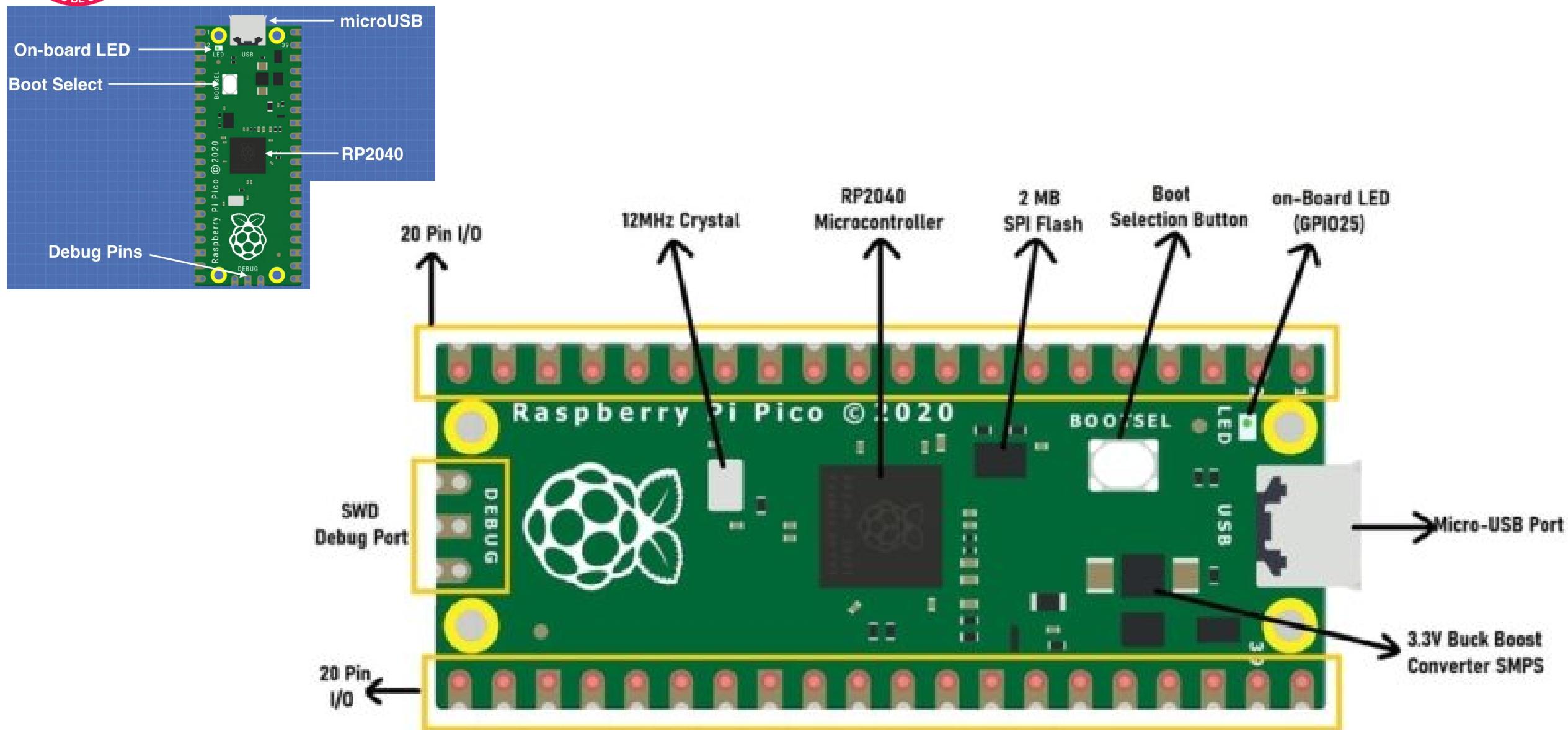


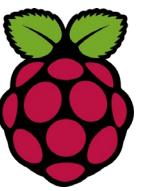
Students will revise the basics of electronics, types of electrical signal, Resistance colour code to enhance the knowledge to build an electronic circuit. Also students will experience about ability to learn coding and electronics to implement a LED flash SOS (Morse code) .

- ✓ Familiarization with Basic Electronic concepts, their origin, impact, and different applications to improve technical results.
- ✓ Introduction to Resistance Colour code
- ✓ Implementation of LED Flash SOS (Morse Code) using Raspberry Pi Pico



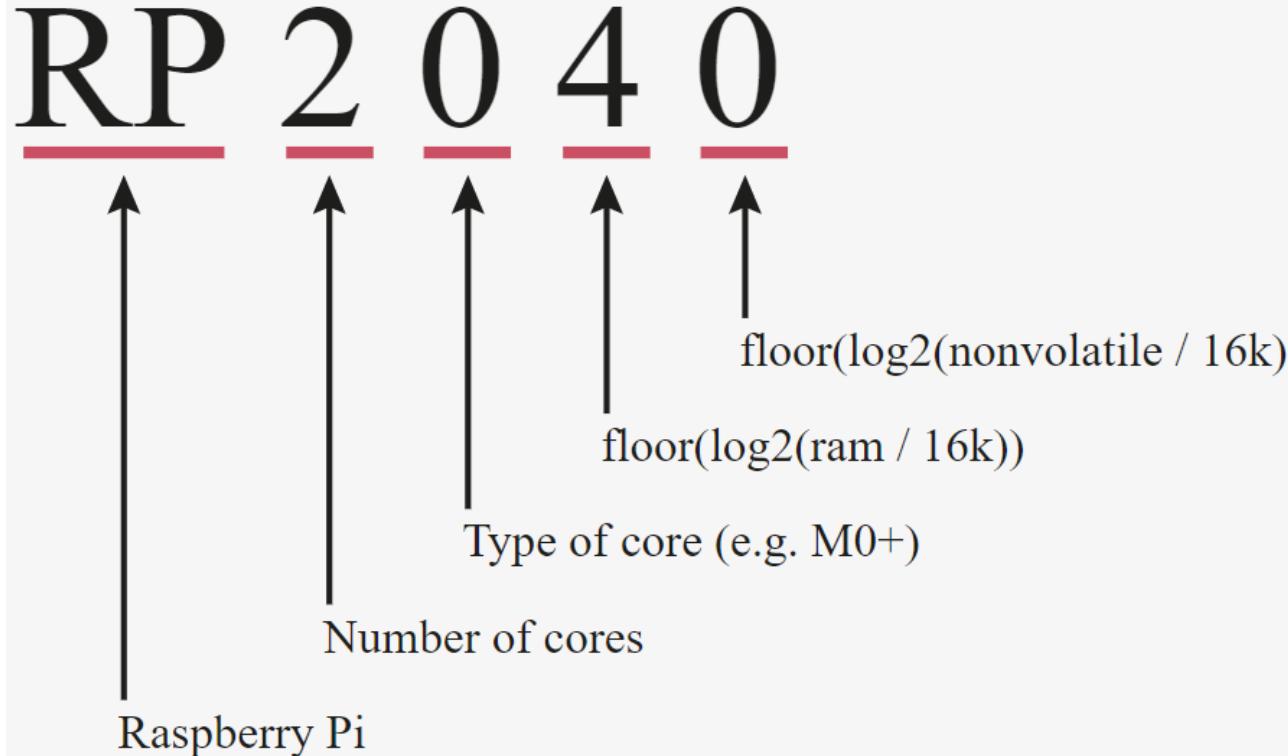
# Raspberry Pi Pico – Simple Pinout





# Why is the chip called RP2040?

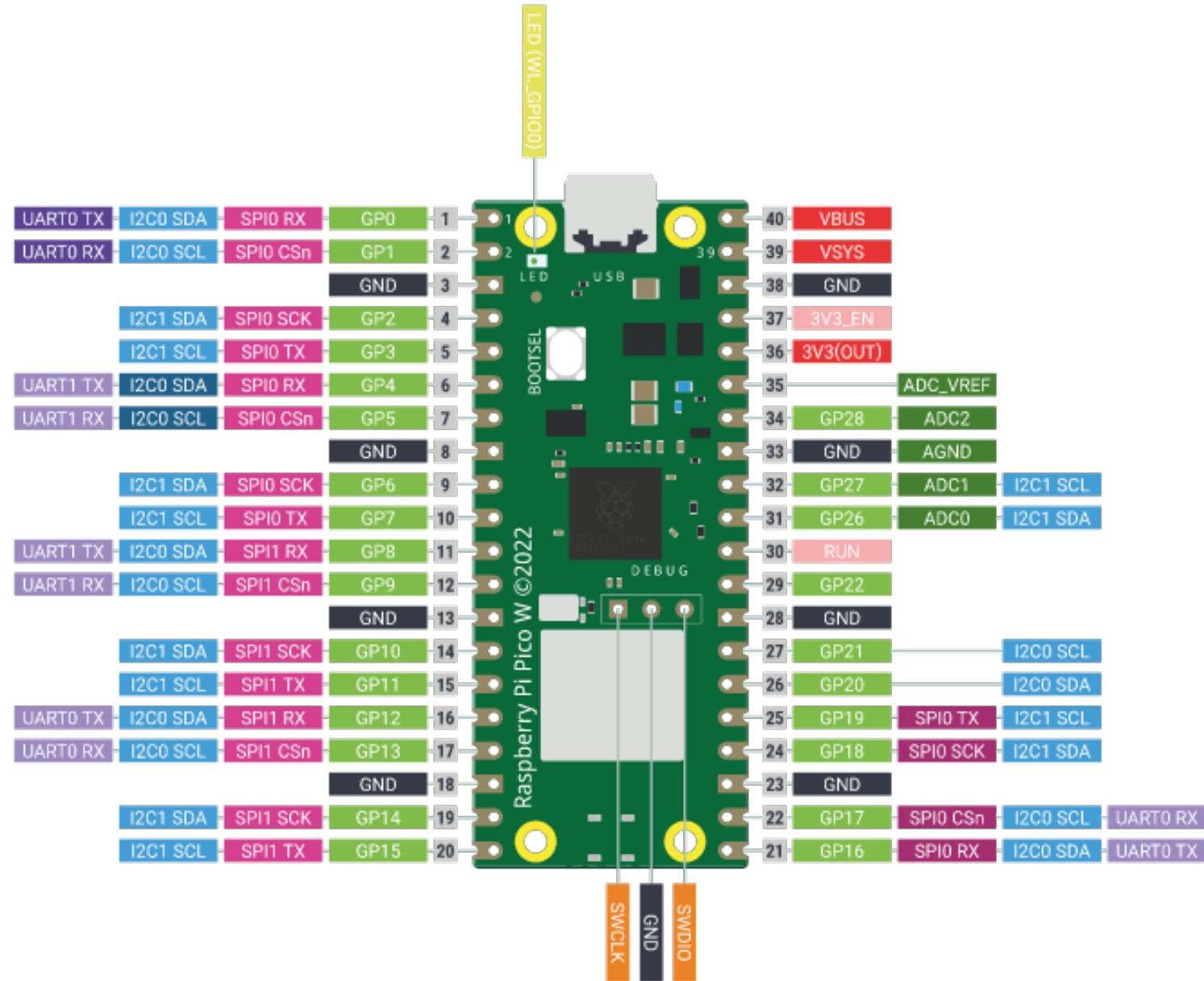
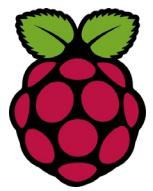
The post-fix numeral on RP2040 comes from the following,



1. Number of processor cores (2)
2. Loosely which type of processor (M0+)
3.  $\text{floor}(\log_2(\text{ram} / 16\text{k}))$
4.  $\text{floor}(\log_2(\text{nonvolatile} / 16\text{k}))$  or 0 if no onboard nonvolatile storage



# Raspberry Pi Pico W Pinout



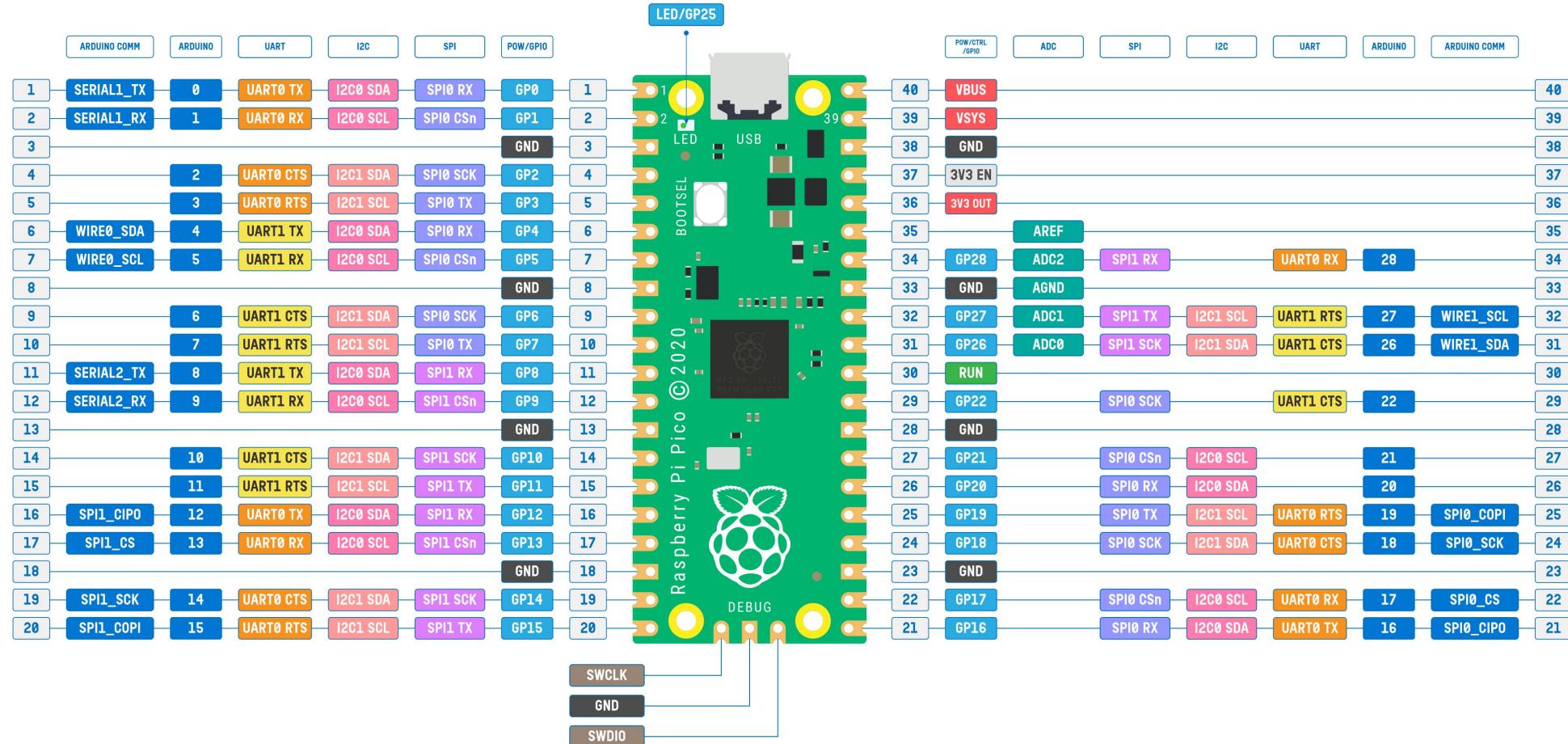
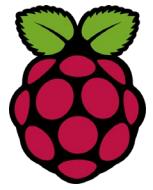
RP2040



Infineon 43439



# Raspberry Pi Pico – Full Pinout



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Raspberry Pi Pico vector image is originally designed by Raspberry Pi. Please visit [raspberrypi.com](https://www.raspberrypi.com) for more info.

## ARDUINO PINS

## SWD Pins

PHYSICAL PIN	POSITIVE SUPPLY	UART1 Pins	UART0 Pins
RESET/ENABLE	GROUND SUPPLY	I2C1 Pins	I2C0 Pins
GPIO PORT/PIN	ANALOG PIN	SPI1 Pins	SPI0 Pins

- GP29/ADC3 is used to measure VSYS.
- GP25 is used for debug LED.
- GP24 is used for VBUS sense.
- GP23 is connected to SMPS Power Save pin.
- All GPIO pins support PWM. There are total 16 PWM channels.
- All GPIO pins support level and edge interrupts.
- Arduino pins are as per [Arduino-Pico core](#) by [@earlephilhower](mailto:Earle F. Philhower, III)
- Arduino's default Serial is the USB-CDC of Pico.

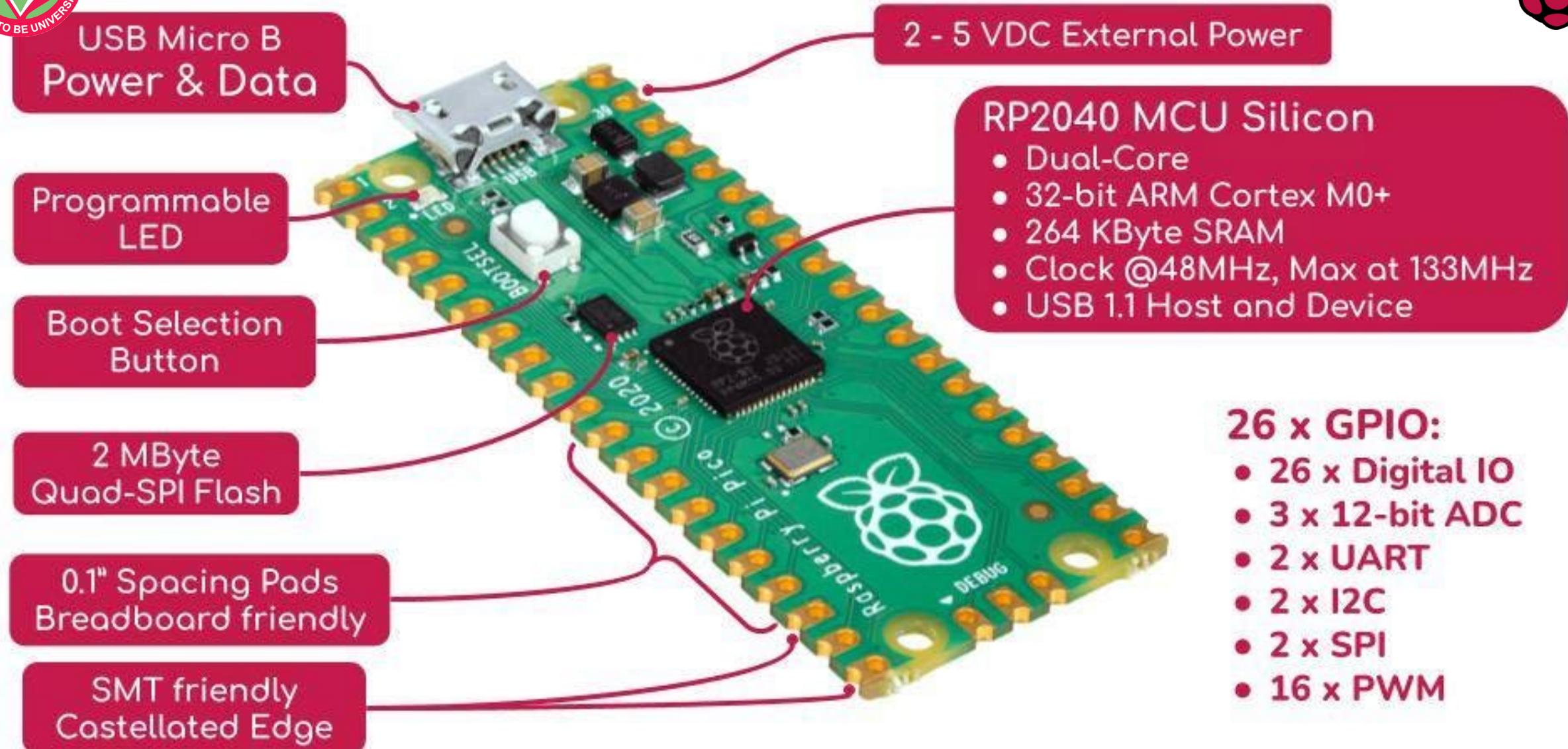
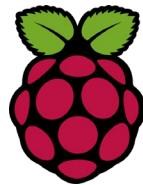


Rev. 0.2, 15-07-2022

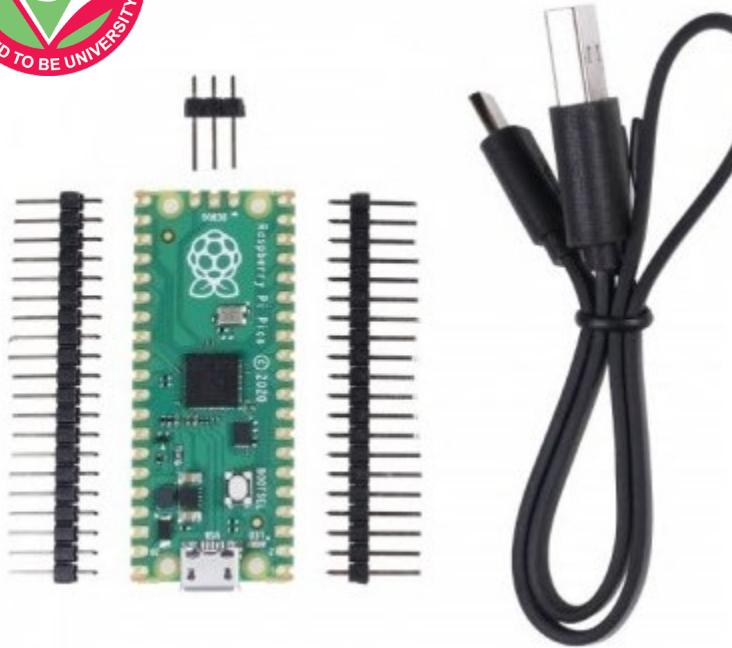
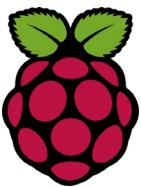
Design: Vishnu Mohanan

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# Raspberry Pi Pico – In Short

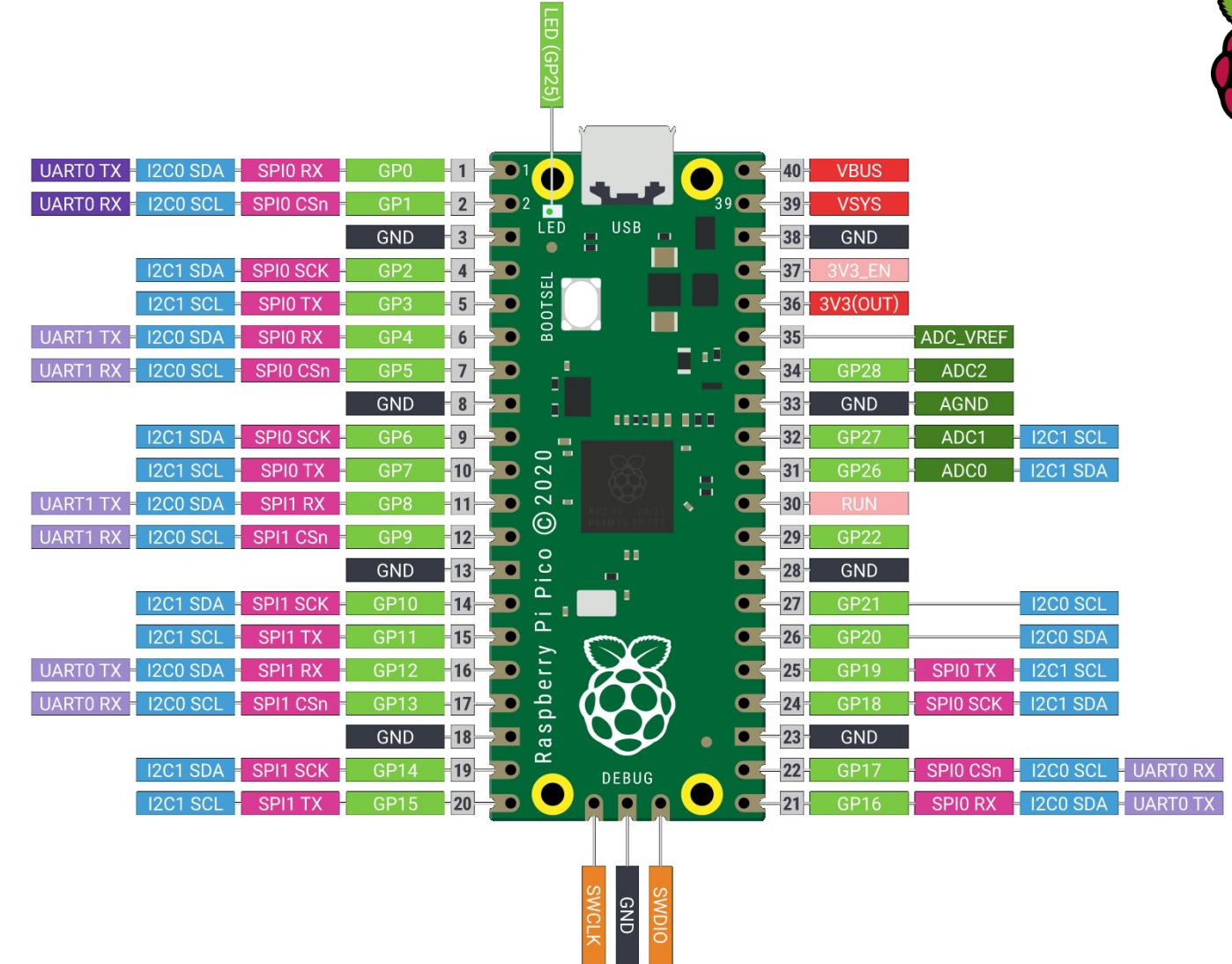


Pi Foundation has released an RP2040 Microprocessor based development board, in the same form factor as an Arduino Nano.

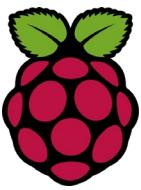


## Package Includes:

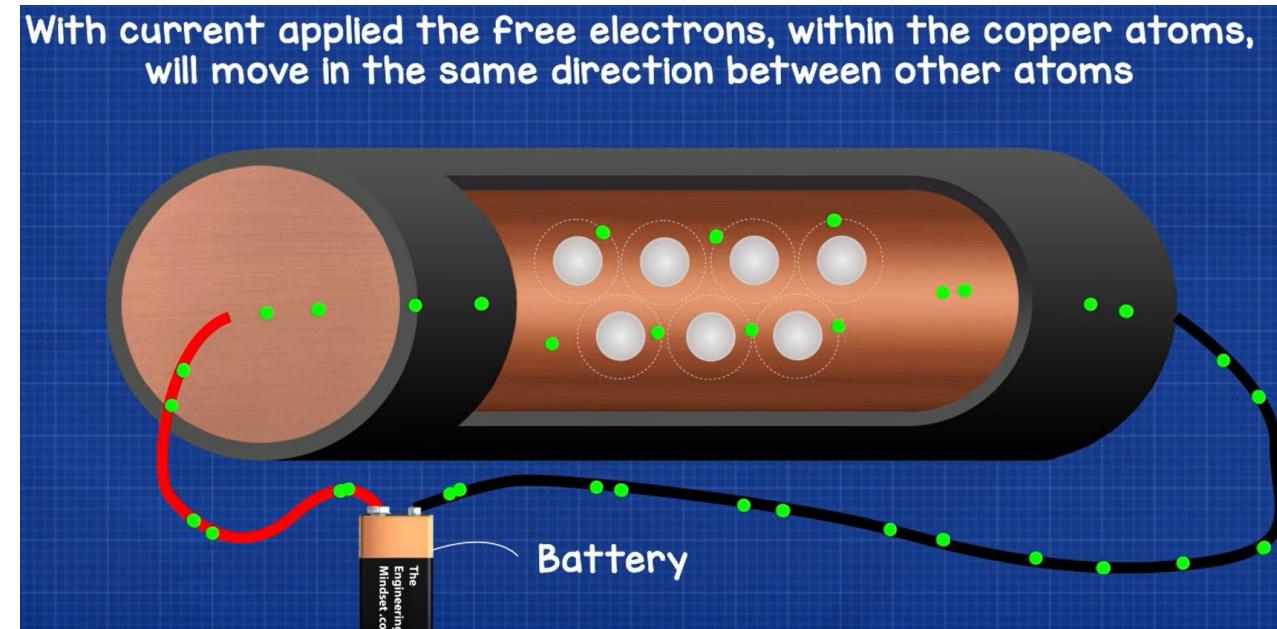
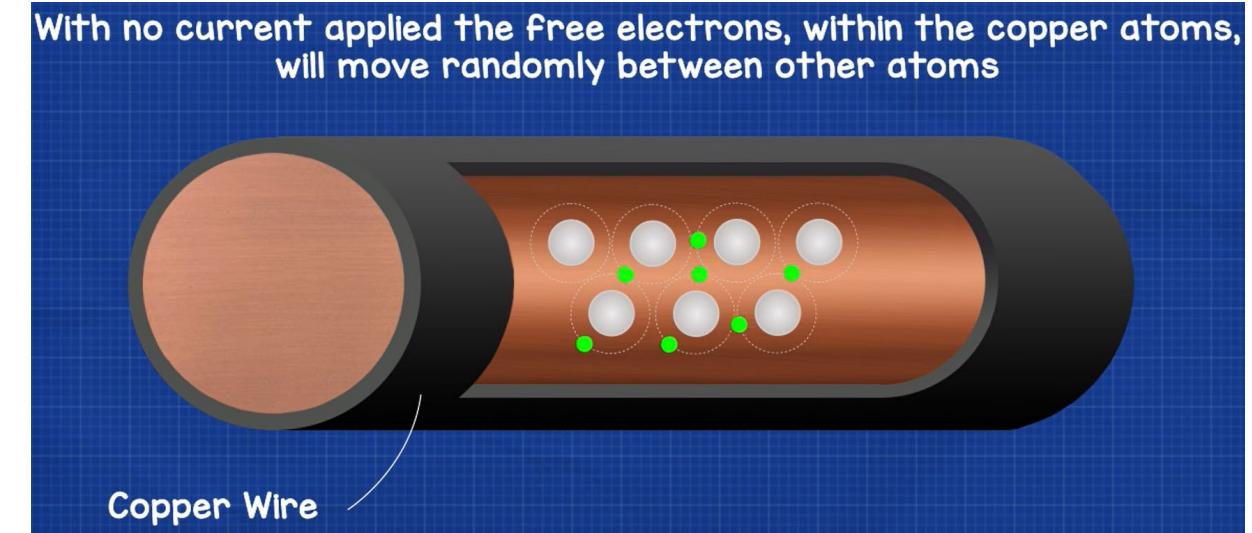
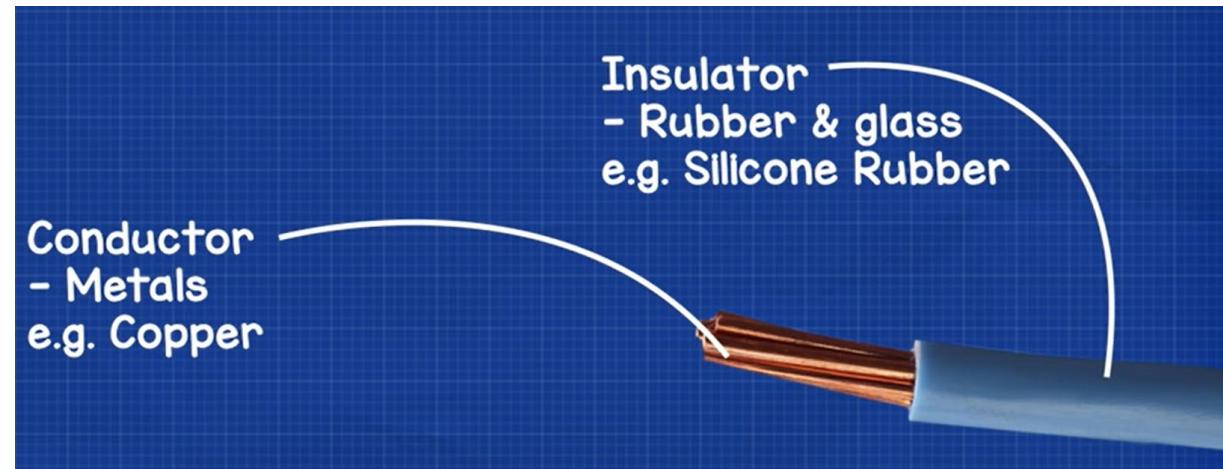
- 1 x Raspberry Pi Pico
- 1 x Micro-USB cable
- 2 x 20 Pin Header
- 1 x 3 Pin Header

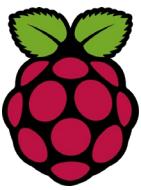


■ Power ■ Ground ■ UART / UART (default) ■ GPIO, PIO, and PWM ■ ADC ■ SPI ■ I2C ■ System Control ■ Debugging

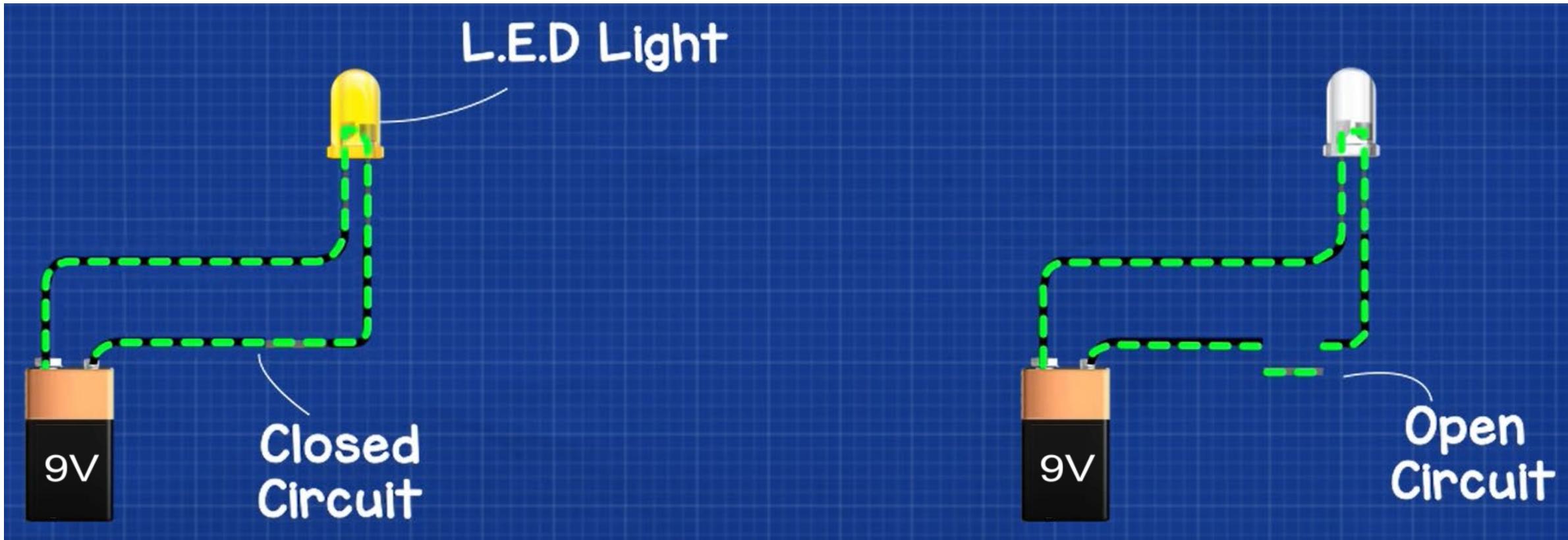


# Conductors and Insulators





# Open and Closed Circuit



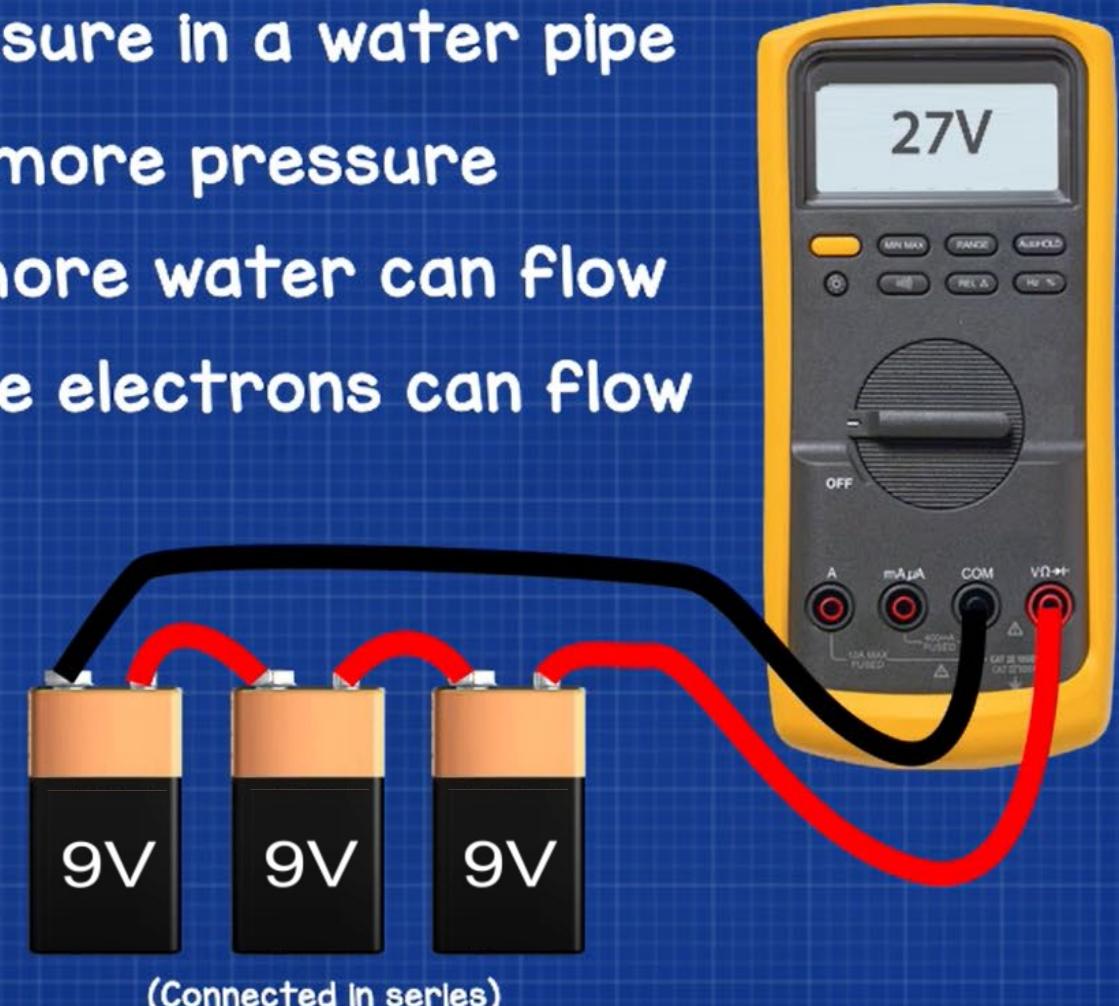
# Voltage

Think of Voltage like pressure in a water pipe

More voltage means more pressure

More pressure means more water can flow

More Voltage means more electrons can flow



# Voltage



What does a "Volt" mean?

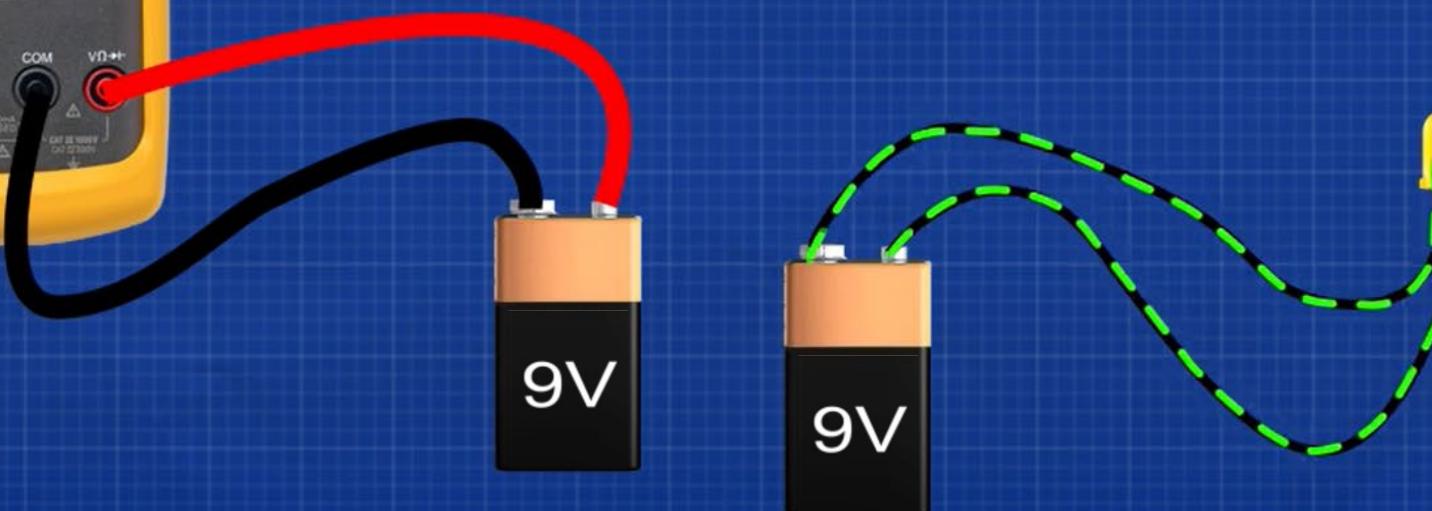
We know: more Voltage means more electrons can flow

$$\text{Volt} = \frac{\text{Joules}}{\text{Coulomb}}$$

Work

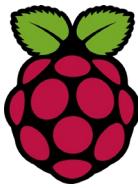
Per

Group of flowing electrons



A 9V Battery can do:

9 Joules of work,  
or heat, per coulomb

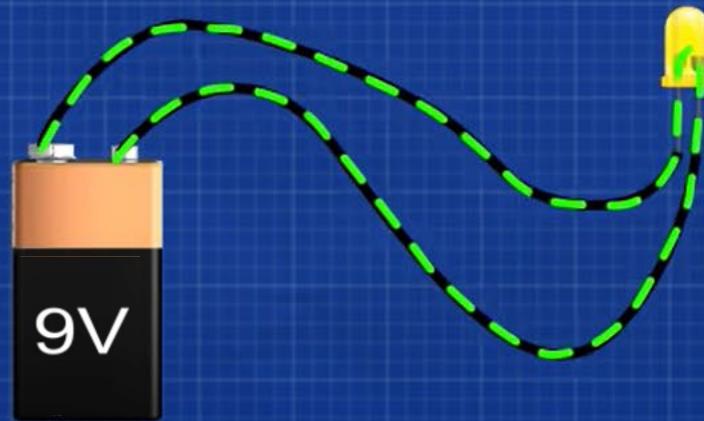


# Current

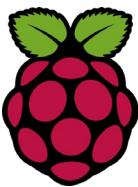
Current is the flow of electrons, measured in Amperes (Amps), past a single point in a circuit within a set amount of time

1 Amp = 1 Coulomb

1 Coulomb = 6,242,000,000,000,000,000 electrons per second



Electrons are negatively charged  
they flow from the negative terminal  
to the positive terminal



# Resistance

Resistance is a restriction to the flow of electrons

Resistance is measured in Ohms  $\Omega$

## Size

Length



Thickness



## Material

Copper



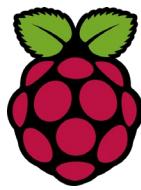
Aluminium



## Temperature

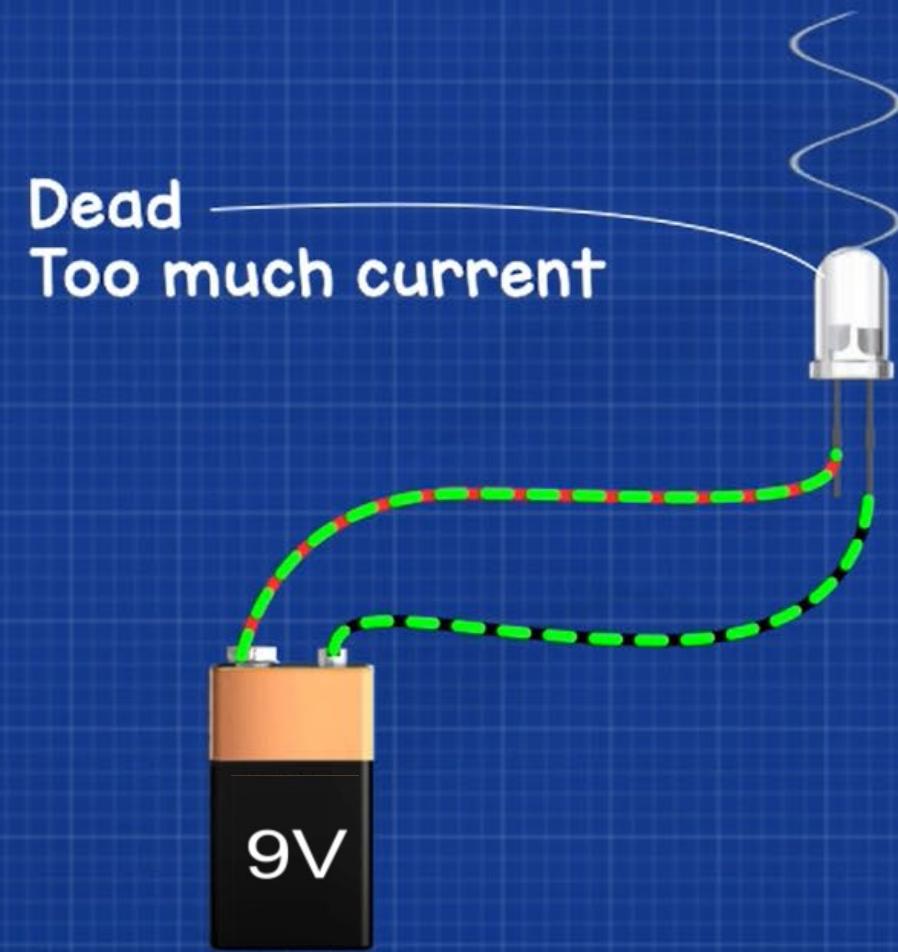
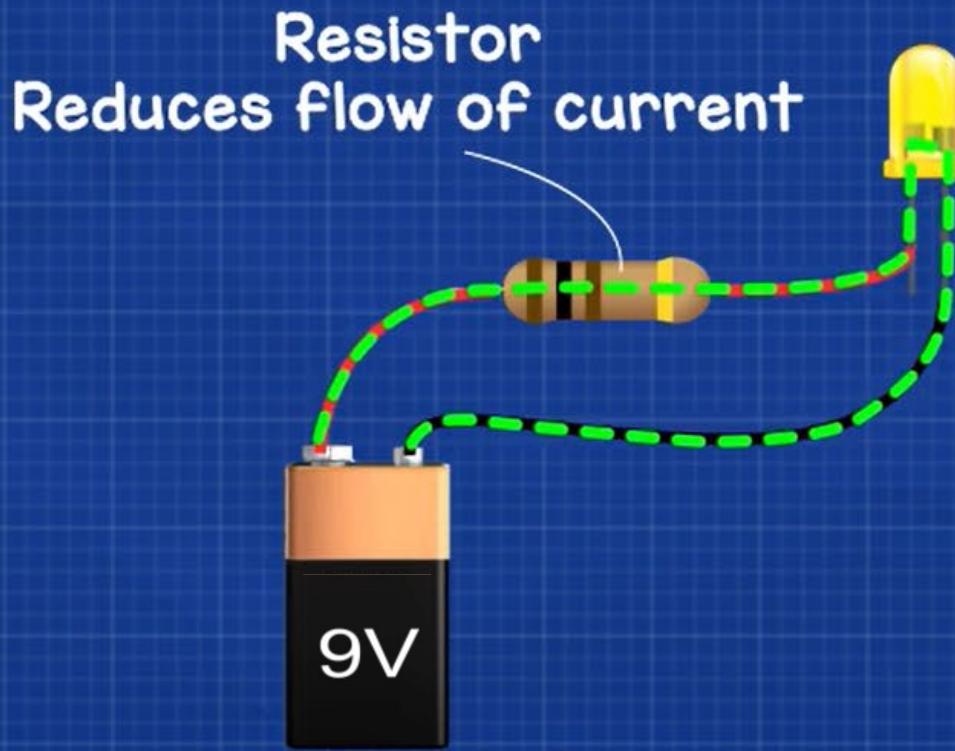
Less More

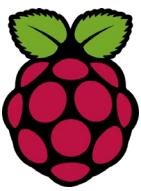




# Resistors

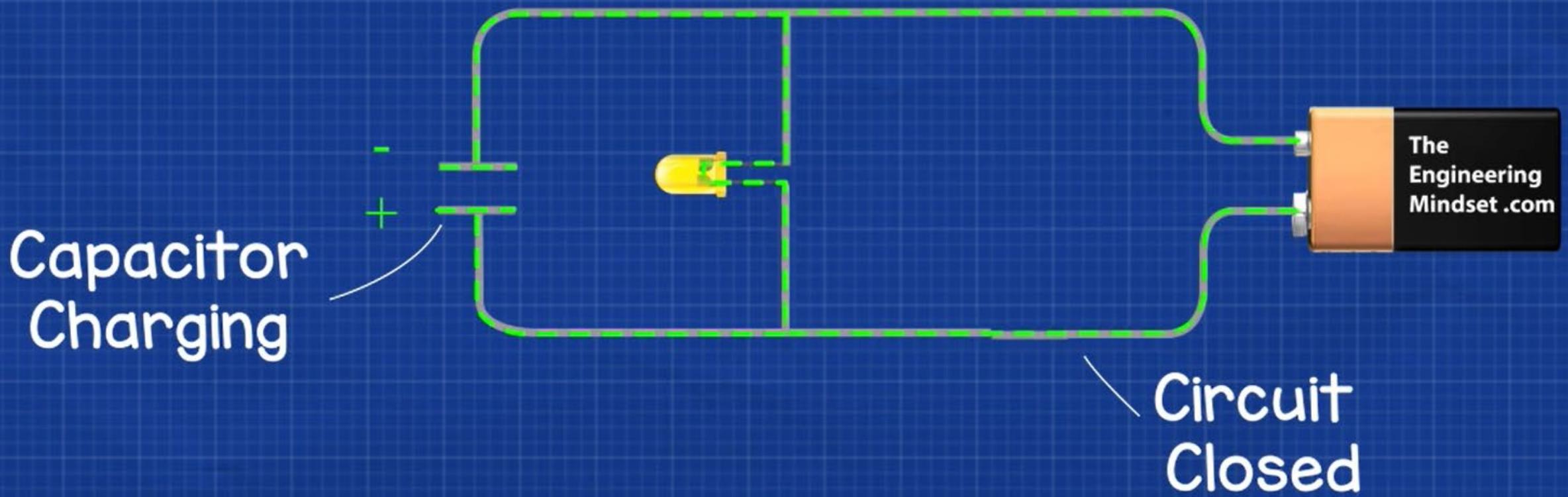
Resistors protect components by restricting the flow of current





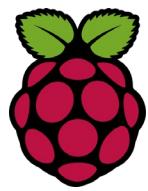
# Capacitors

Capacitors store electric charge

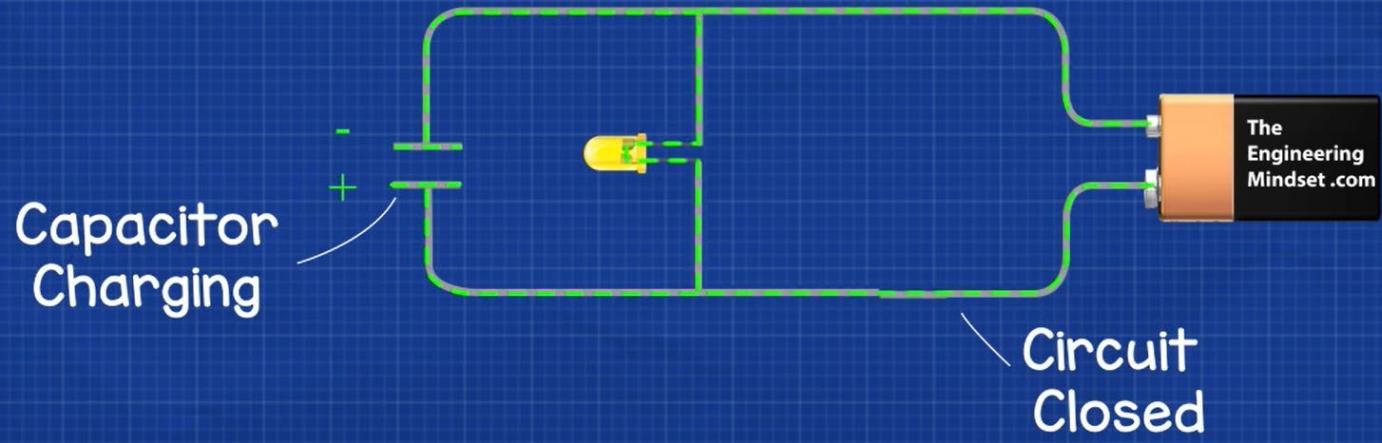




# Capacitors

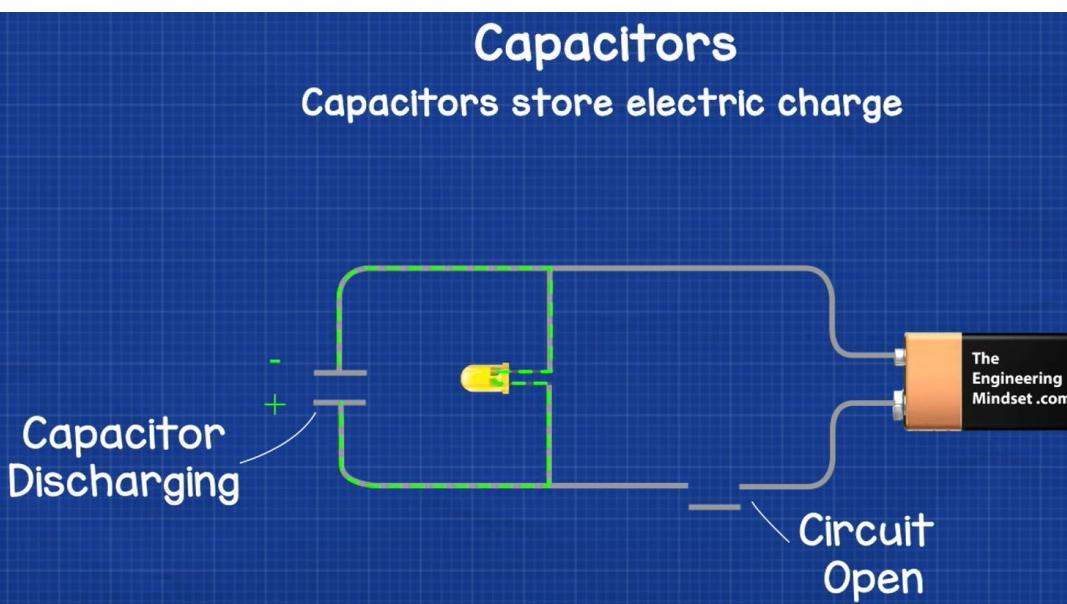


Capacitors store electric charge



Capacitors

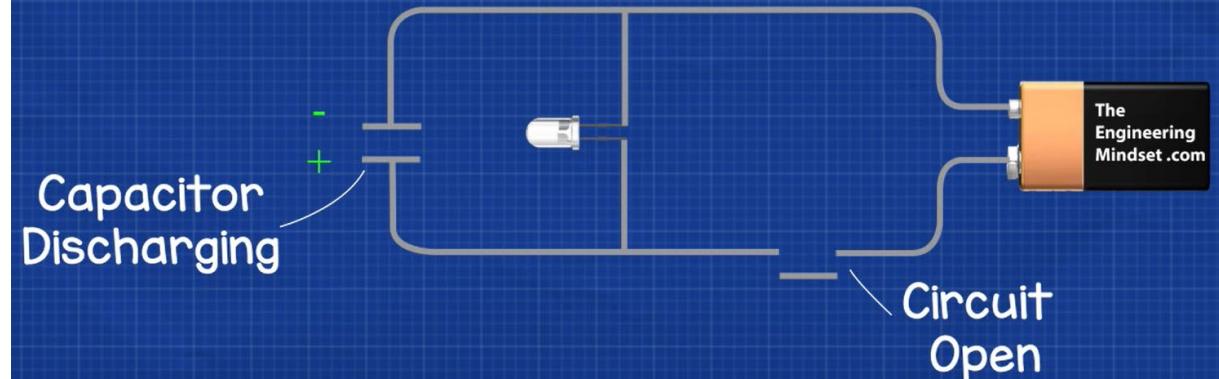
Capacitors store electric charge



Capacitors store electric charge

Capacitor  
Discharging

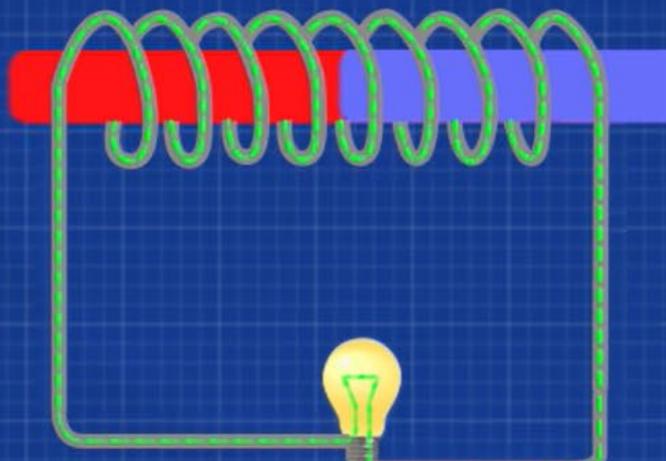
Circuit  
Open



Circuit  
Open

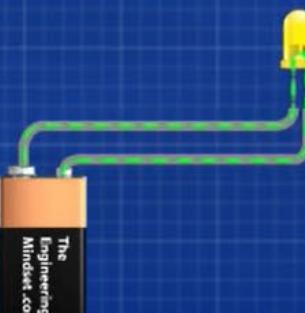
# Types of Electricity

There are two types of current electricity



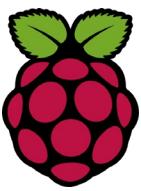
## Alternating Current (AC)

In AC the current moves back and forth with the changing magnetic field  
This is the type of electricity from wall sockets in your home



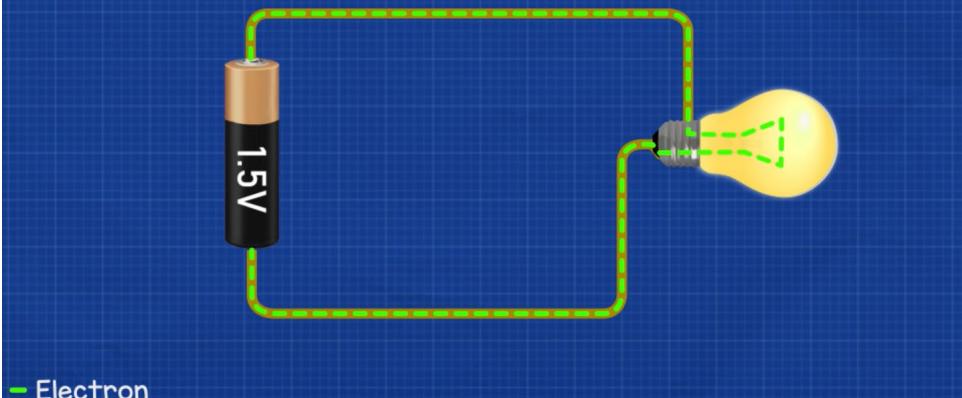
## Direct Current (DC)

In DC the current travels only in one direction  
This is the type of electricity in batteries

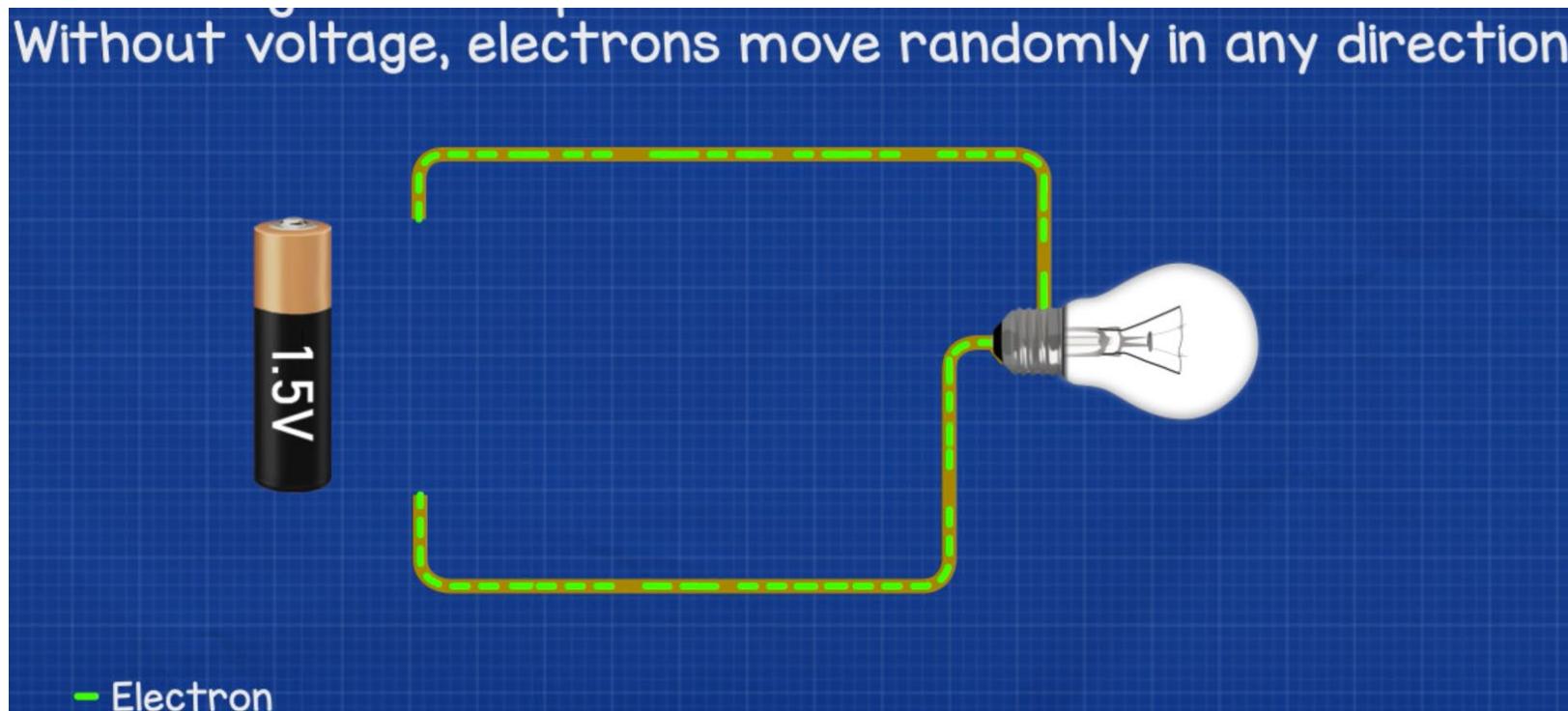


# Voltage

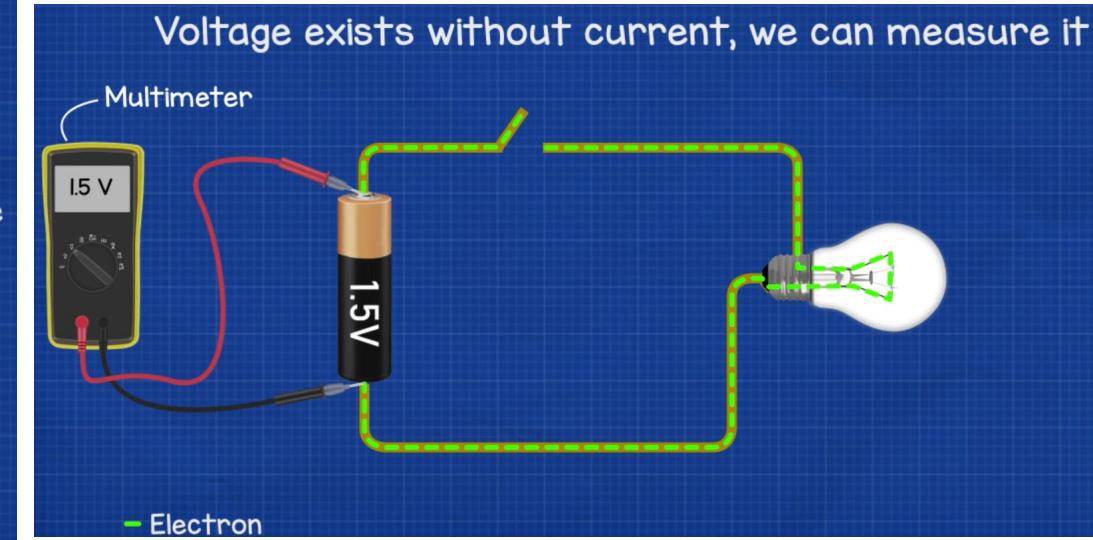
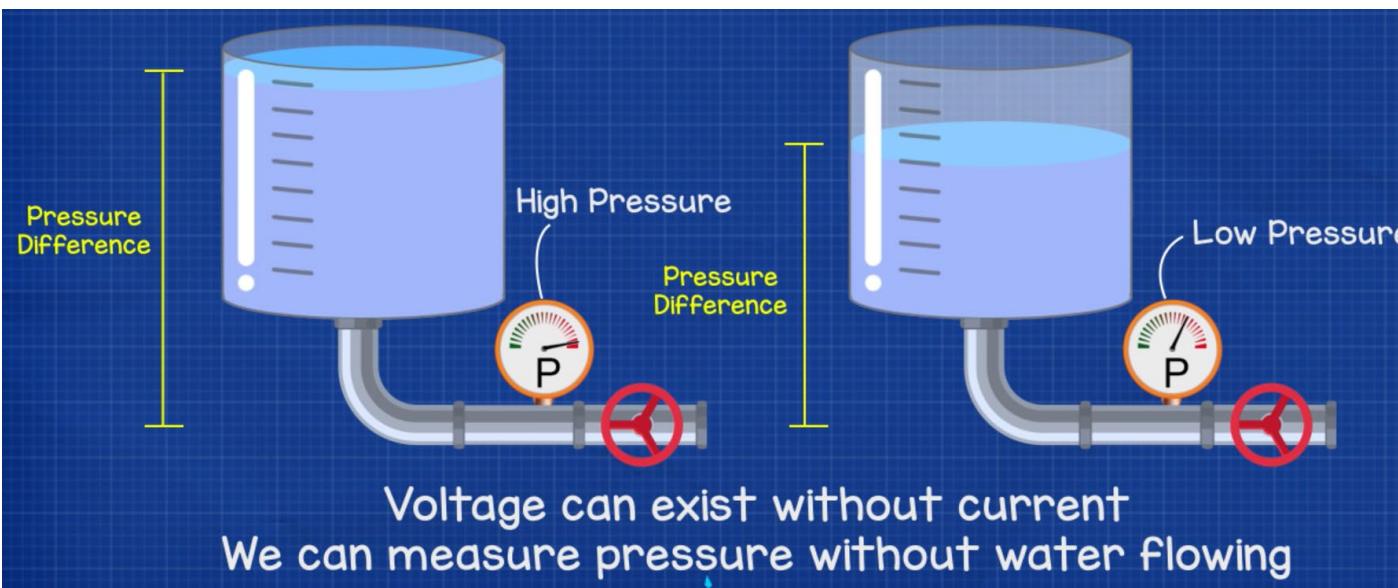
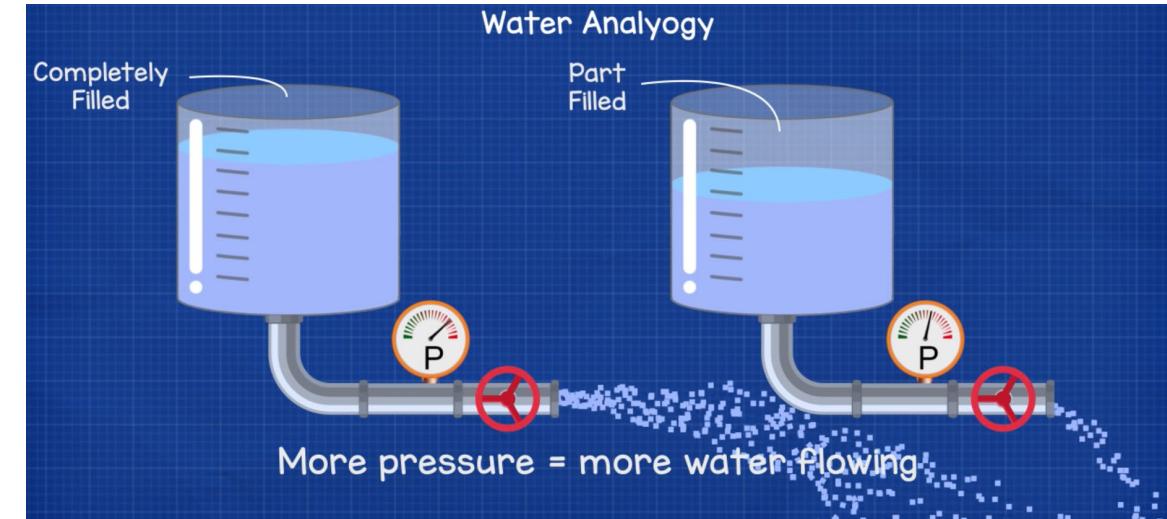
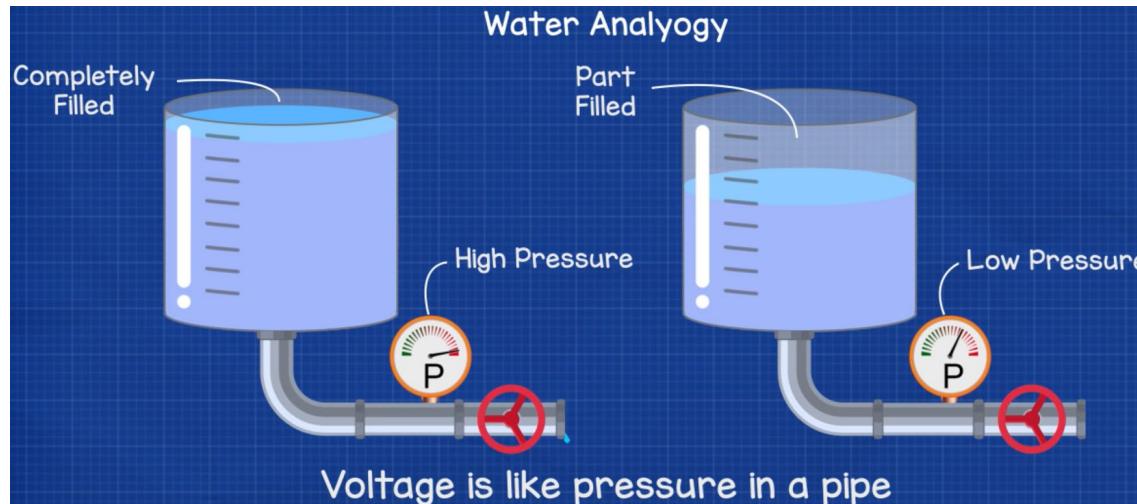
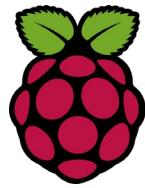
Voltage is what pushes electrons around a circuit



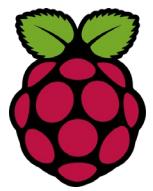
Without voltage, electrons move randomly in any direction



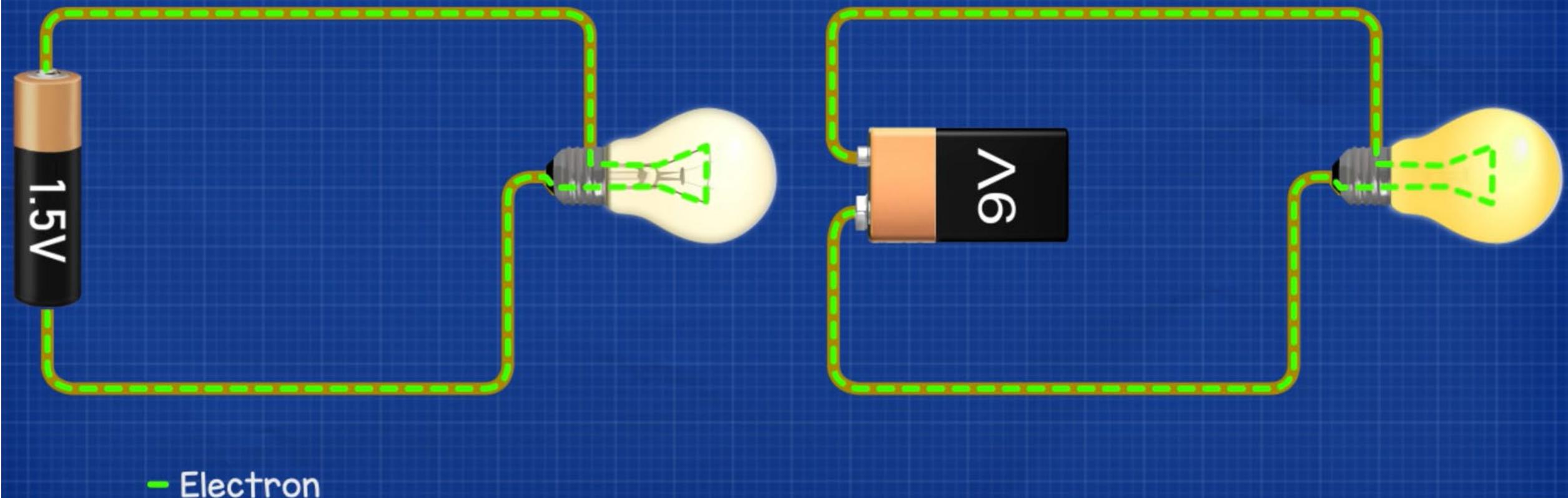
# Voltage



# Voltage

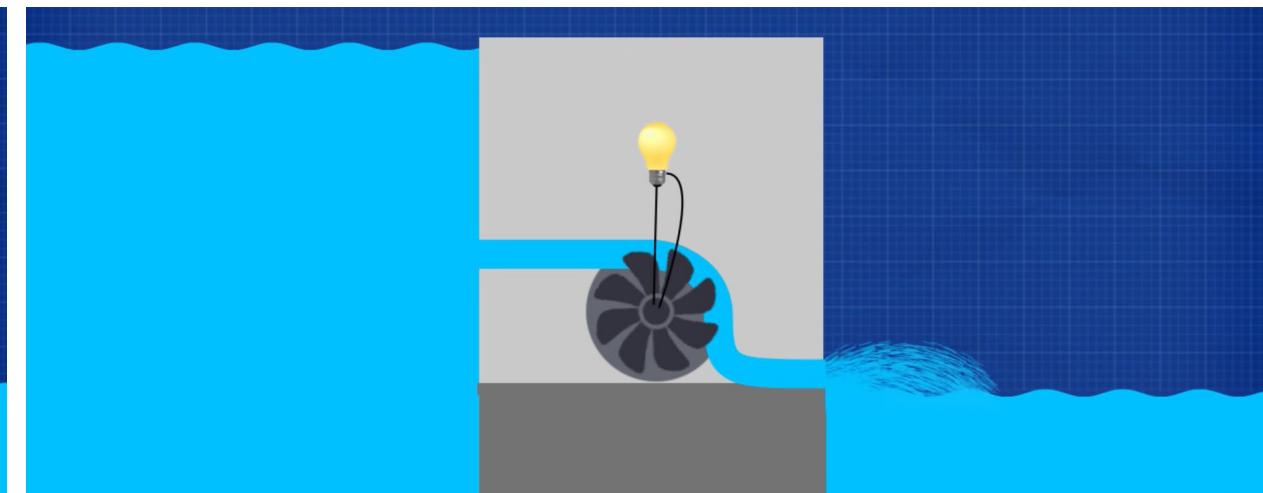
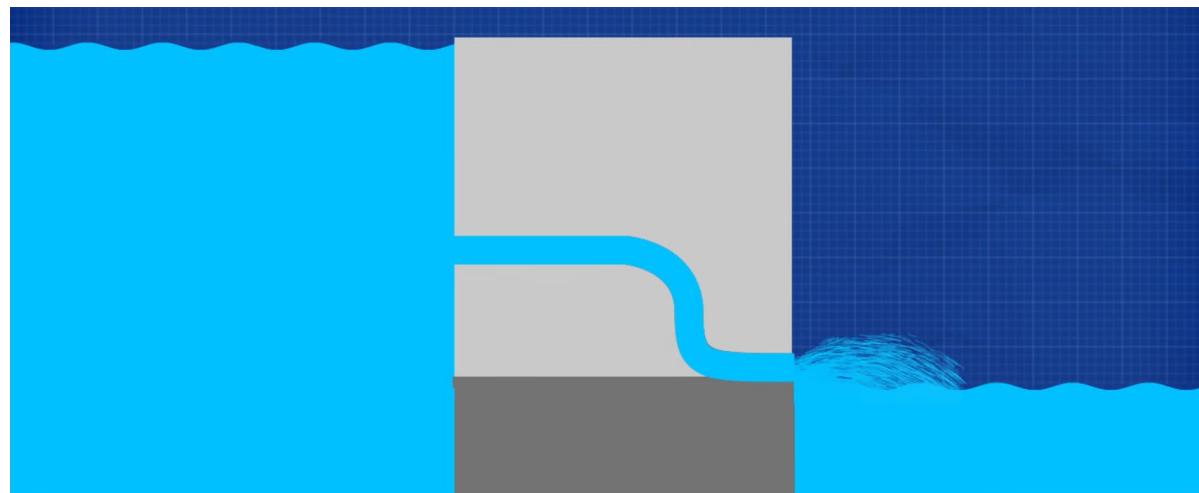
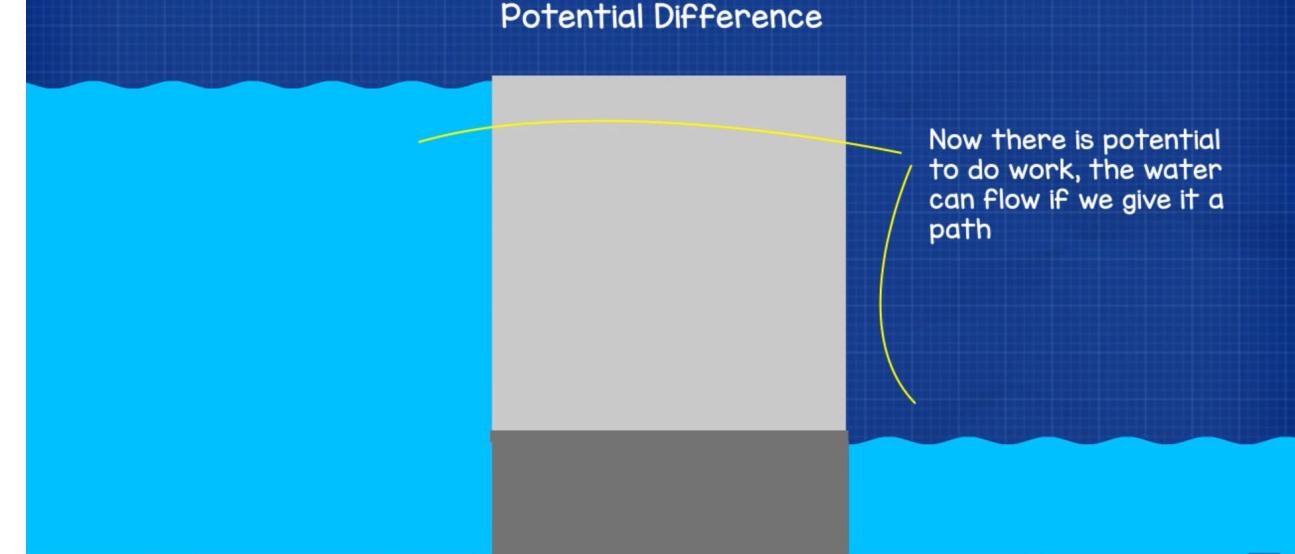
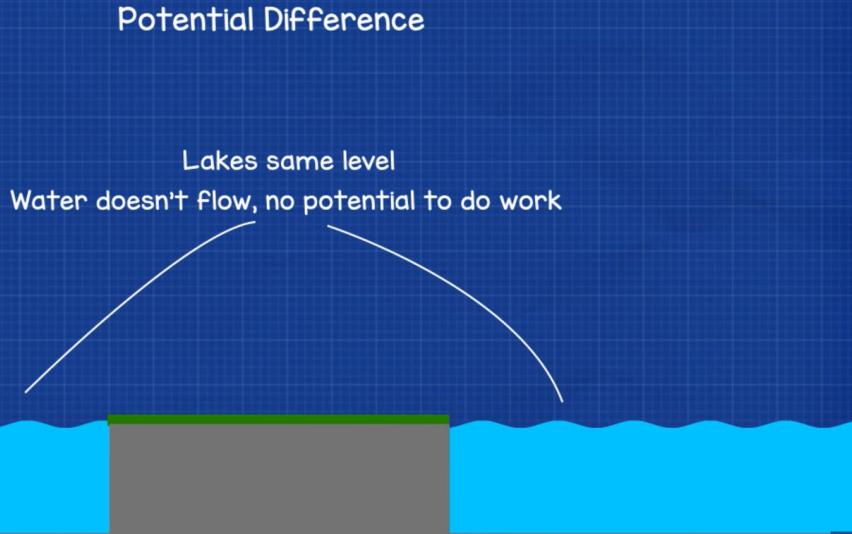
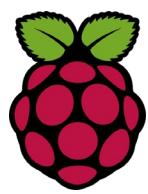


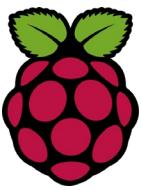
More voltage = more current  
More current = brighter lamp



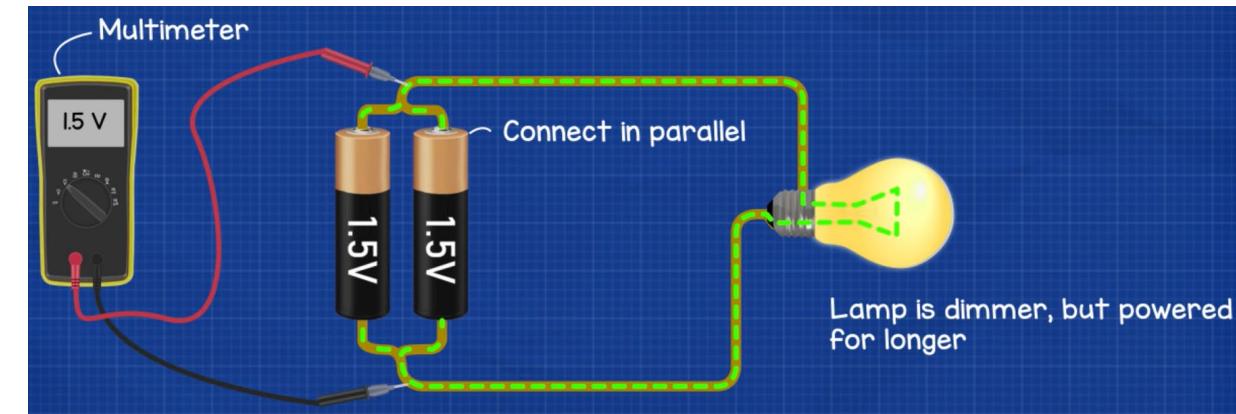
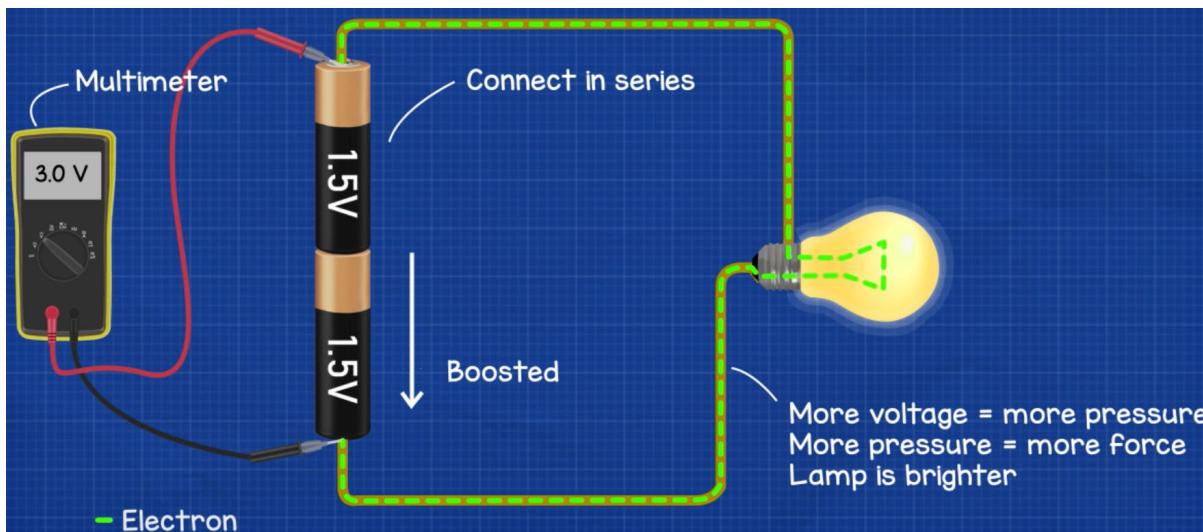
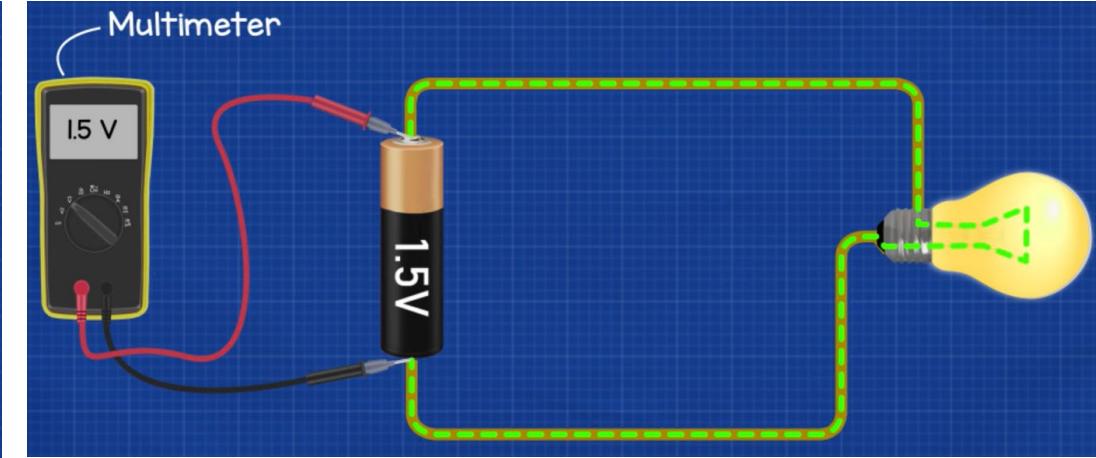
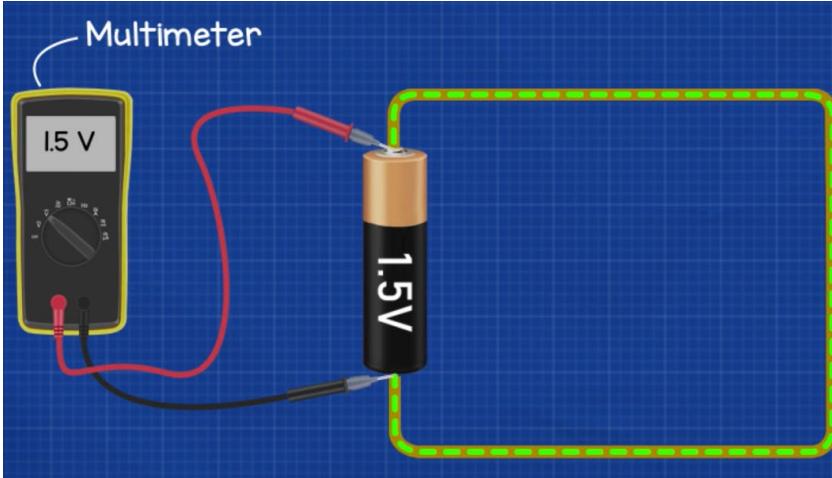
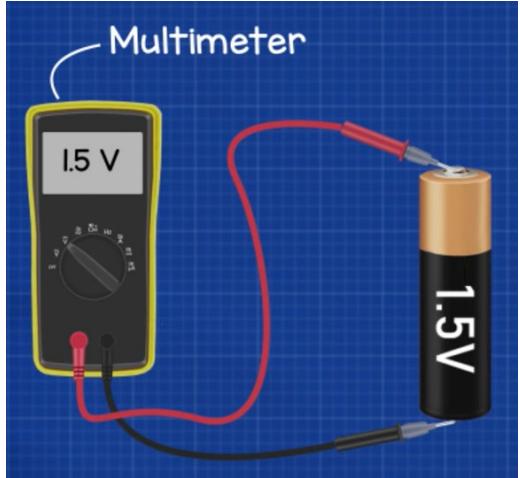


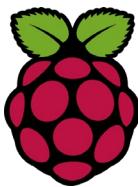
# Potential Difference





# Series and Parallel



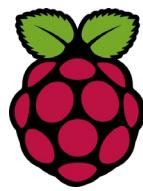


# Voltage Measurement

We measure potential difference or voltage in the units of Volts  
We represent this value with a capital "V"

## Manufacturers Label

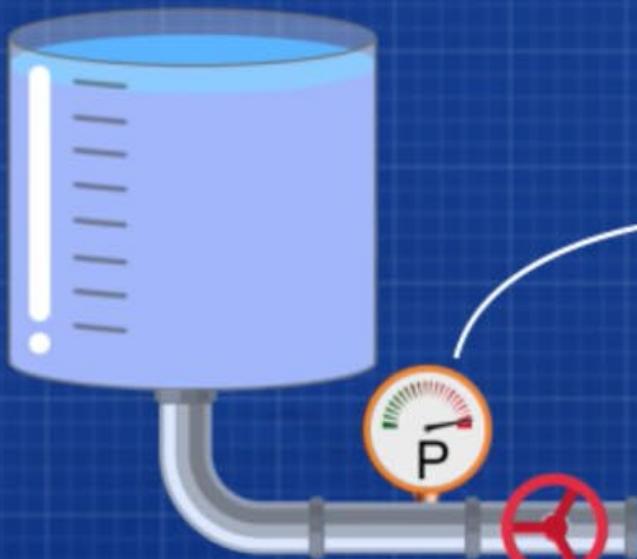




# Voltage and Volts are Different

**Voltage** is the pressure

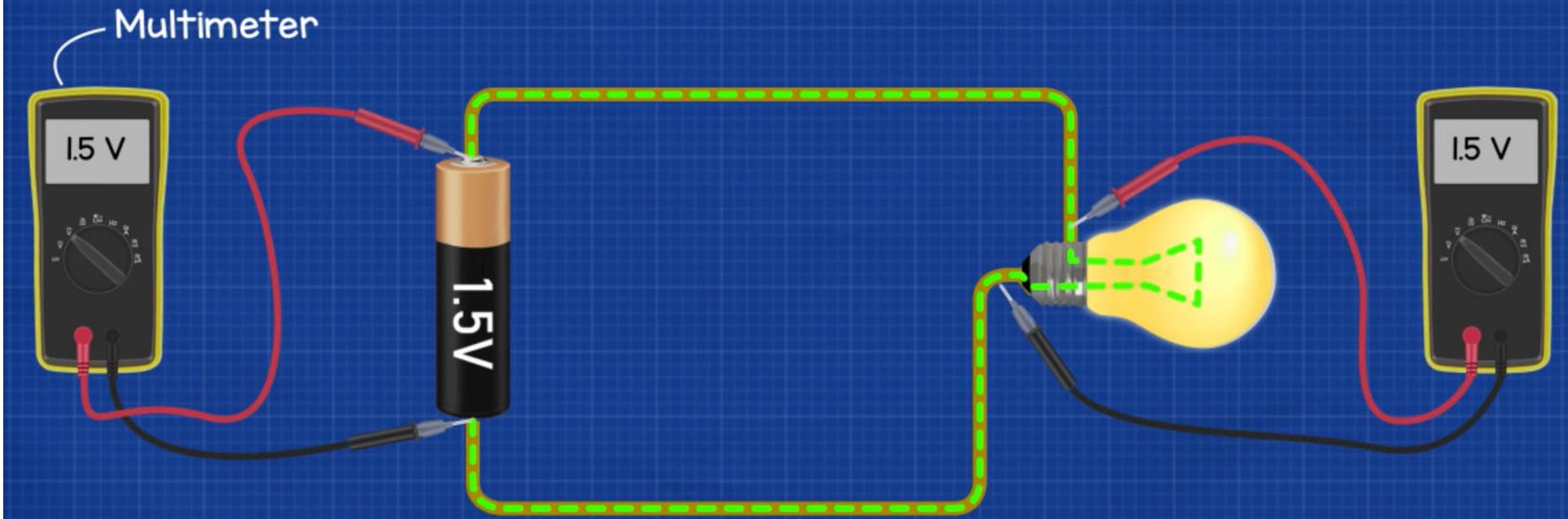
**Volts** is the units we measure the pressure in



Same as for water pressure we use the units of Bar, PSI, kPa etc.

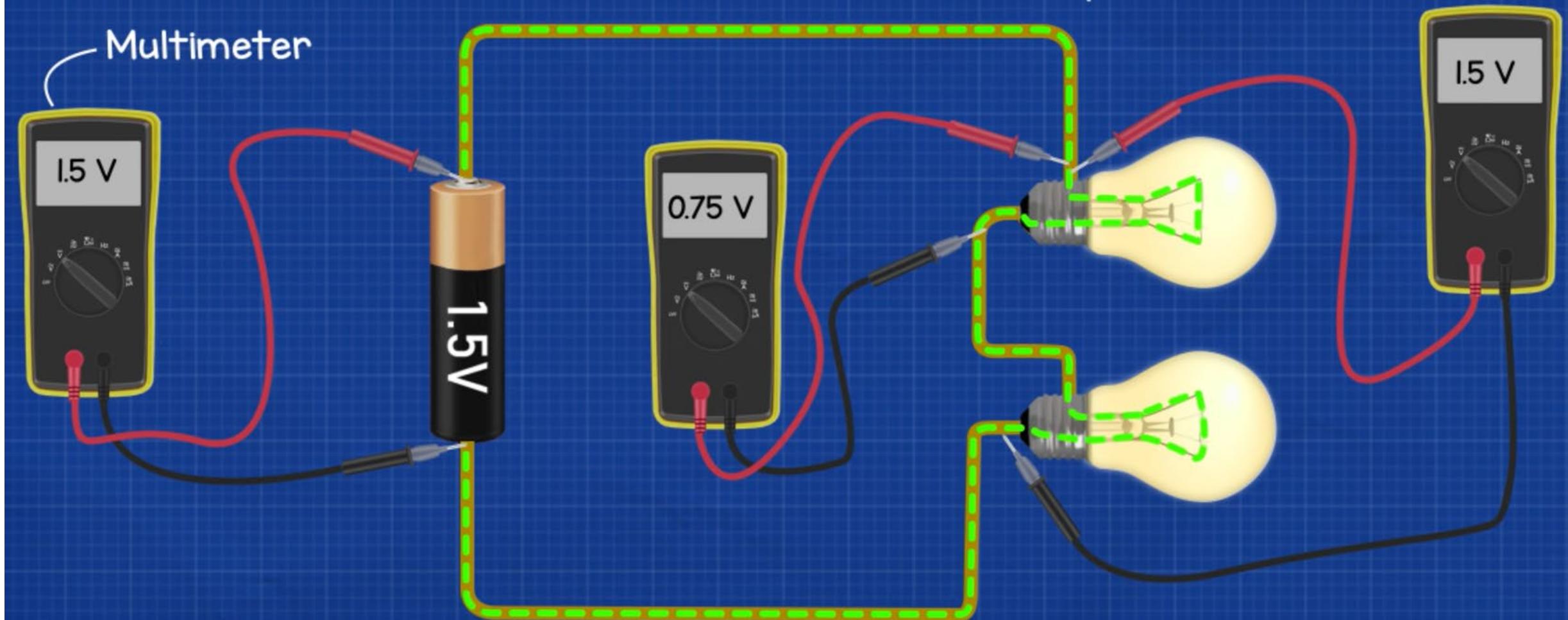
# Voltage Measurement

Single battery circuit, we measure 1.5V across both battery and lamp



# Voltage Measurement

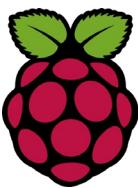
Single battery, dual lamp circuit, we measure 1.5V across the battery  
1.5V across the two lamps  
0.75V across an individual lamp



# Voltage Measurement

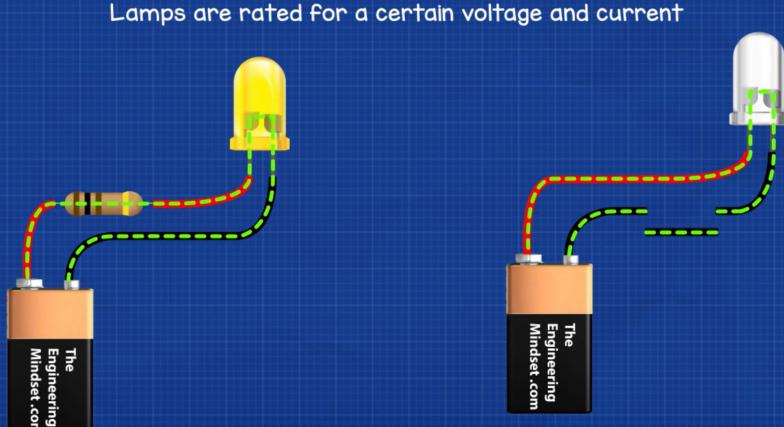


As voltage decreases so does the brightness because there is less pressure to force electrons so less light is produced

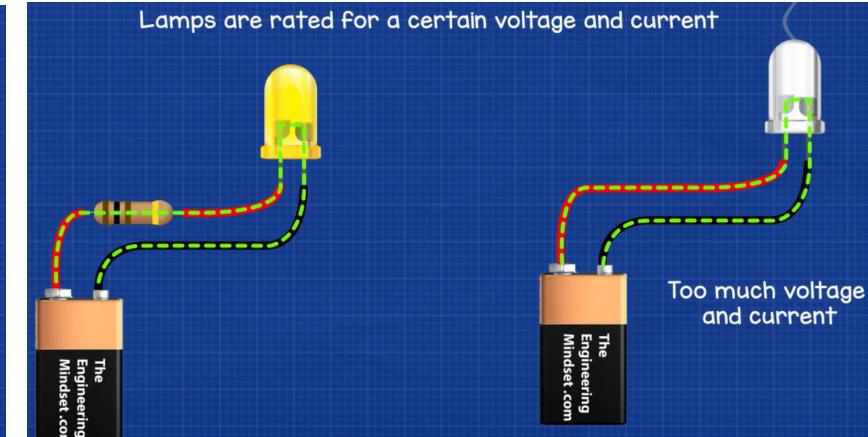


# Direct Voltage

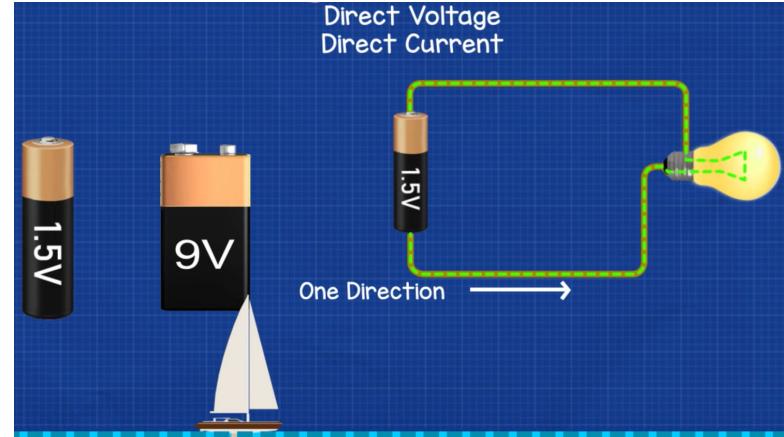
Lamps are rated for a certain voltage and current



Lamps are rated for a certain voltage and current



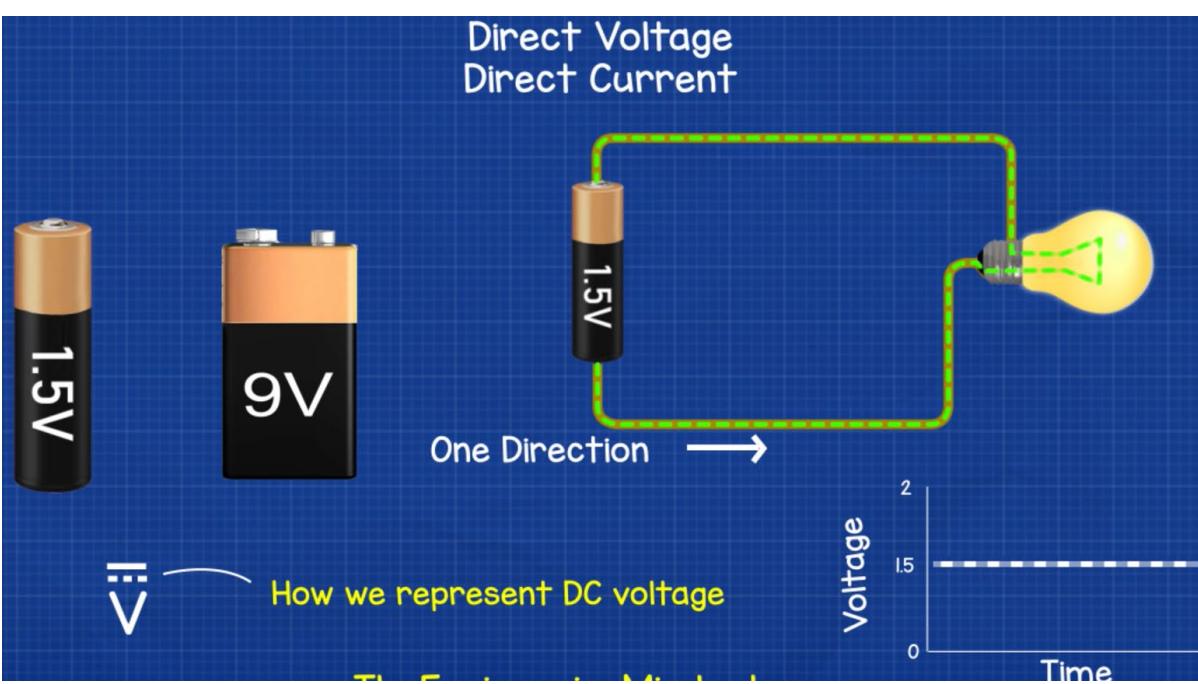
Too much voltage and current



Direct Voltage  
Direct Current

One Direction

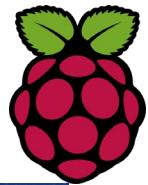
Direct Voltage  
Direct Current



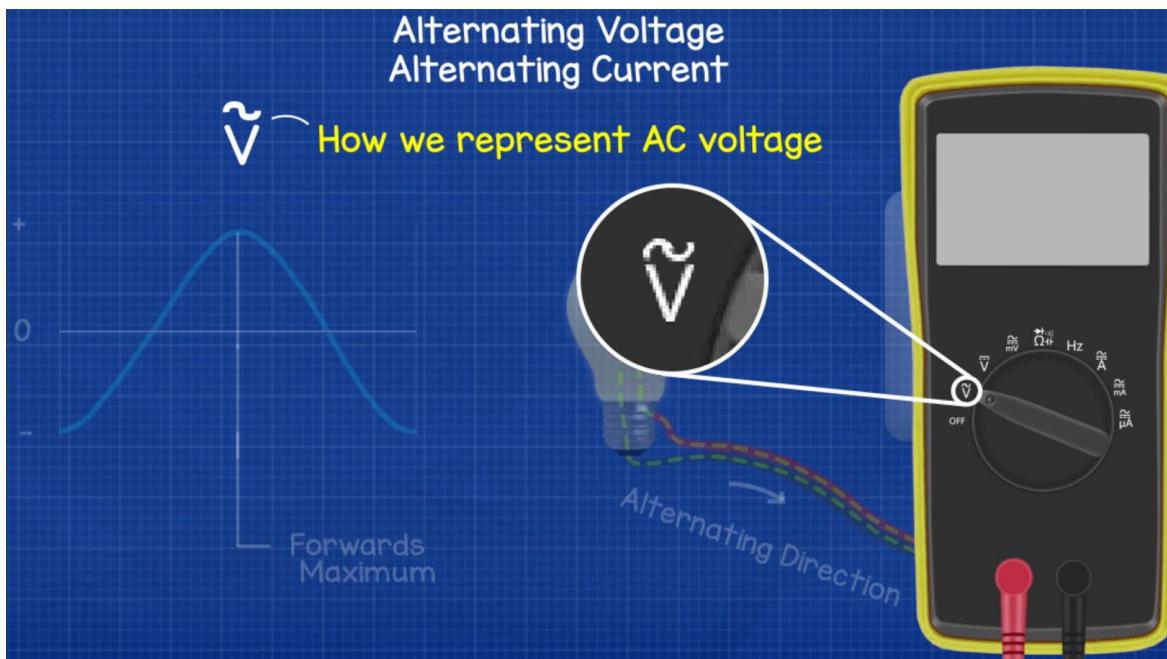
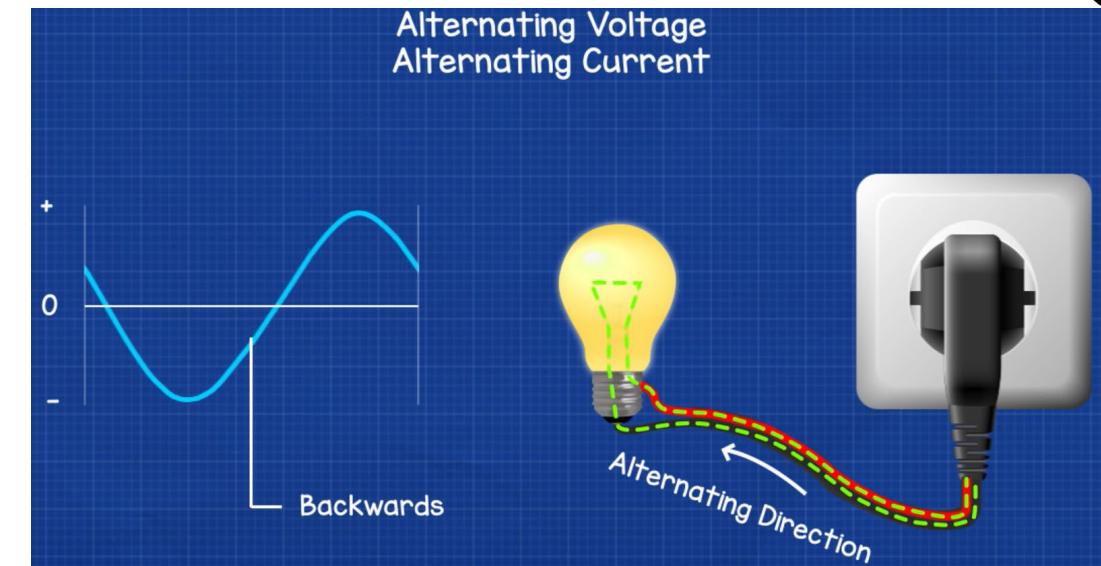
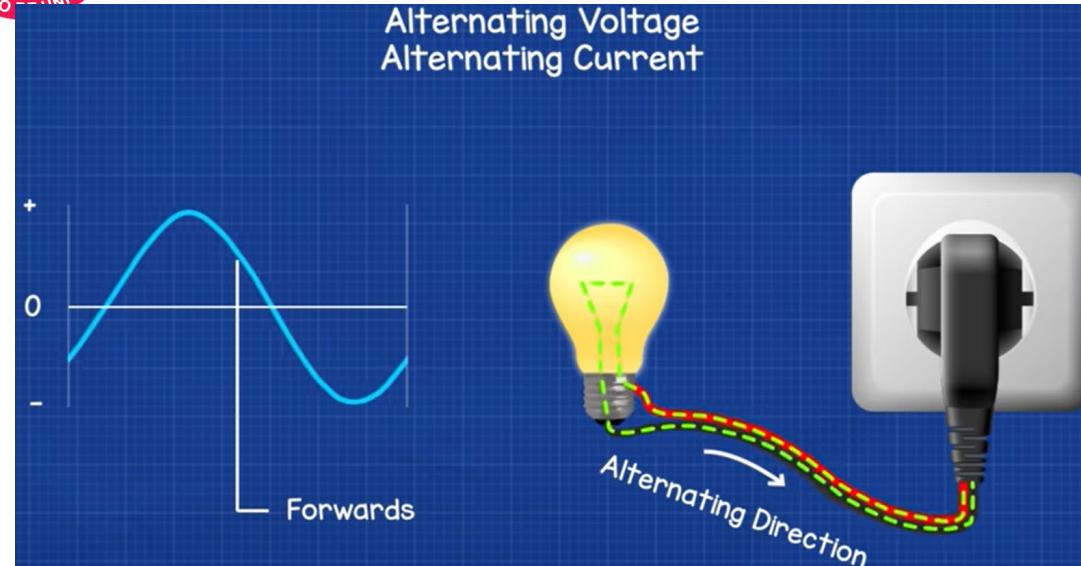
Direct Voltage  
Direct Current

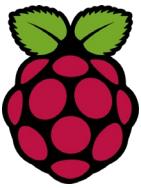
One Direction

How we represent DC voltage

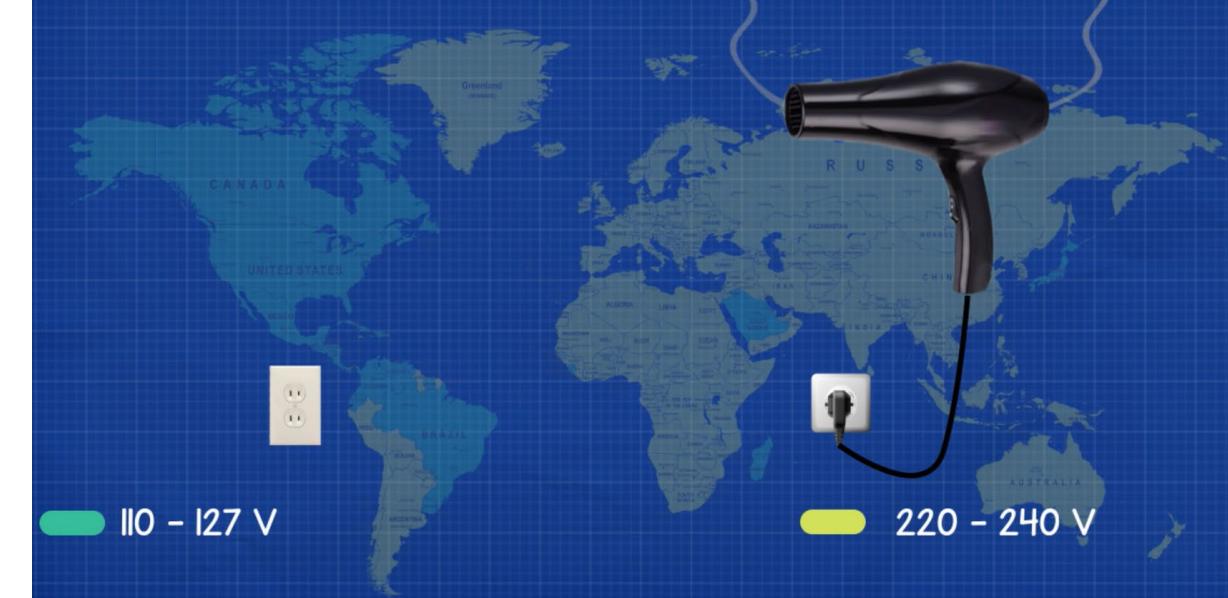


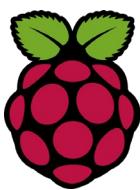
## Alternating Voltage





# Voltage in Different Region





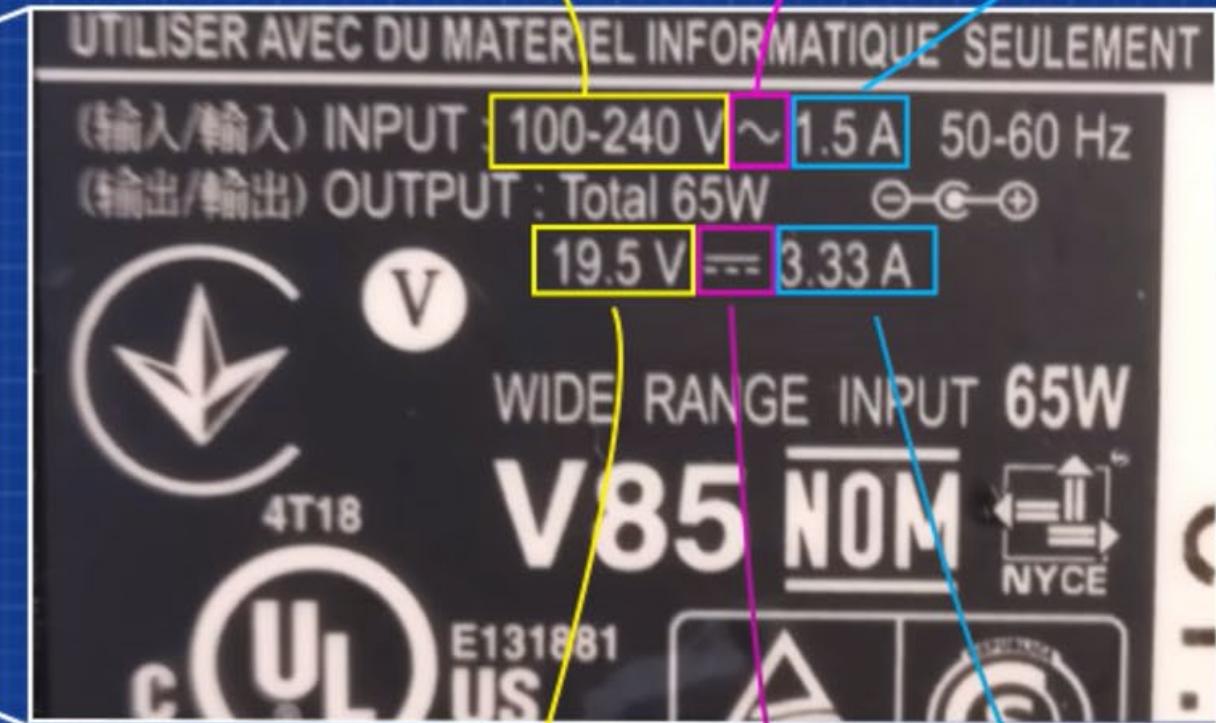
# Voltage

Manufacturer Label



Laptop Charger

Input: 100-240 V AC 1.5 Amps



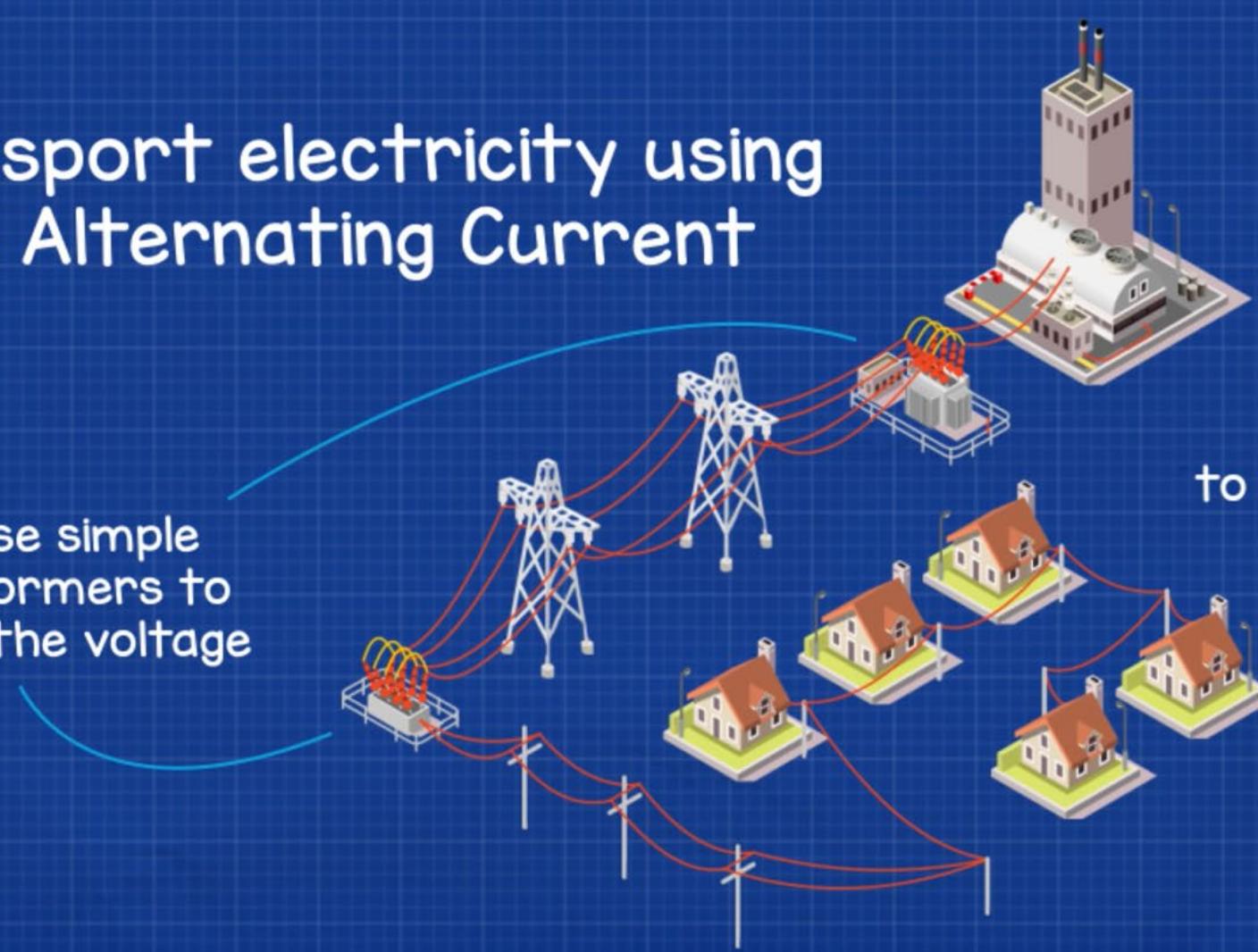
Output: 19.5 V DC 3.33 Amps

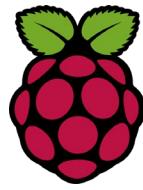
# Alternating Current

Transport electricity using  
AC Alternating Current

Can use simple  
transformers to  
change the voltage

AC is more efficient  
to transport over long distance





# Direct Current

We use DC Direct Current for electronic devices

DC is less complex  
allows circuit boards and devices to be more compact



# Direct Current

Control Circuit Board



DC Direct Current



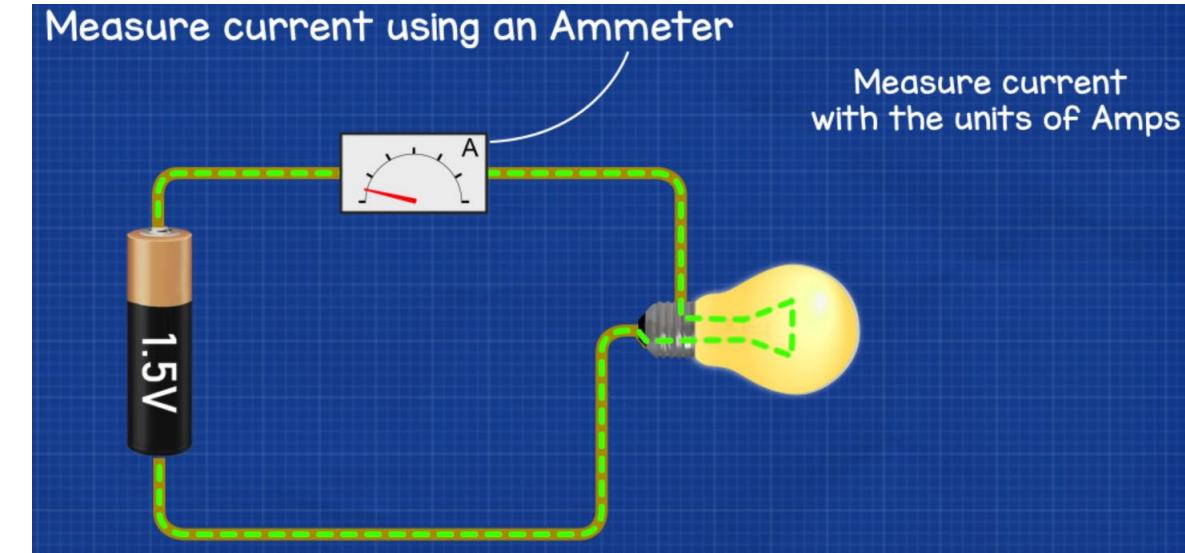
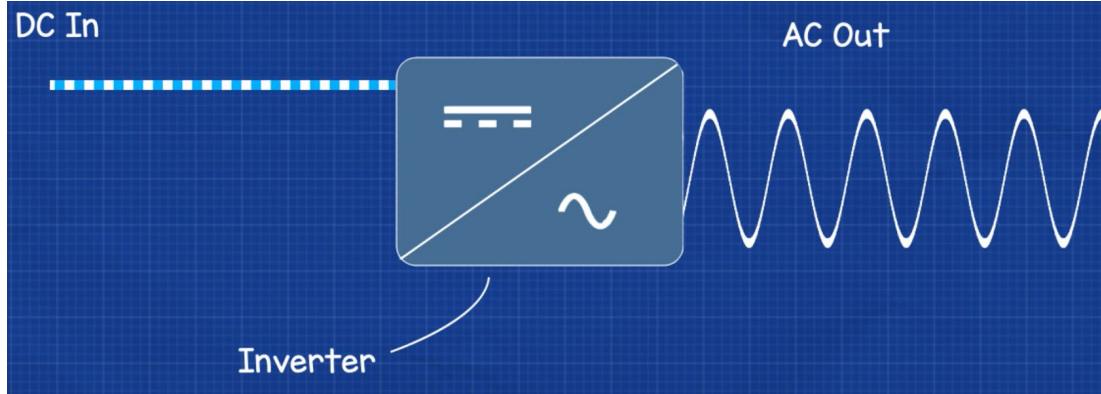
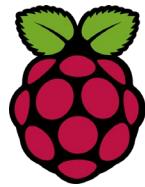
Washing Machine

AC induction motor

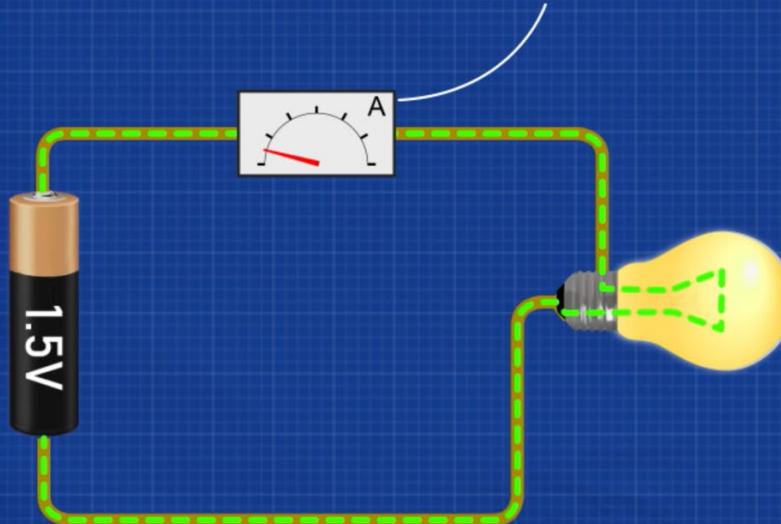




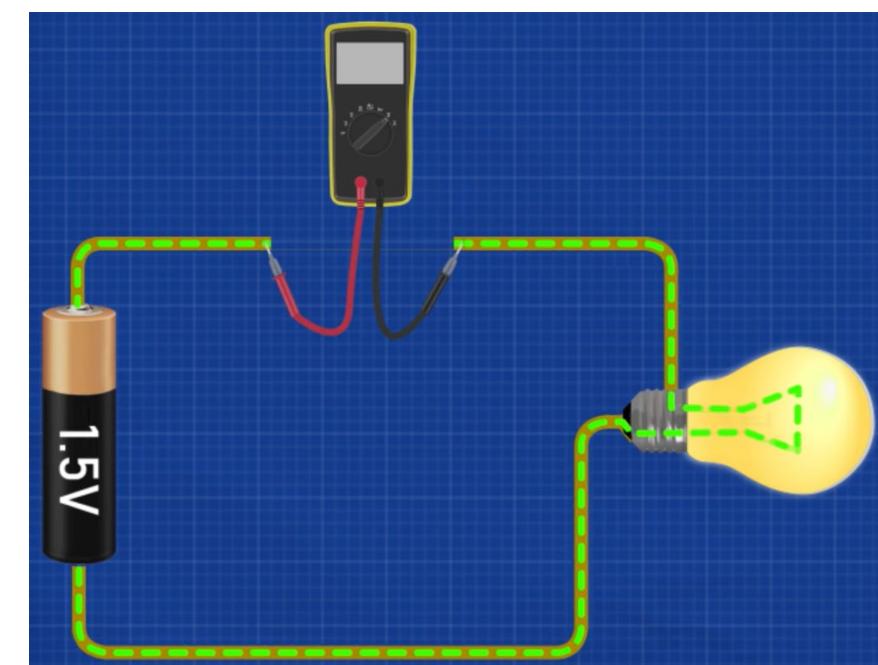
# Current Measurement

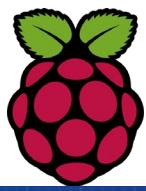


Current must pass through the Ammeter

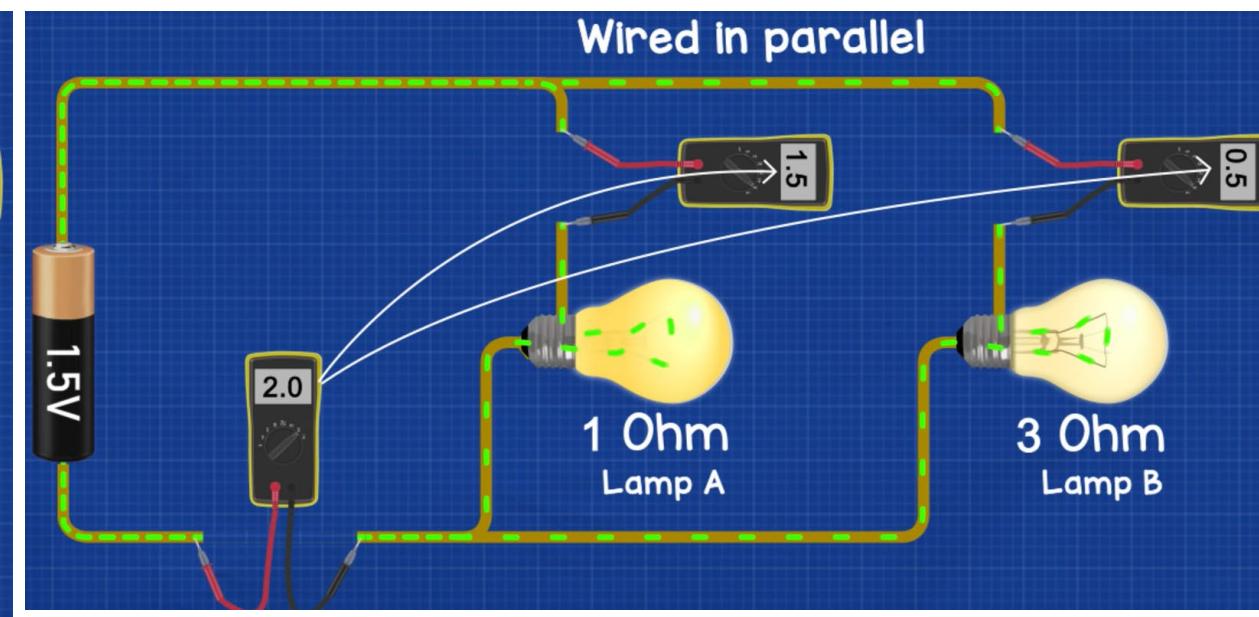
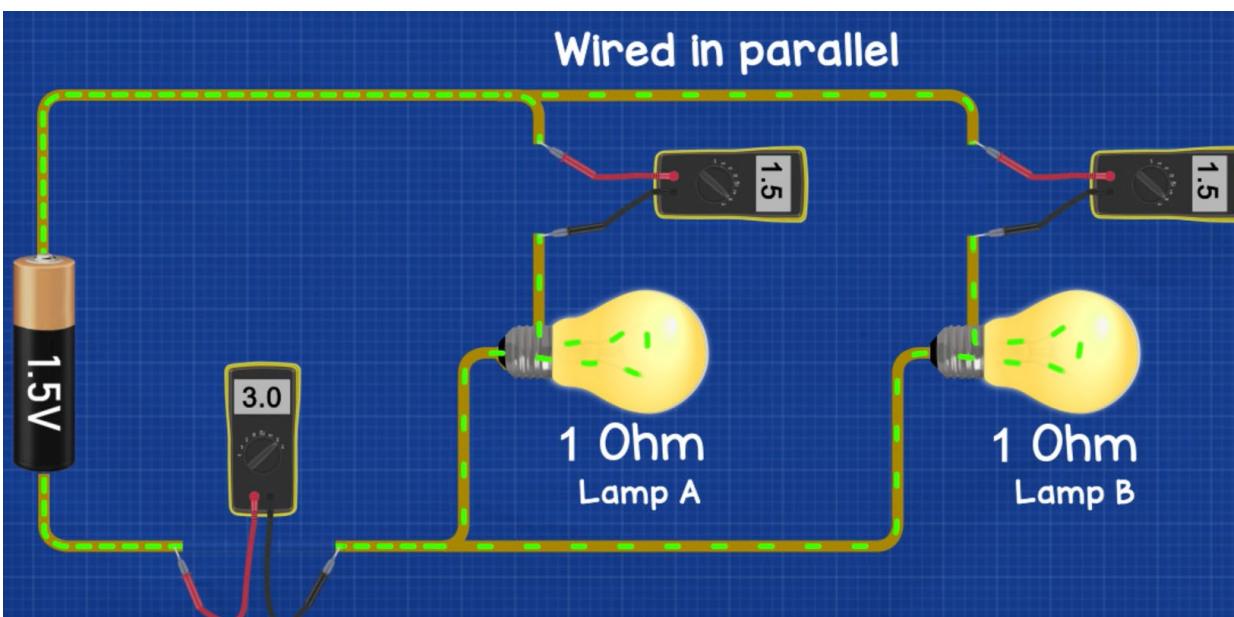
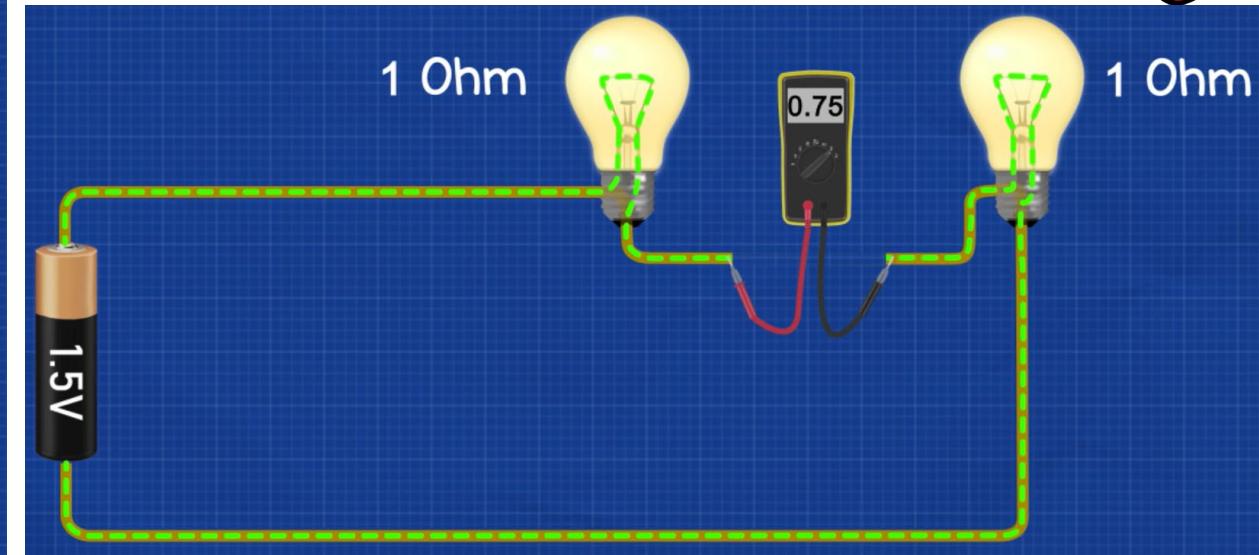
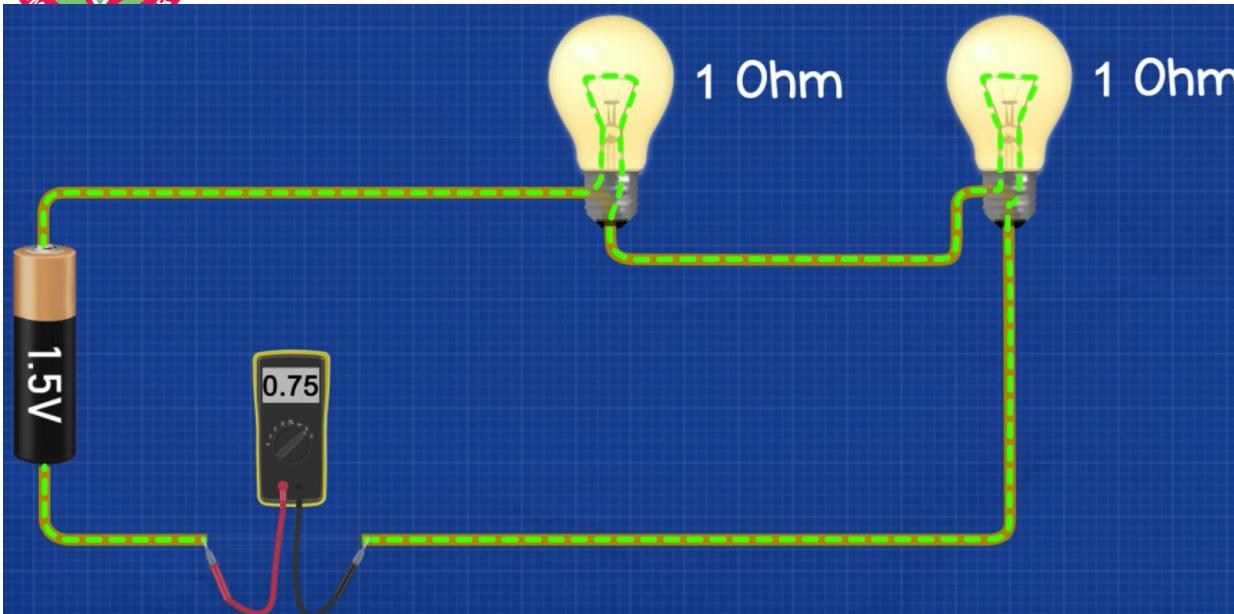


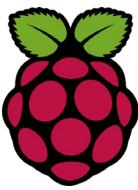
Water must pass through  
a water meter



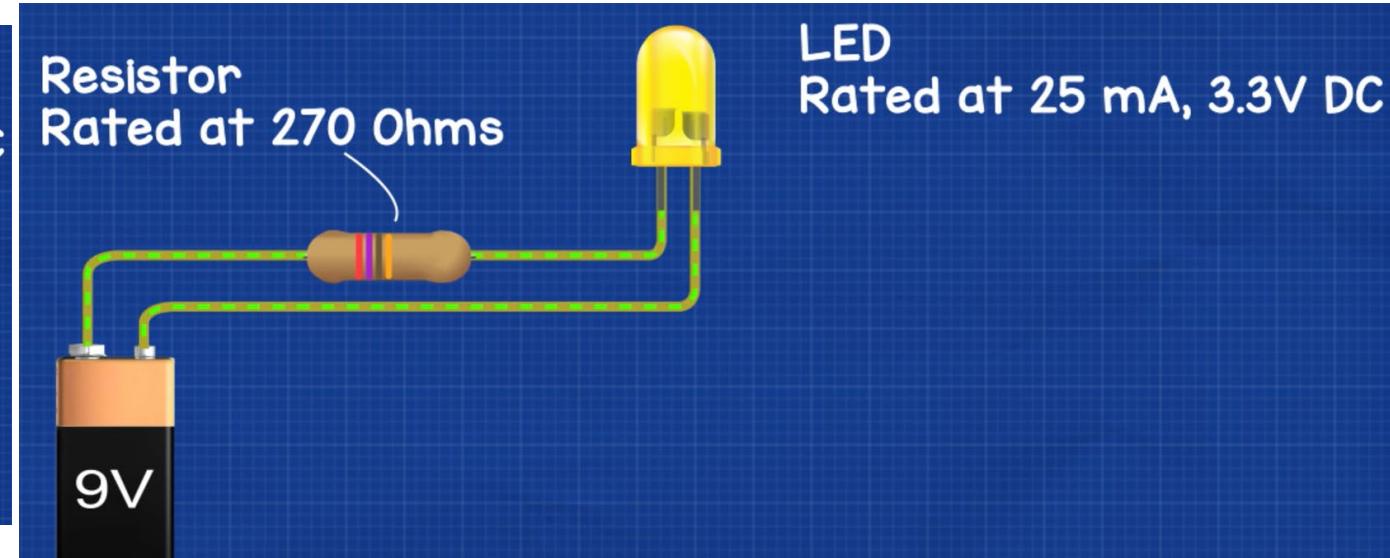
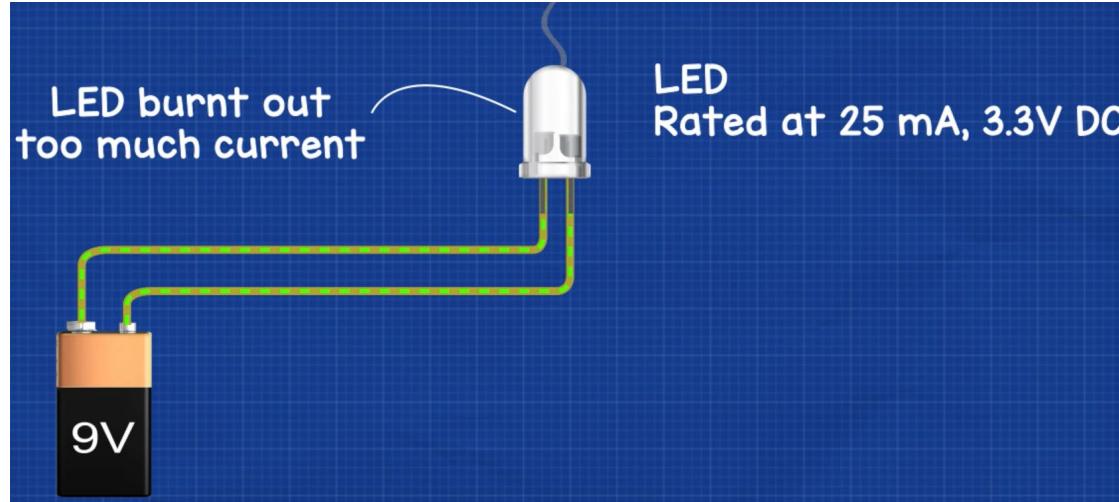


# Current in Series and Parallel Circuit

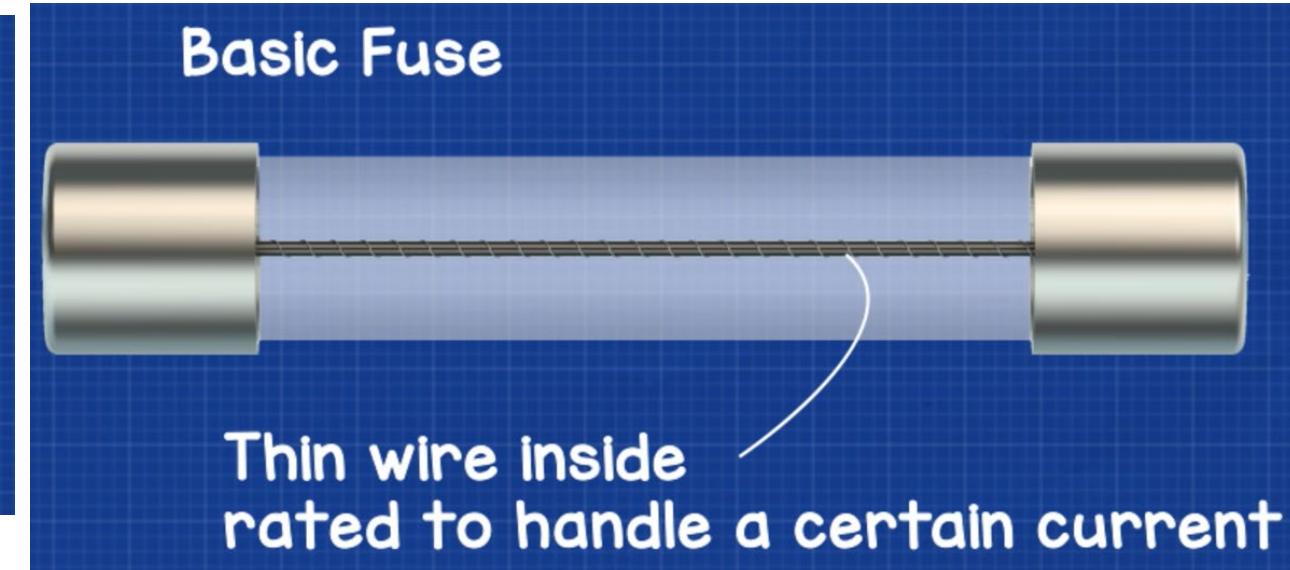




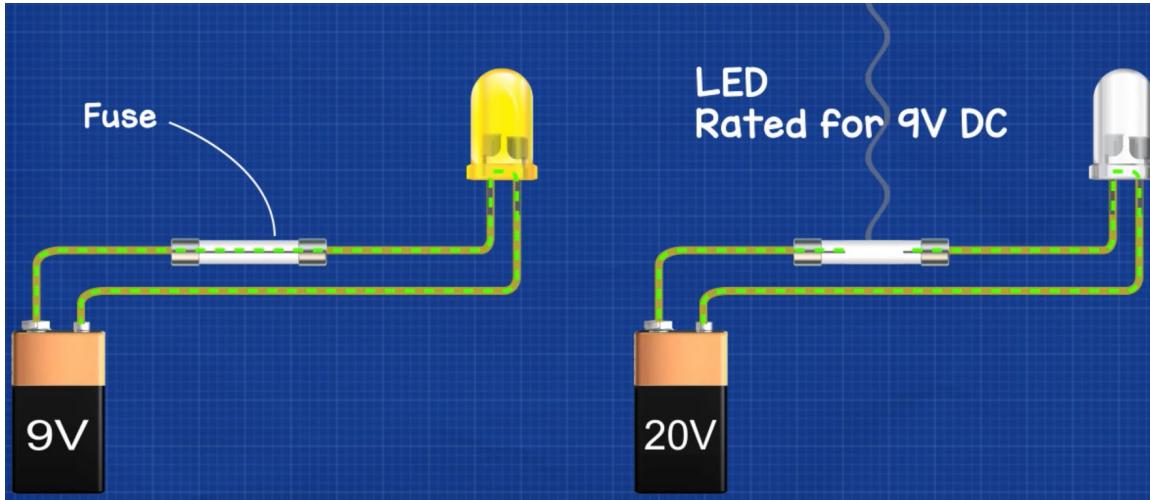
# Current and limiting Resistor



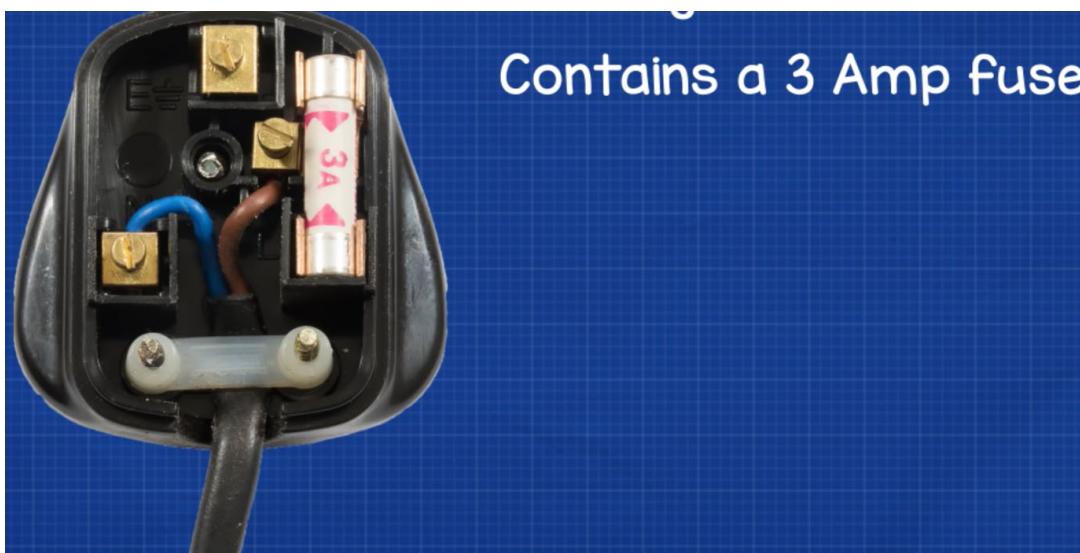
**Fuse - safety device that melts and breaks an electric circuit if the current exceeds a safe level**



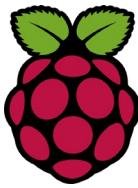
# Fuse



Circuit Board Fuses

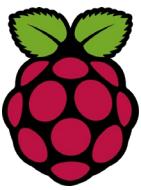


Consumer Unit

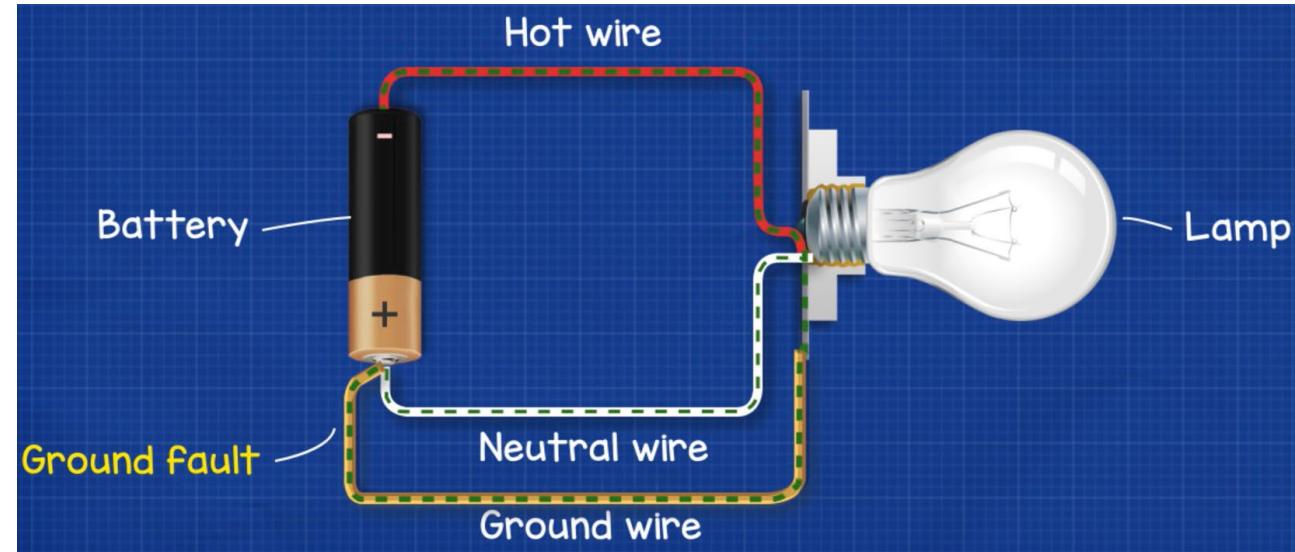
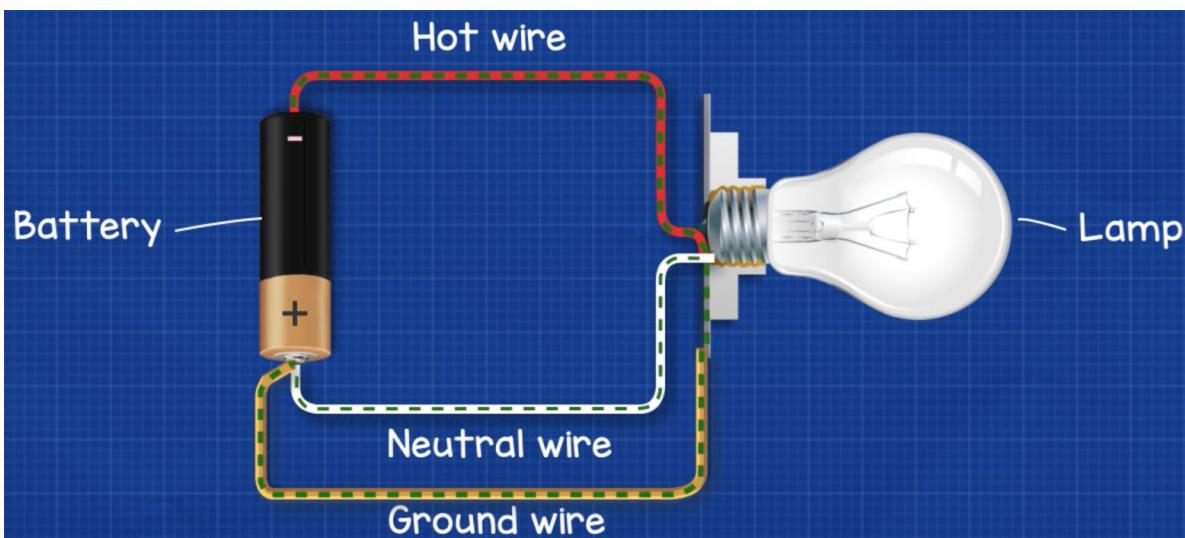
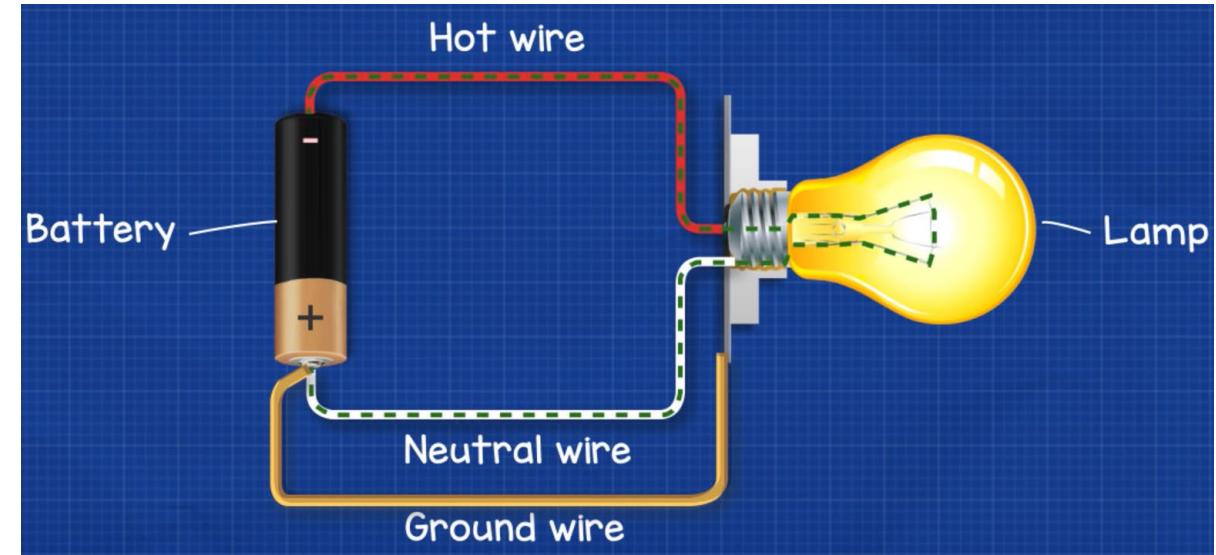
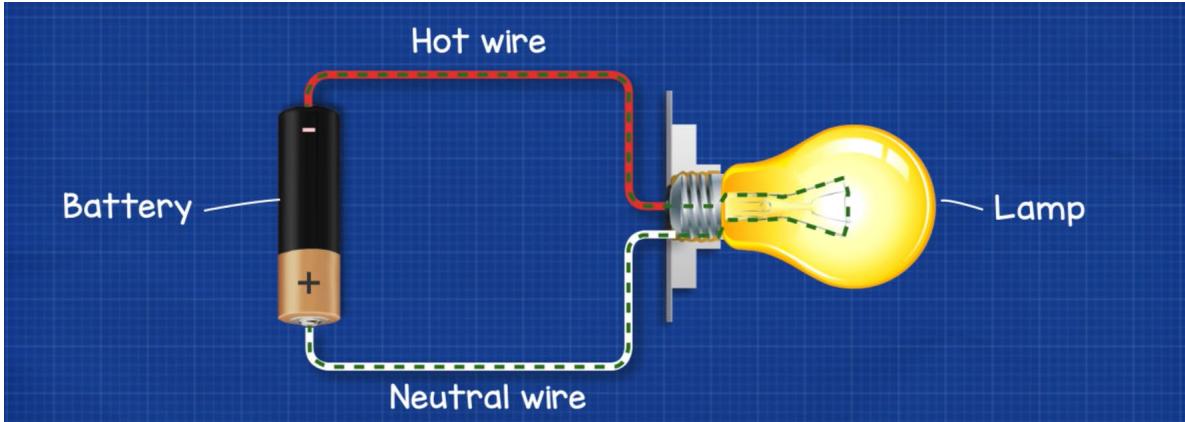


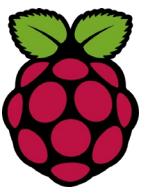
## Remember these Points

- 1) Electricity will only flow in a complete circuit. If you come into contact with an electrical conductor, your body might complete the circuit.
- 2) Electricity always tries to return to its source.
- 3) Electricity takes all available paths to complete a circuit. It takes preference to a path with less resistance and more current will flow in that path.

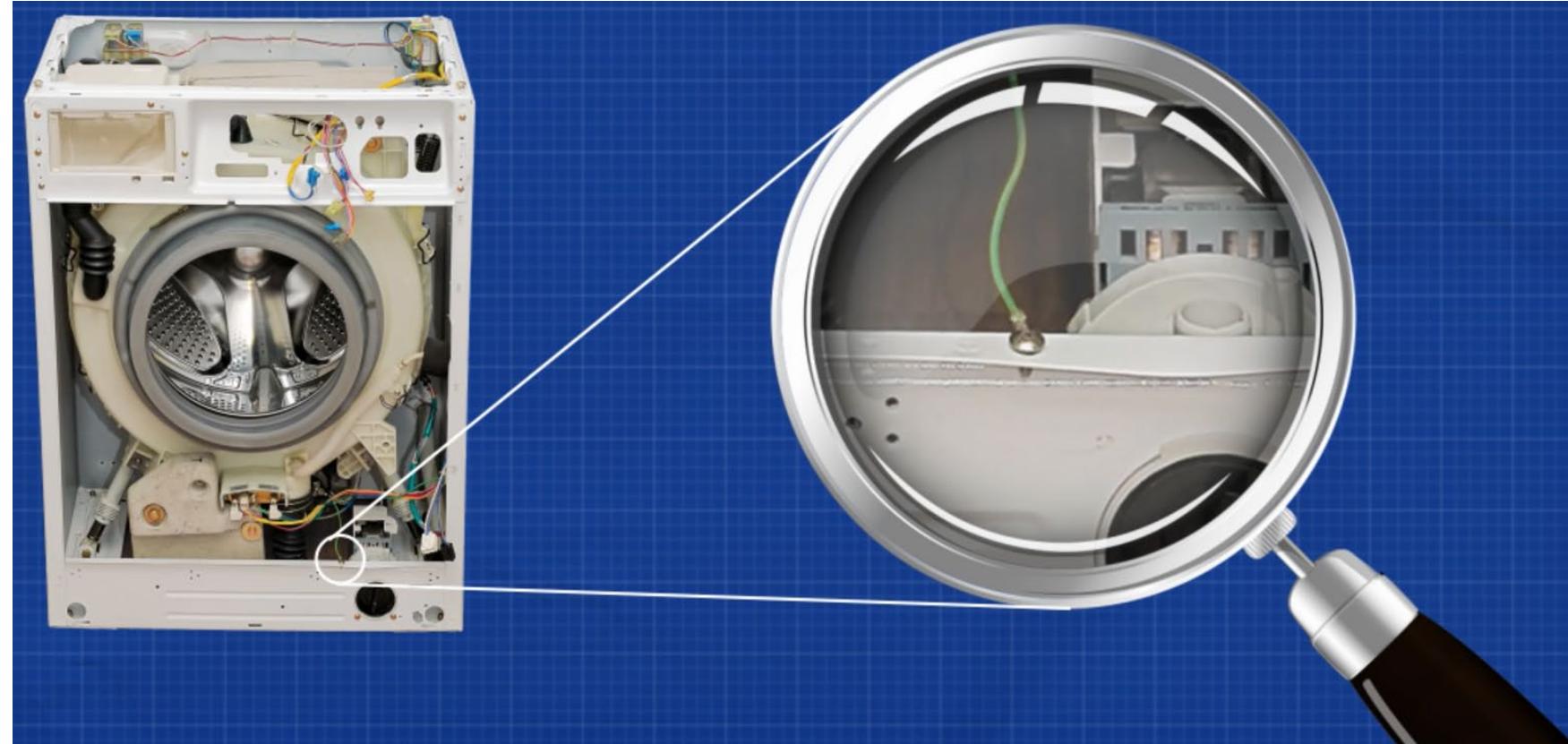
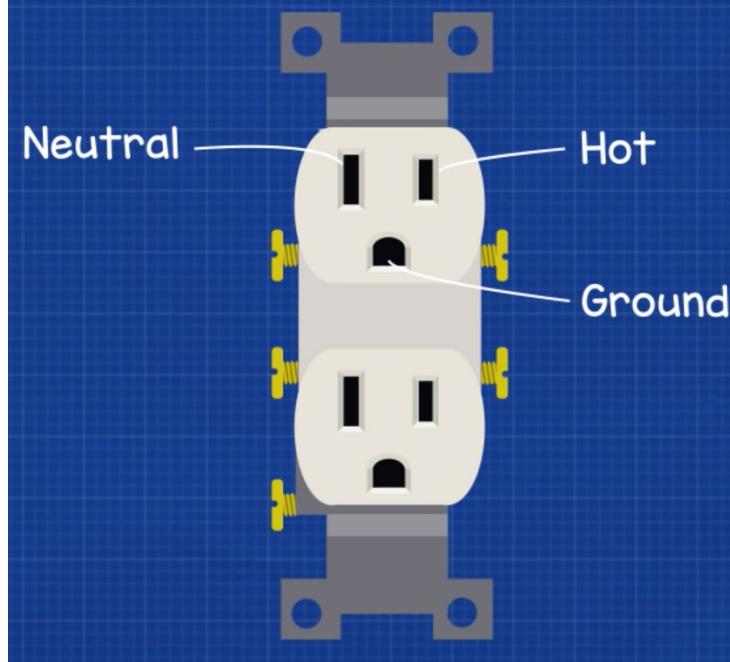


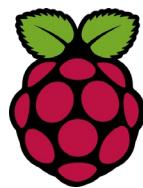
# Ground, Neutral and Hot Wire/Phase





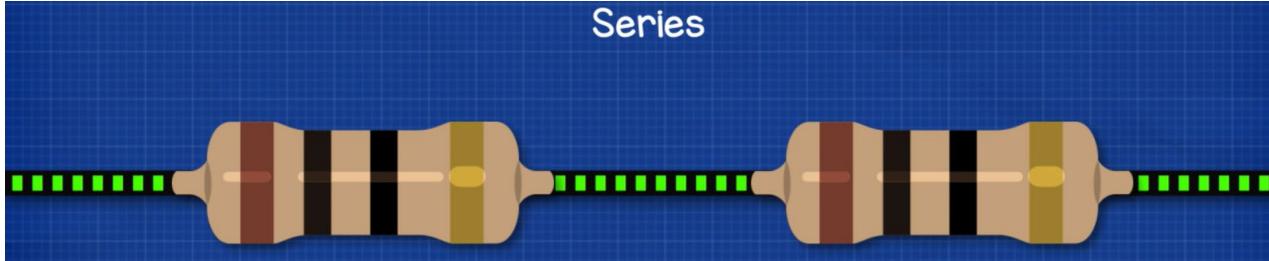
# Ground, Neutral and Hot Wire/Phase





# Resistance in Series

Series

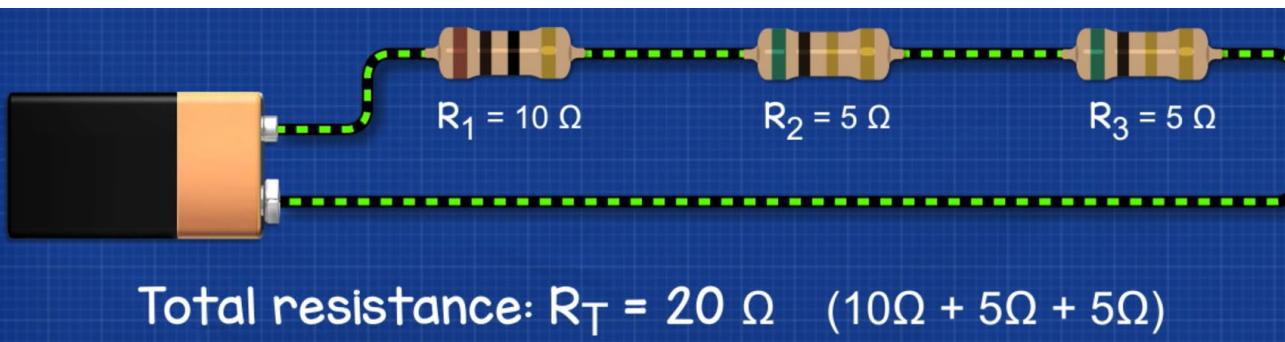
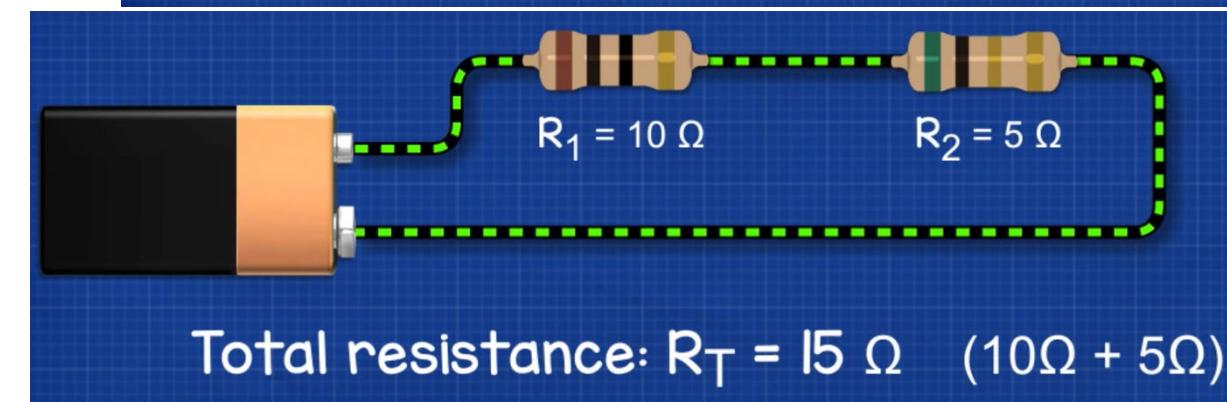
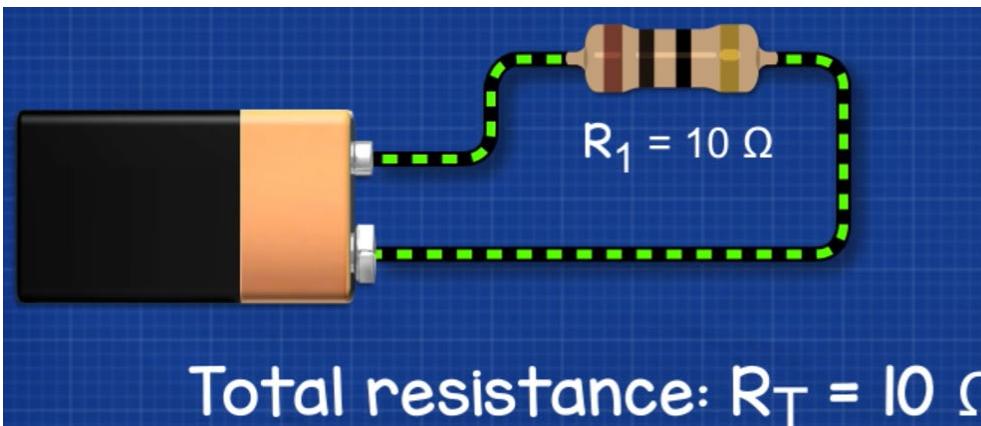


$R_1$

$R_2$

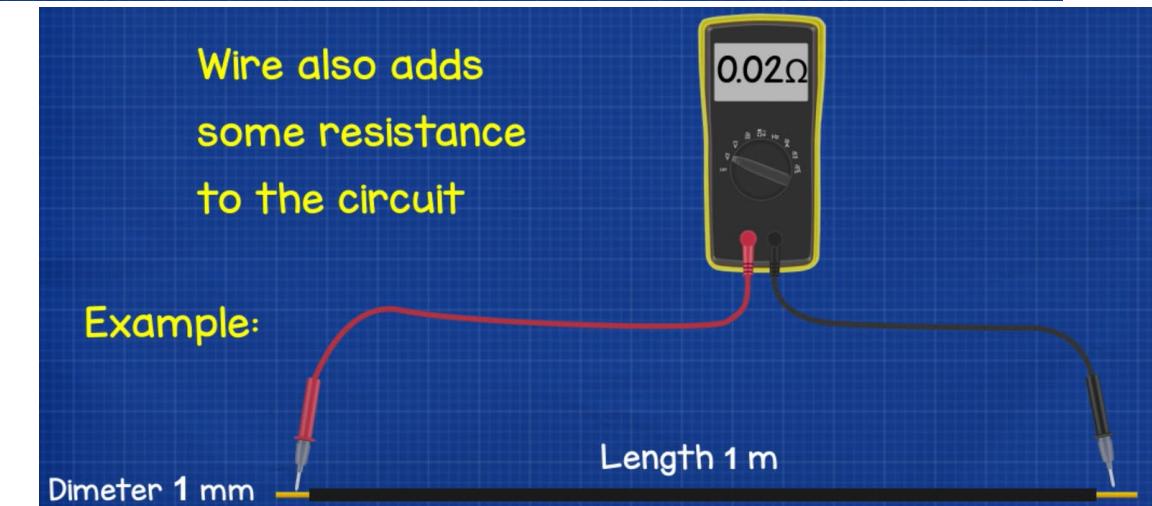
$R_3$

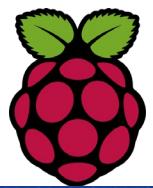
$$\text{Total resistance: } R_T = R_1 + R_2 + R_3 + \dots$$



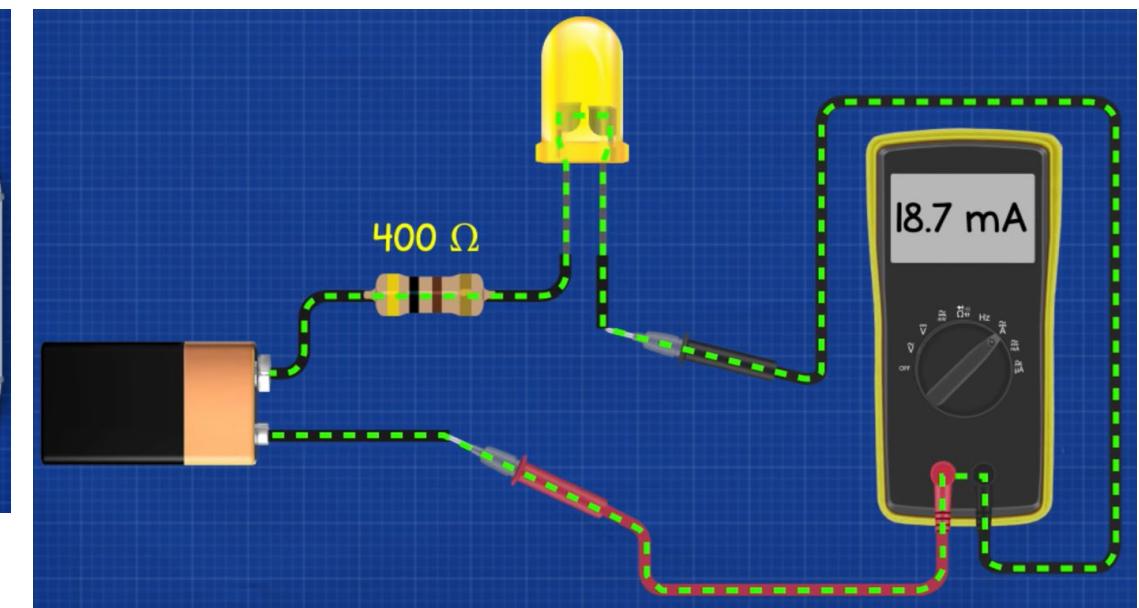
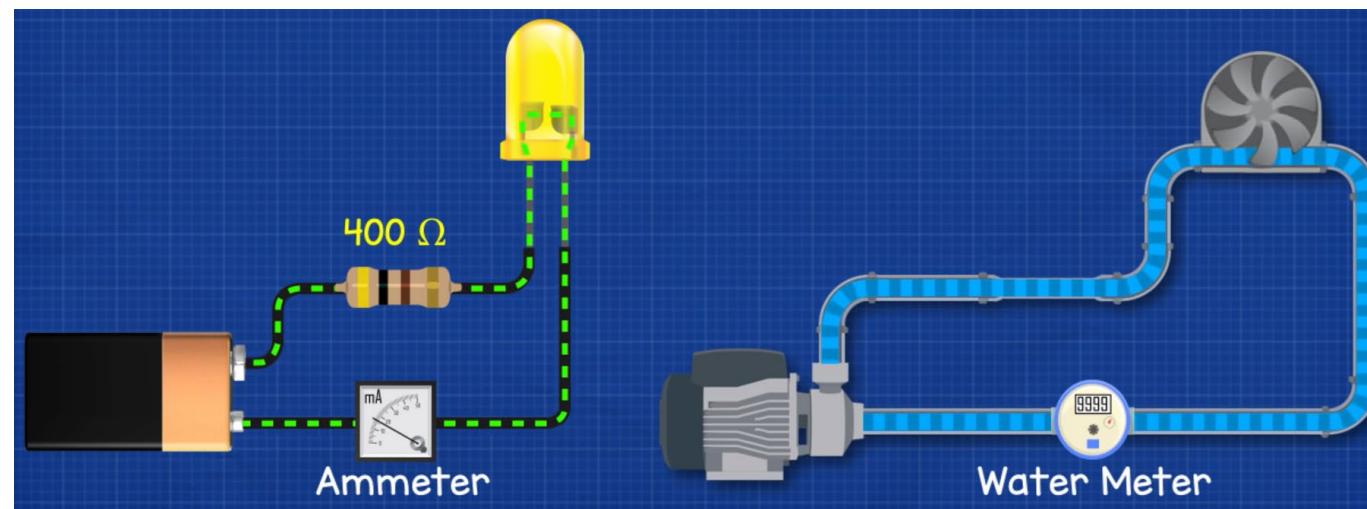
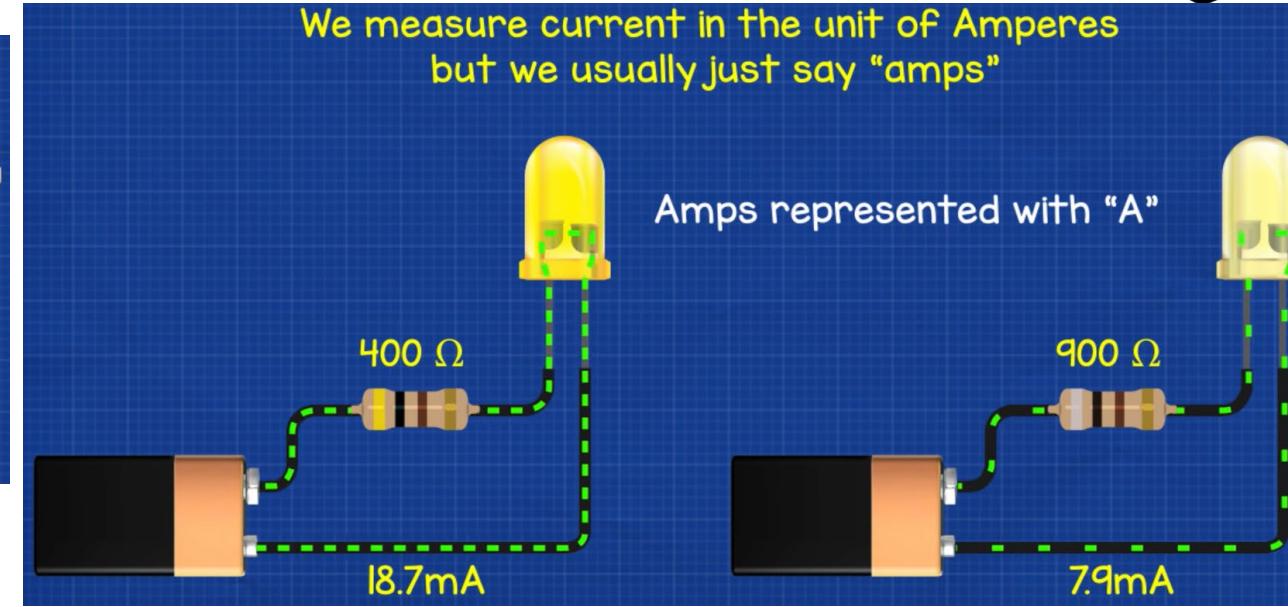
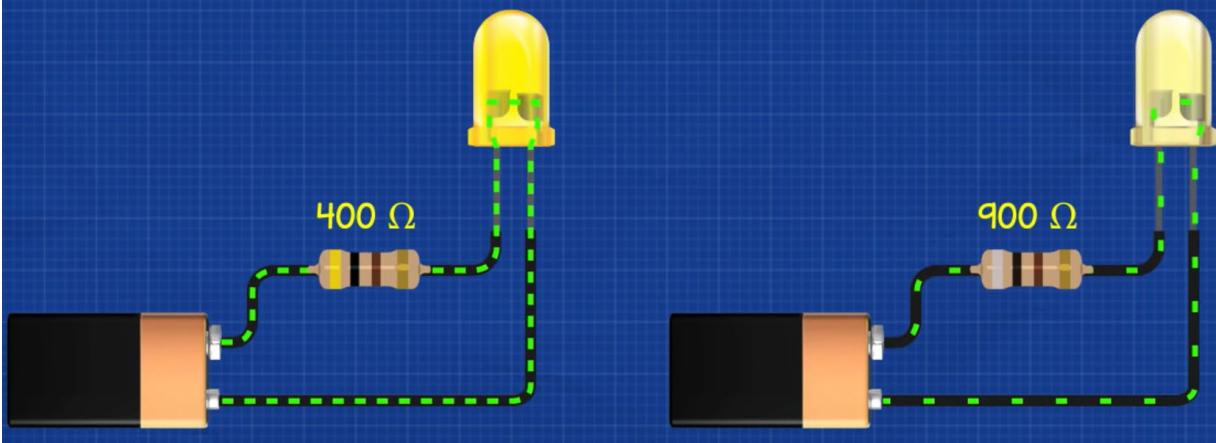
Wire also adds  
some resistance  
to the circuit

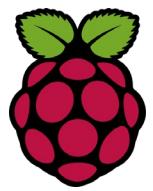
Example:



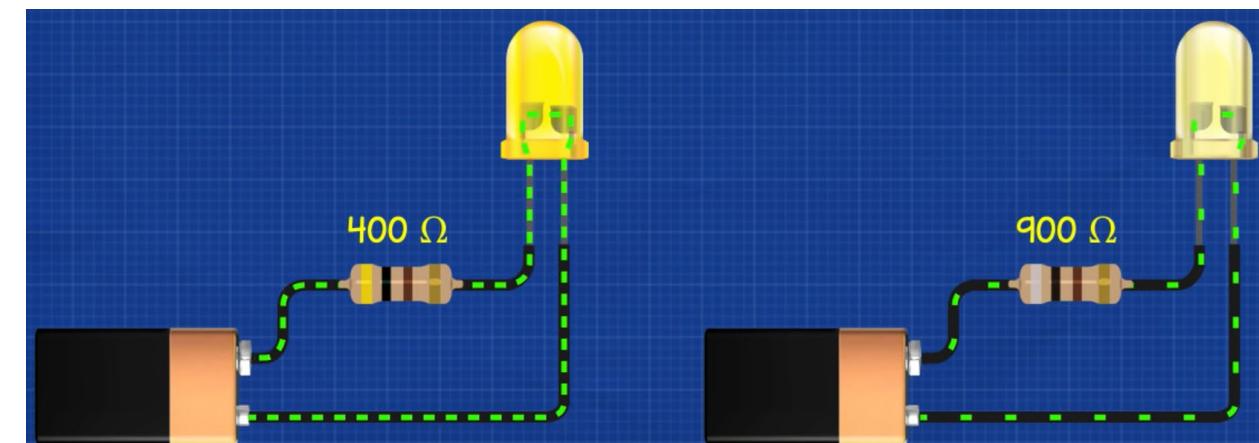
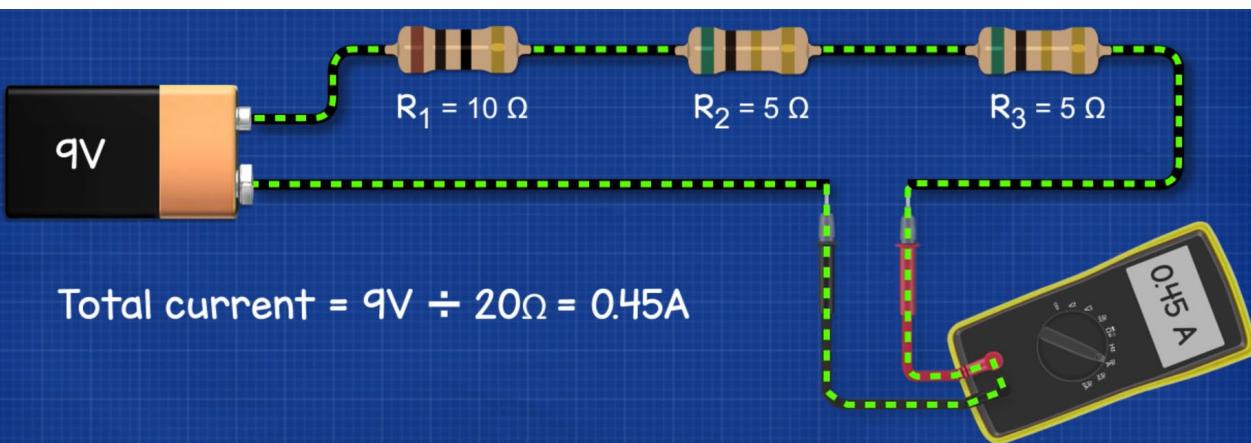
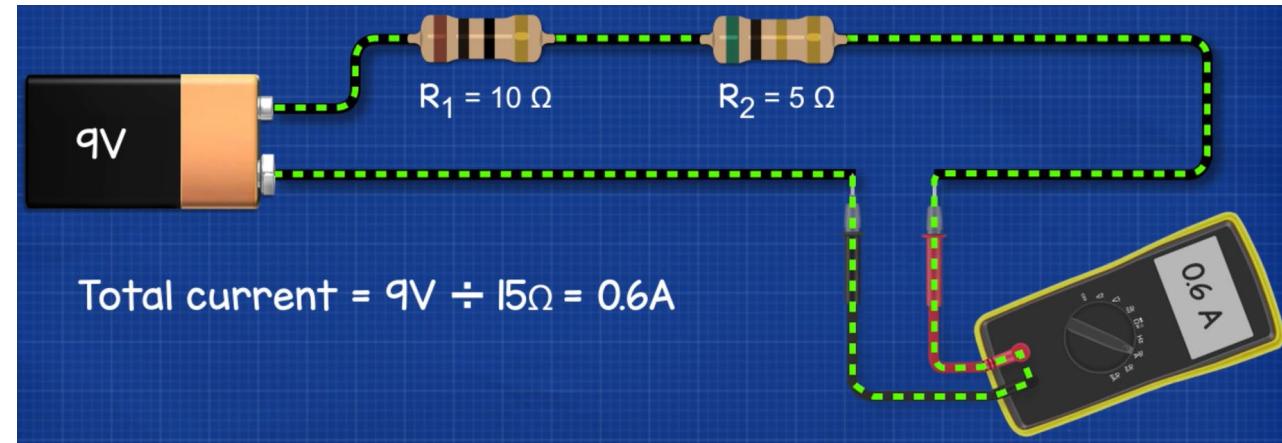
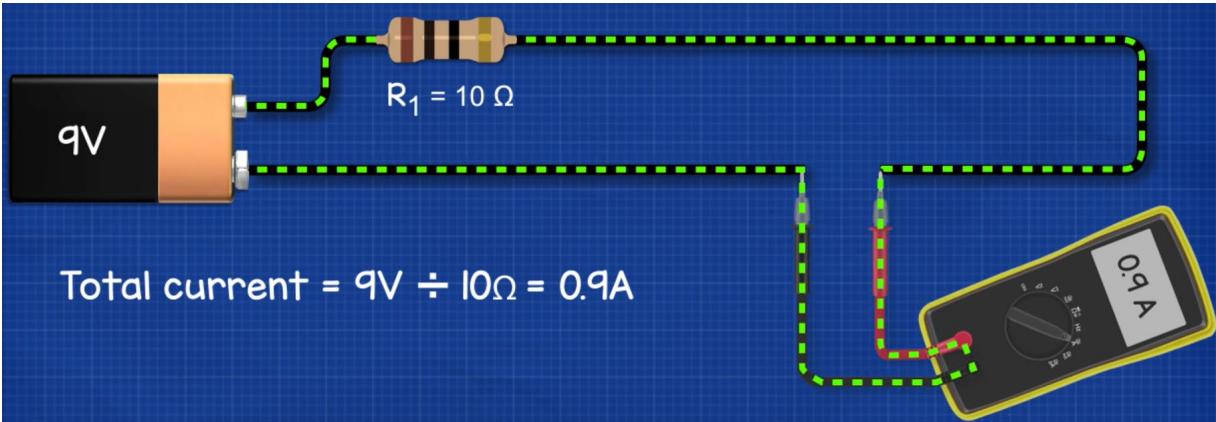


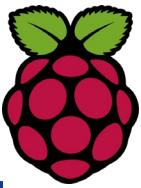
# Resistor Application



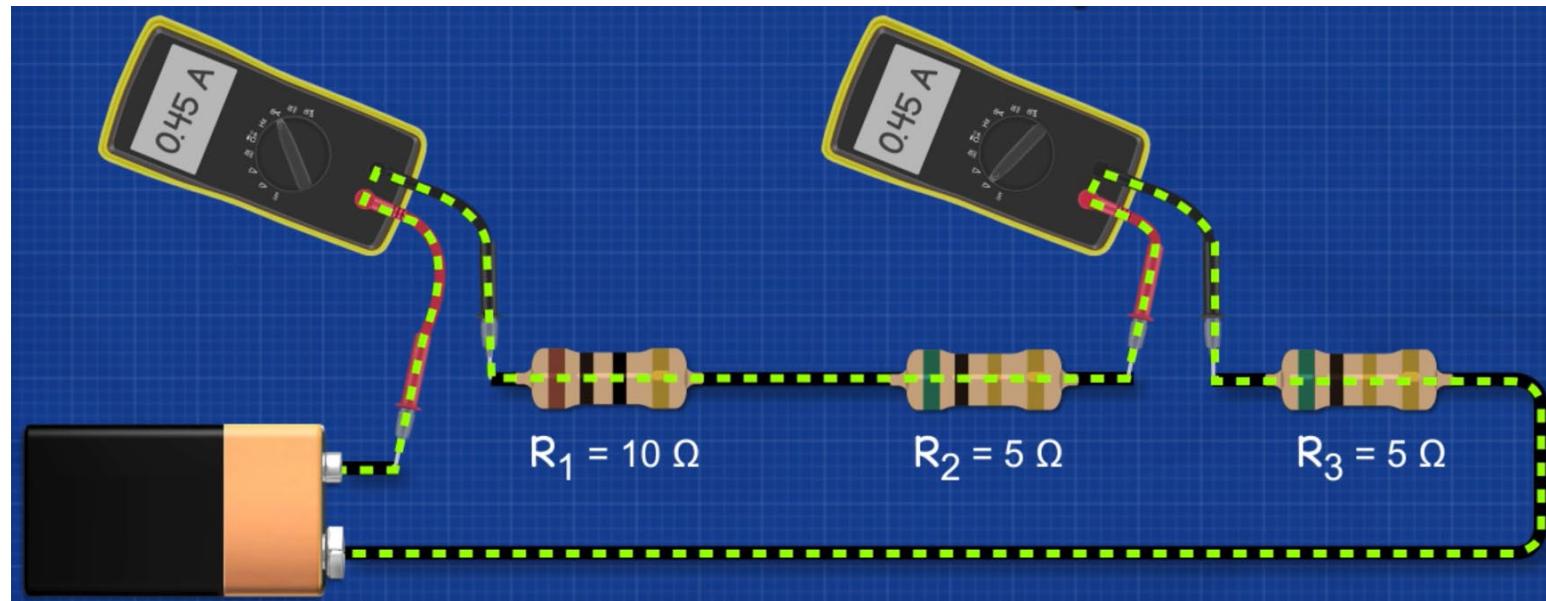
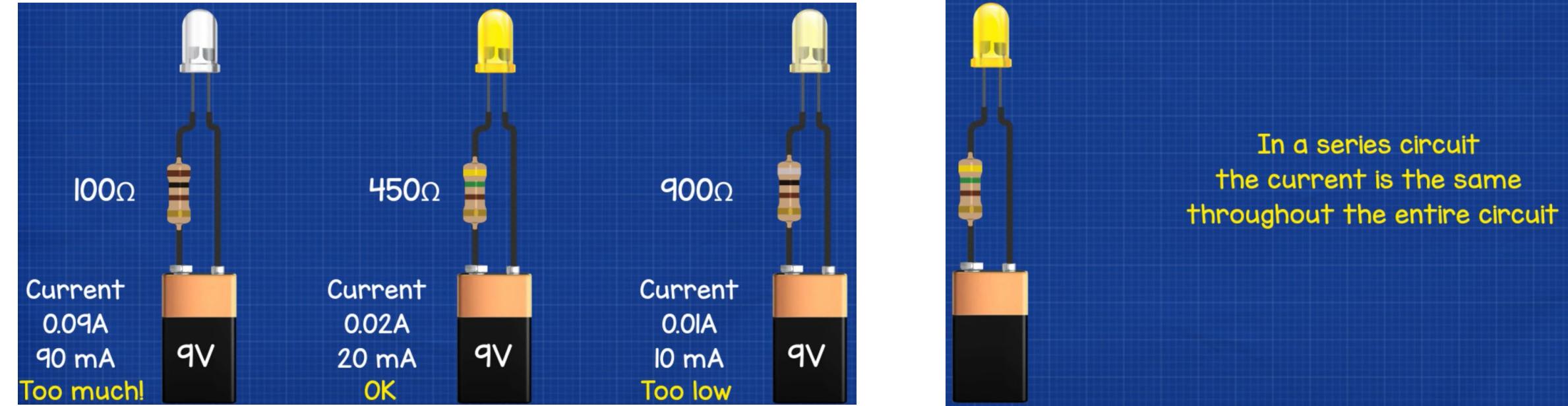


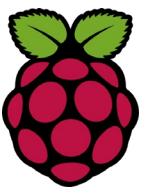
# Resistor Application



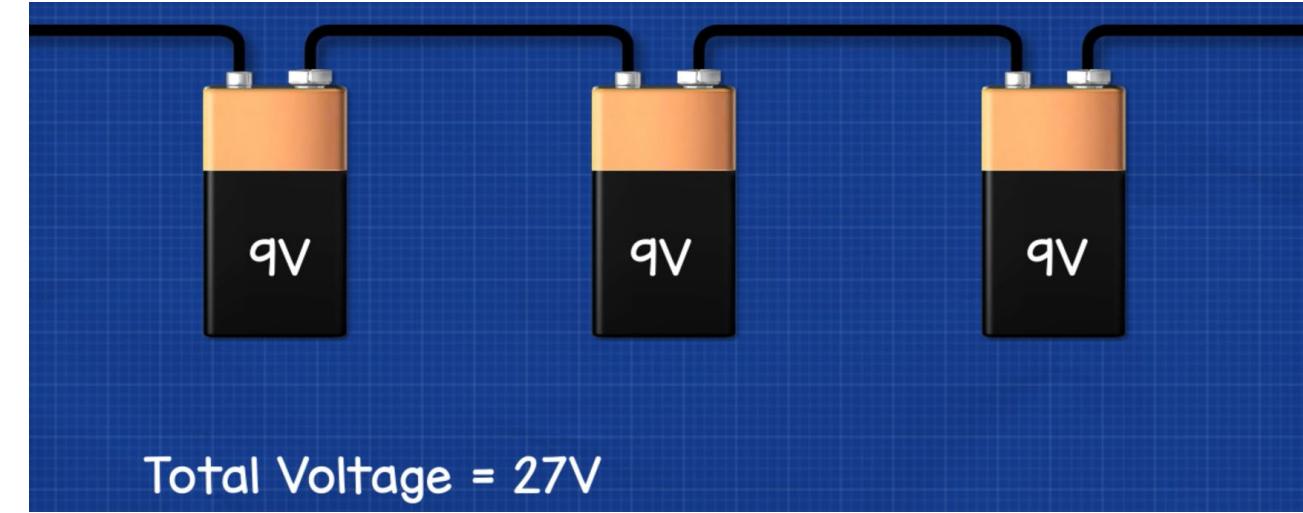
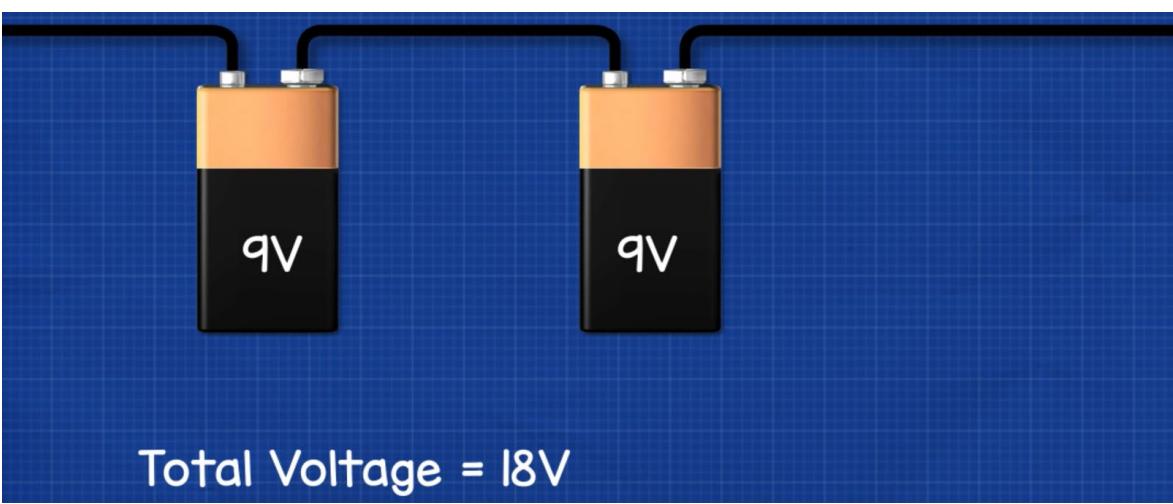
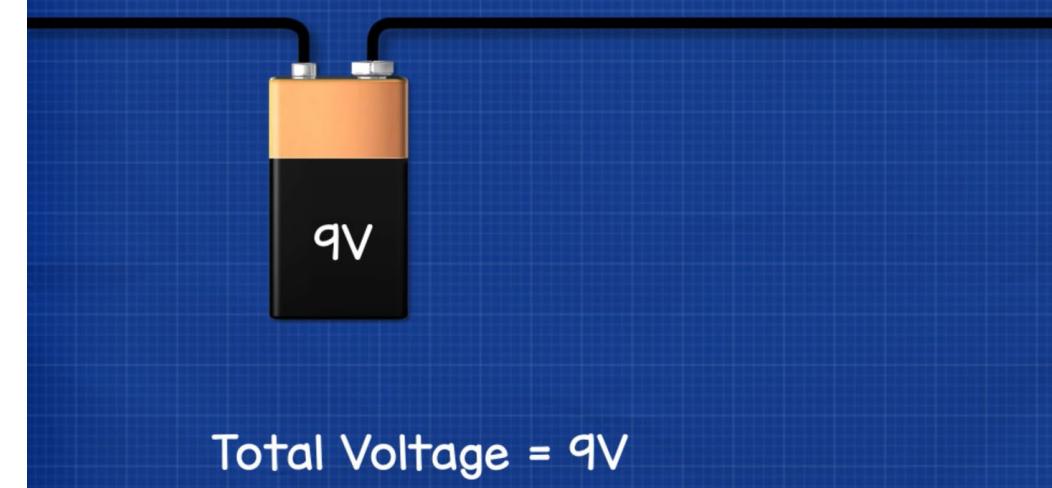
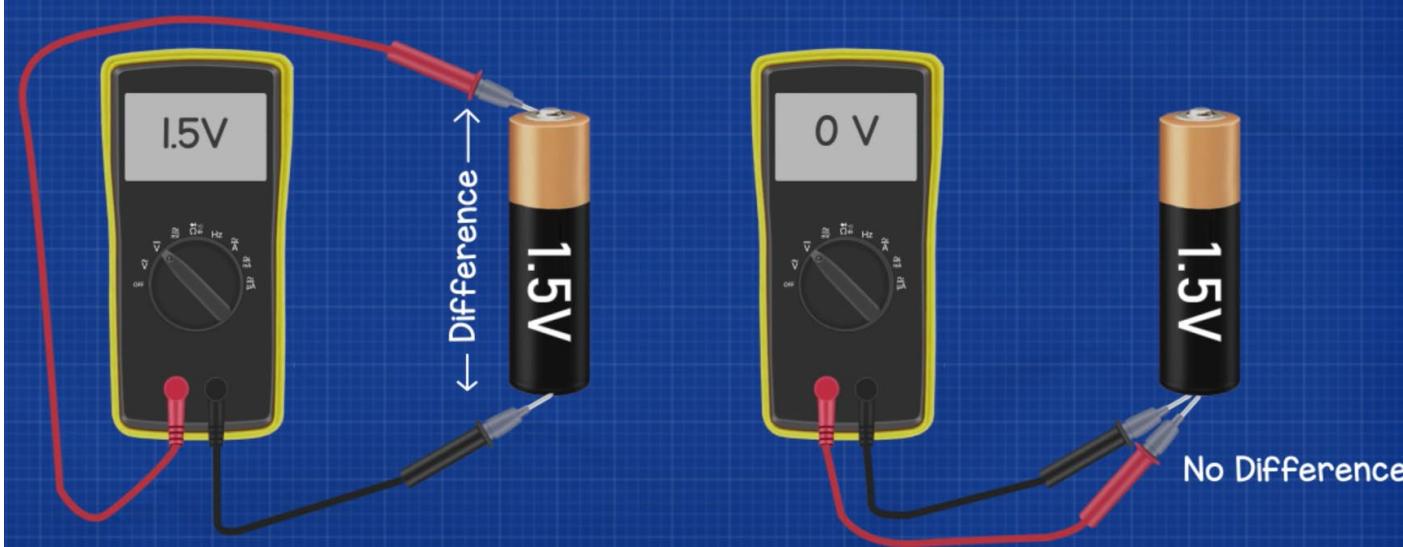


# Resistor Application



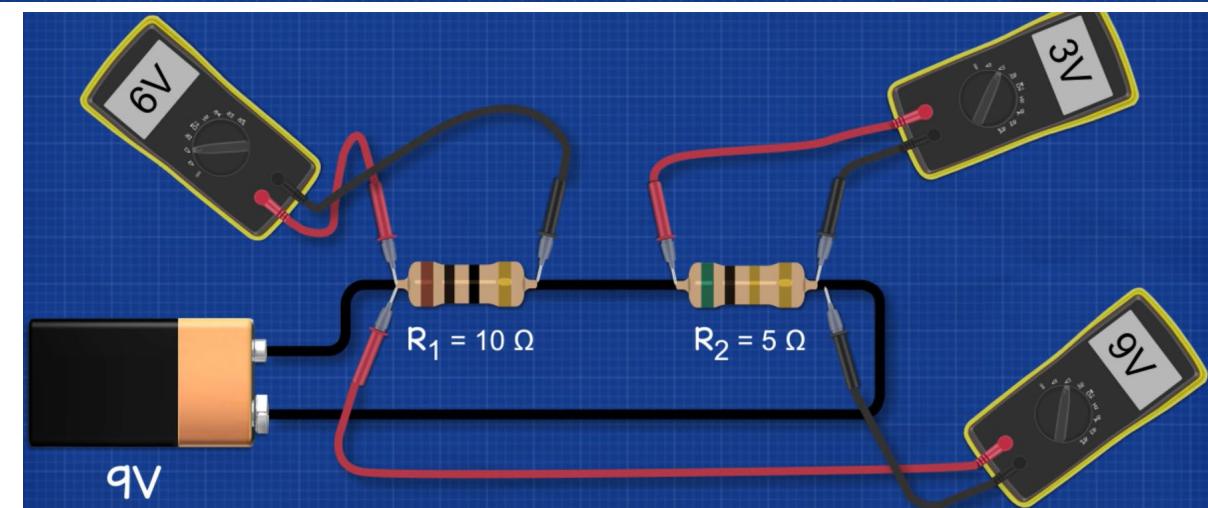
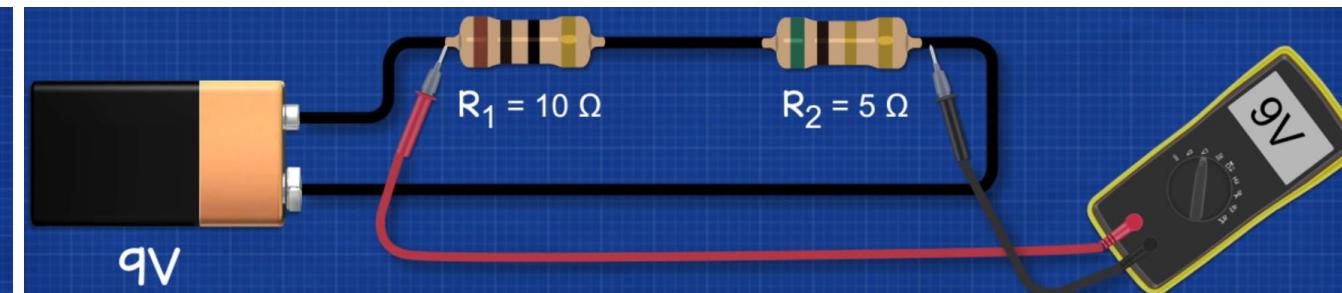
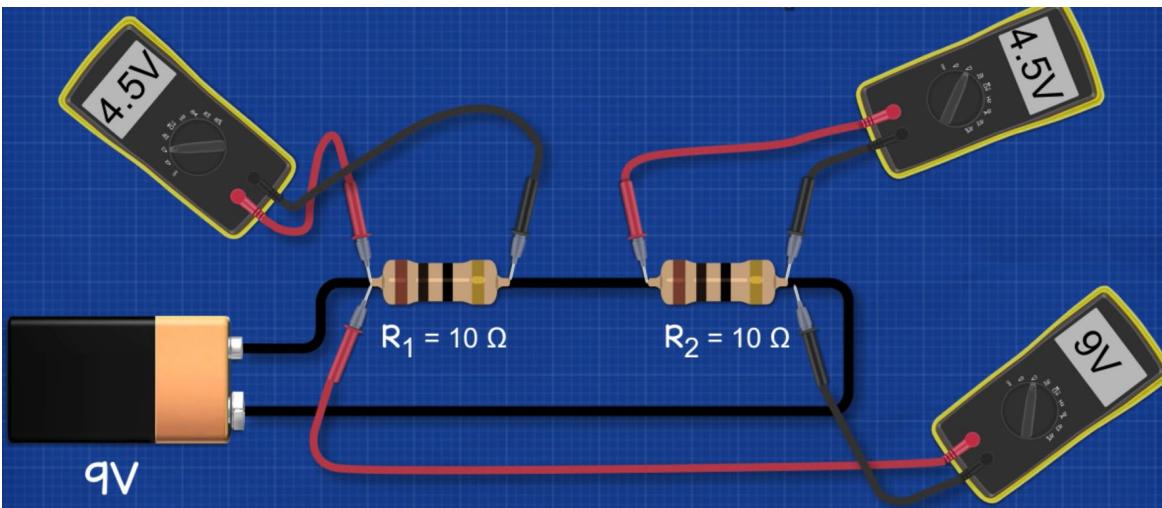
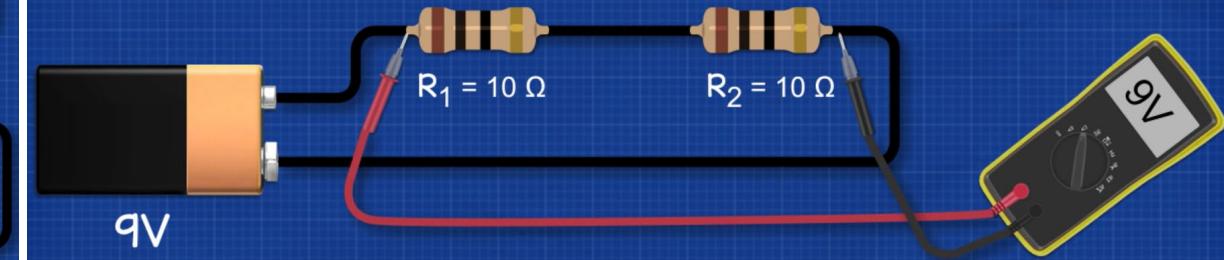
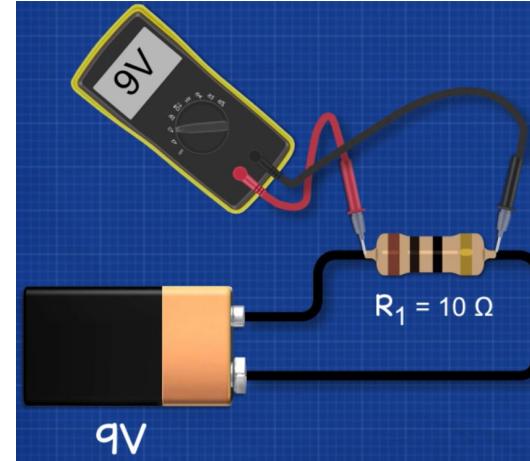
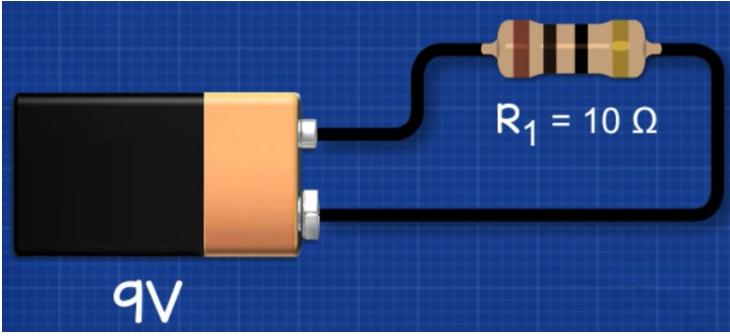
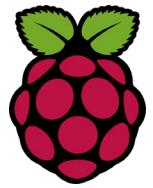


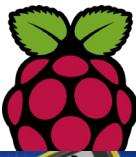
# Voltage Calculation



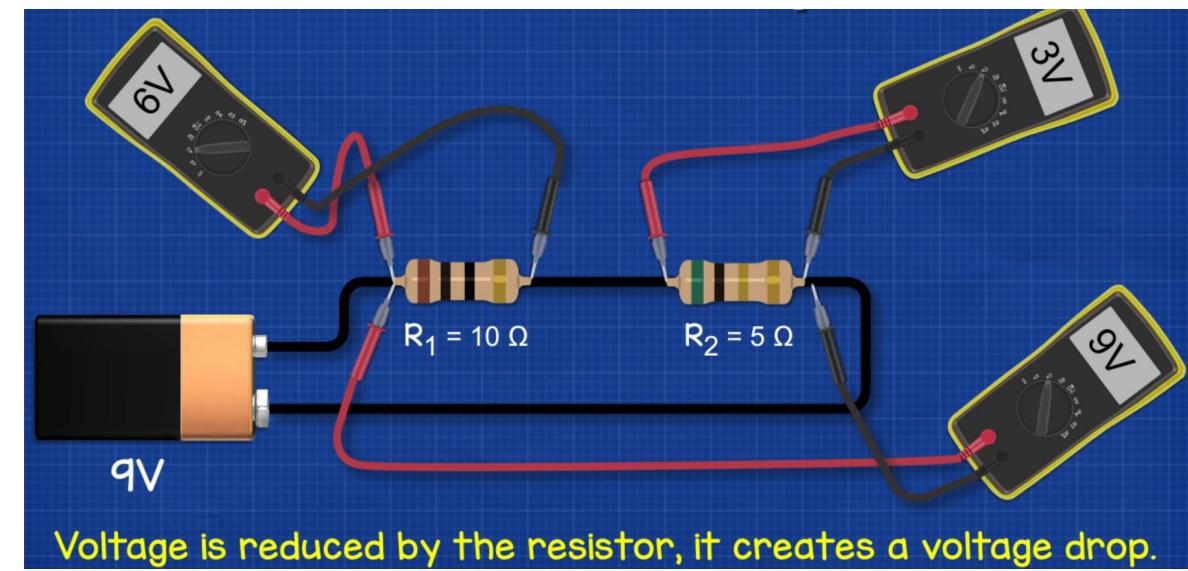
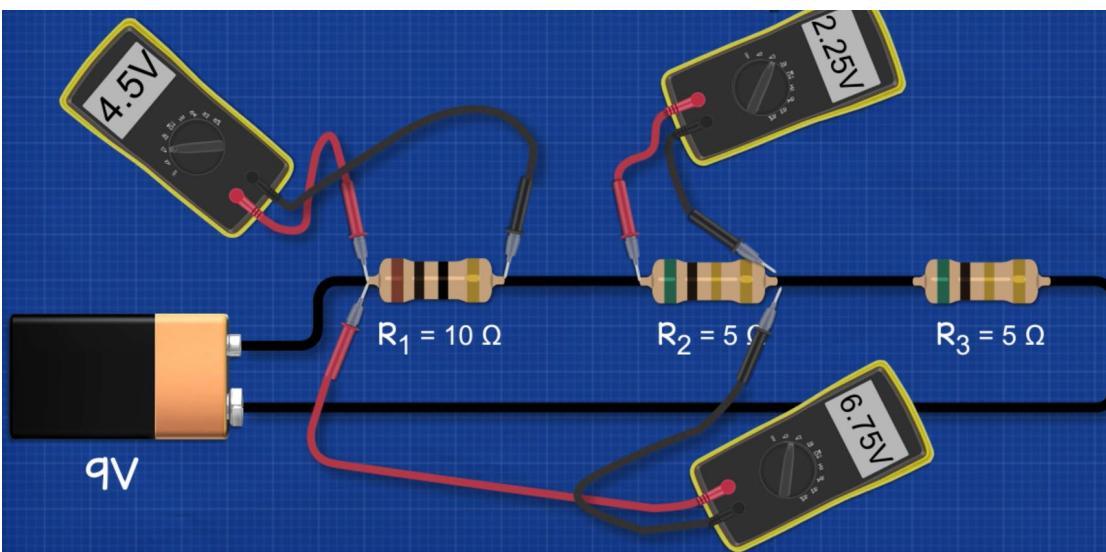
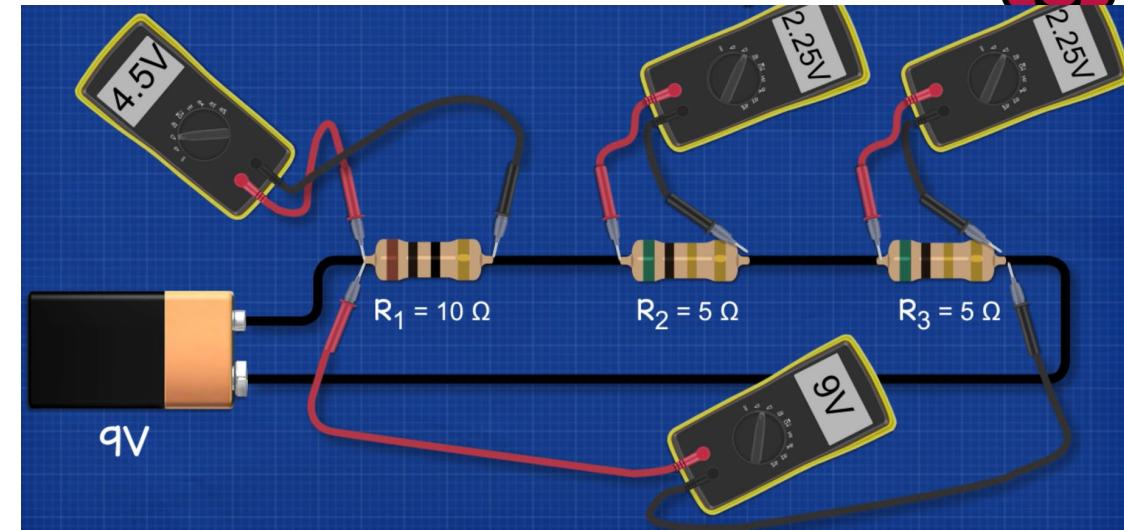
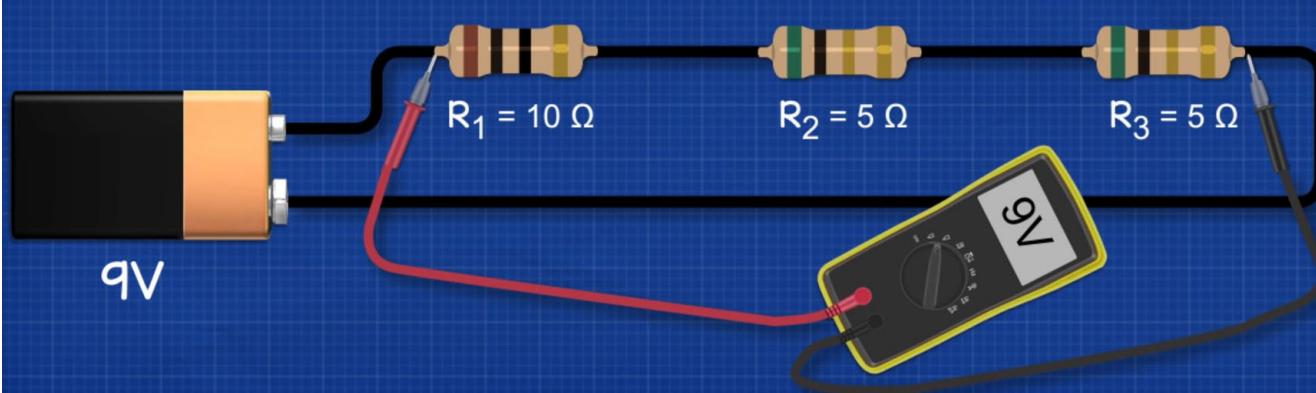


# Resistor Application



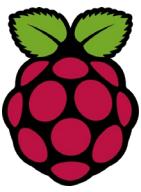


# Resistor Application

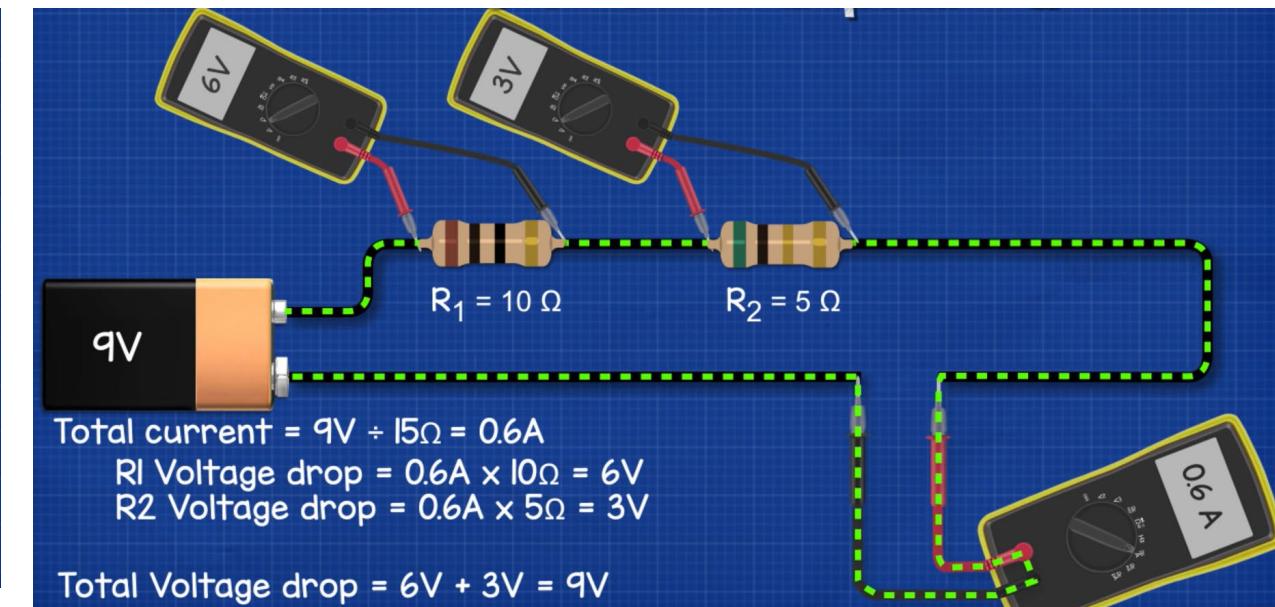
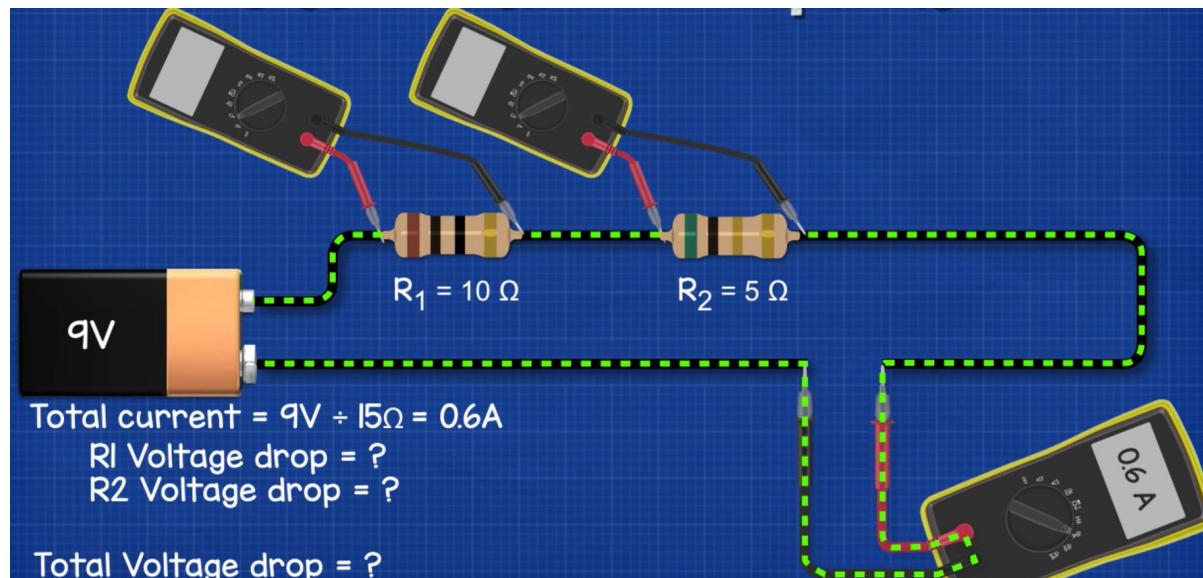
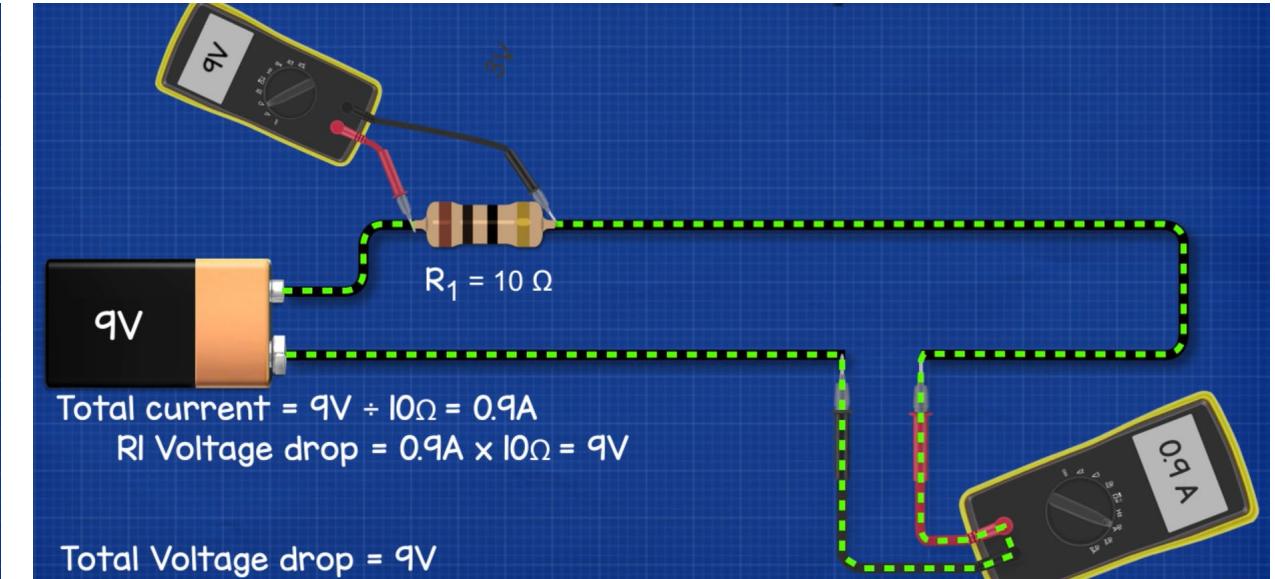
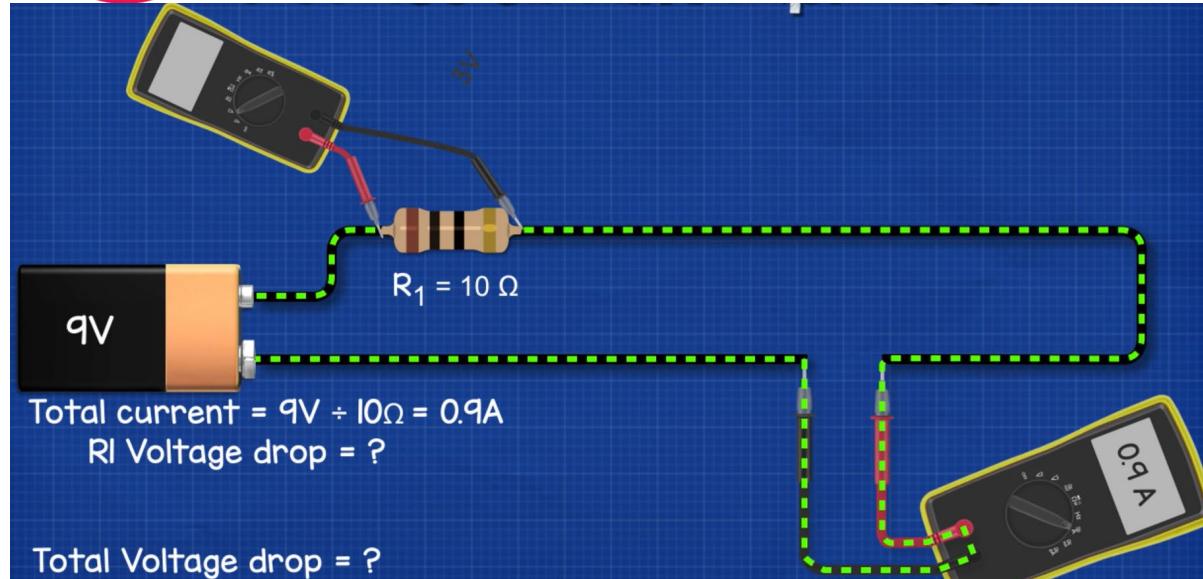


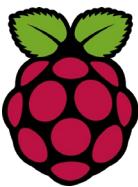
Voltage is reduced by the resistor, it creates a voltage drop.

Unlike current, where it's the same throughout the circuit  
Voltage will be different throughout in a series circuit

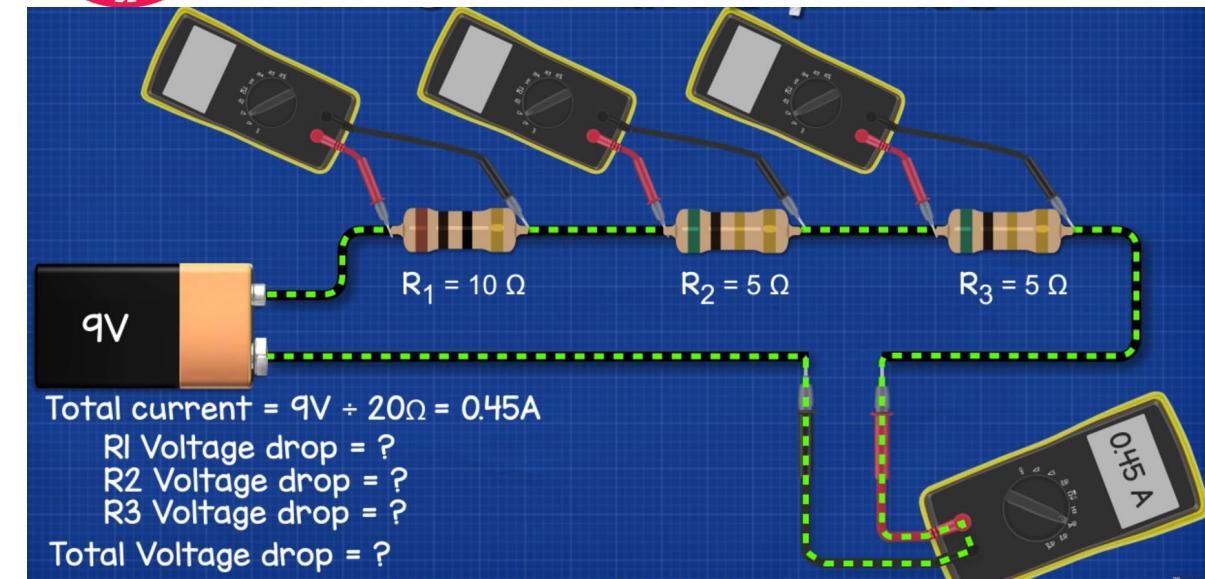


# Voltage Calculation





# Voltage, Current and Power Calculation



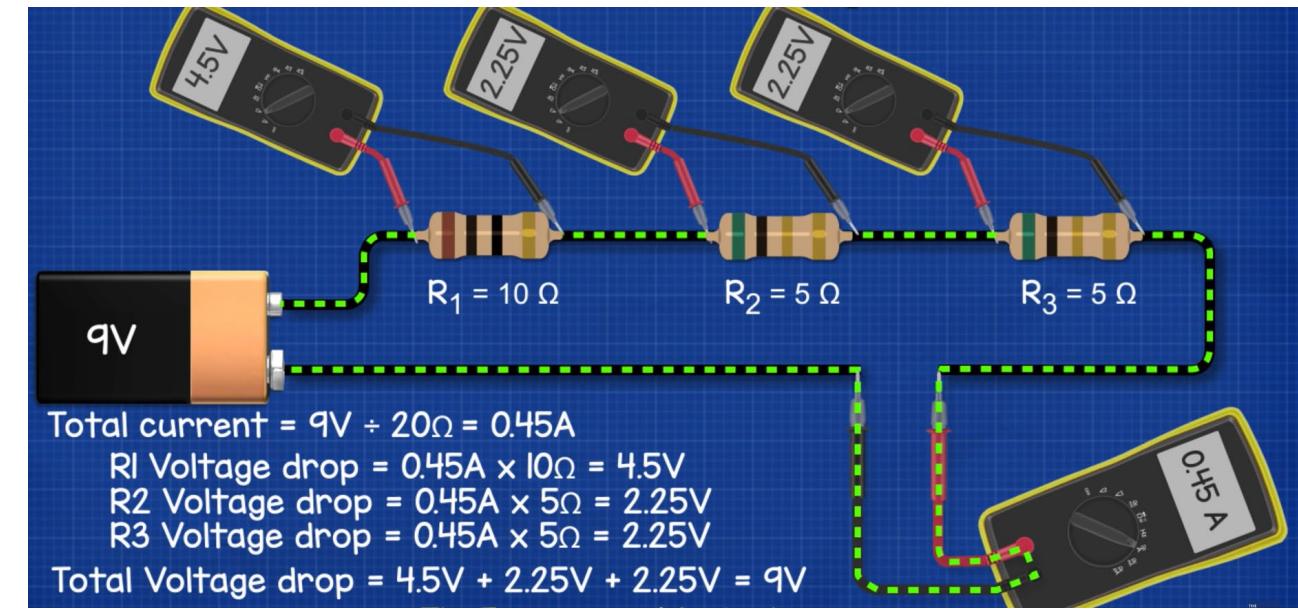
$$\text{Total current} = 9V \div 20\Omega = 0.45A$$

$$R1 \text{ Voltage drop} = ?$$

$$R2 \text{ Voltage drop} = ?$$

$$R3 \text{ Voltage drop} = ?$$

$$\text{Total Voltage drop} = ?$$



$$\text{Total current} = 9V \div 20\Omega = 0.45A$$

$$R1 \text{ Voltage drop} = 0.45A \times 10\Omega = 4.5V$$

$$R2 \text{ Voltage drop} = 0.45A \times 5\Omega = 2.25V$$

$$R3 \text{ Voltage drop} = 0.45A \times 5\Omega = 2.25V$$

$$\text{Total Voltage drop} = 4.5V + 2.25V + 2.25V = 9V$$

## How do we calculate power consumption?

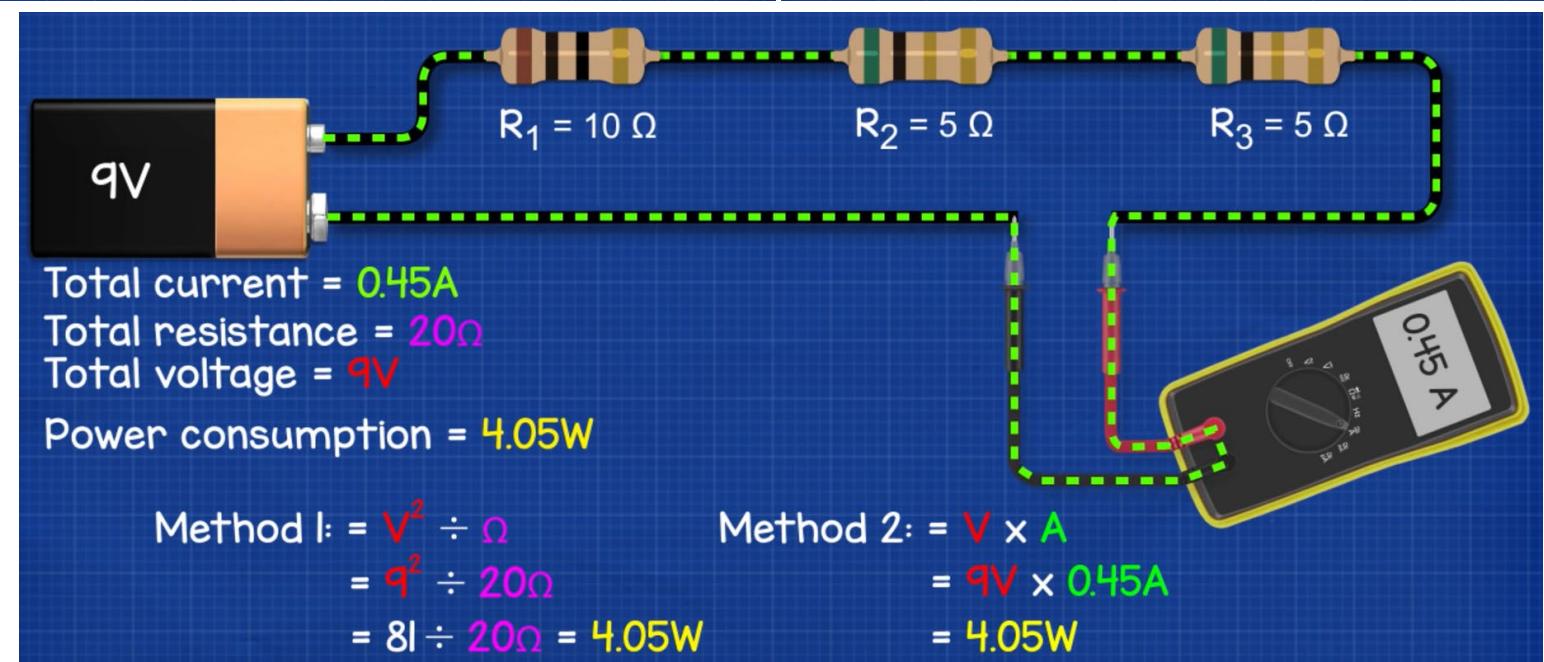
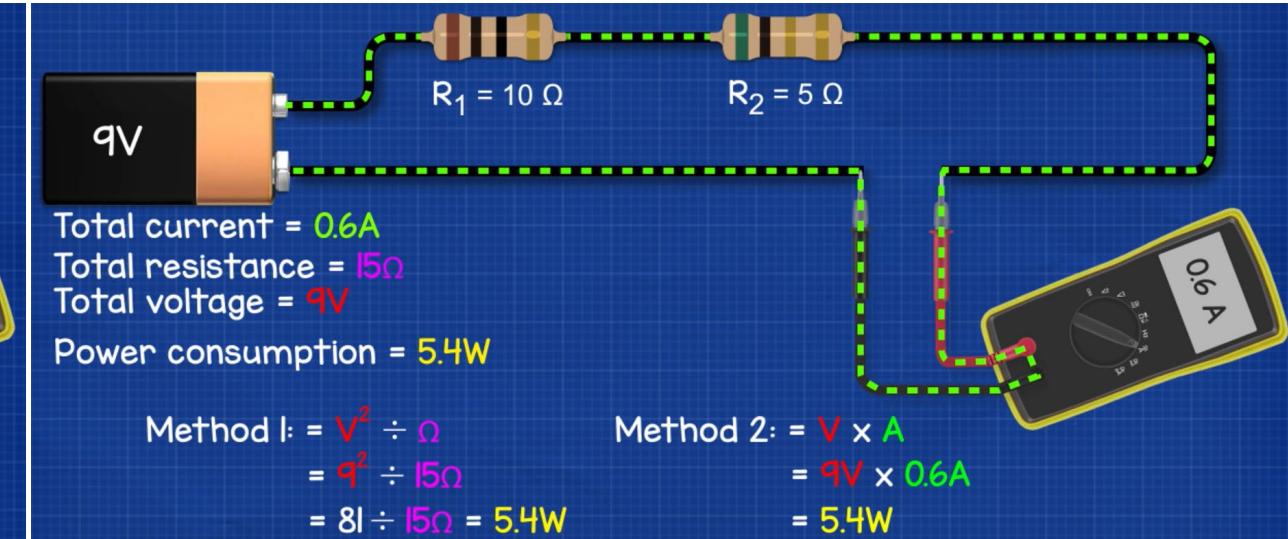
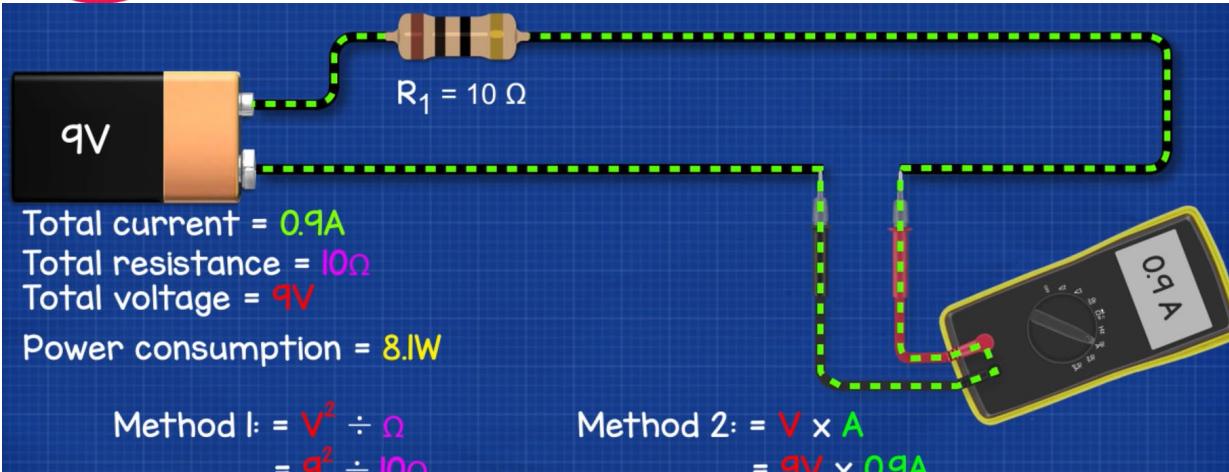
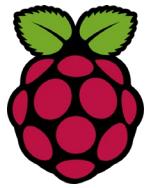
Formulas:

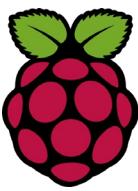
$$\text{Power (Watts)} = \text{Voltage}^2 (V) \div \text{Resistance} (\Omega)$$

or

$$\text{Power (Watts)} = \text{Voltage (V)} \times \text{Current (A)}$$

# Power Consumption Calculation



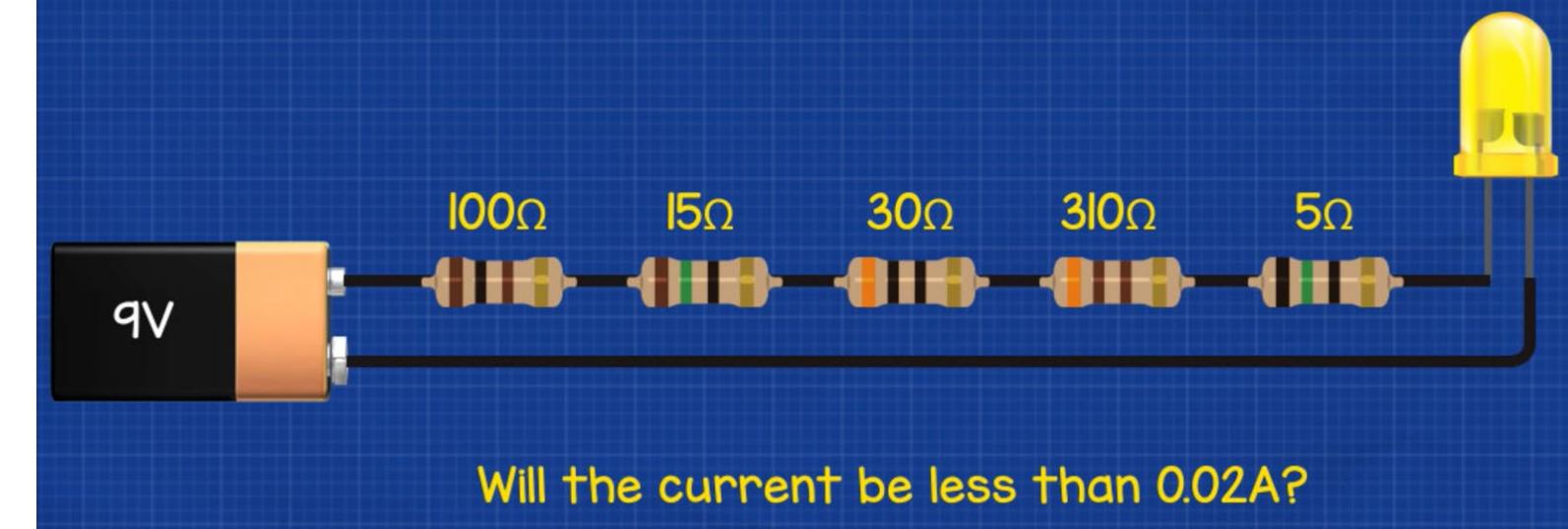


# Try to Solve

Can you solve this problem?



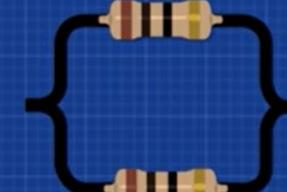
This LED can't exceed 0.02A (20mA)  
Else it will burn out



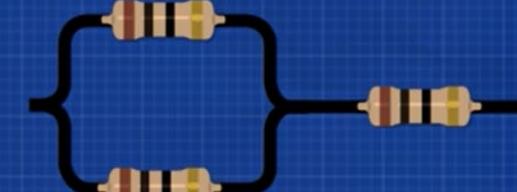
Series



Parallel

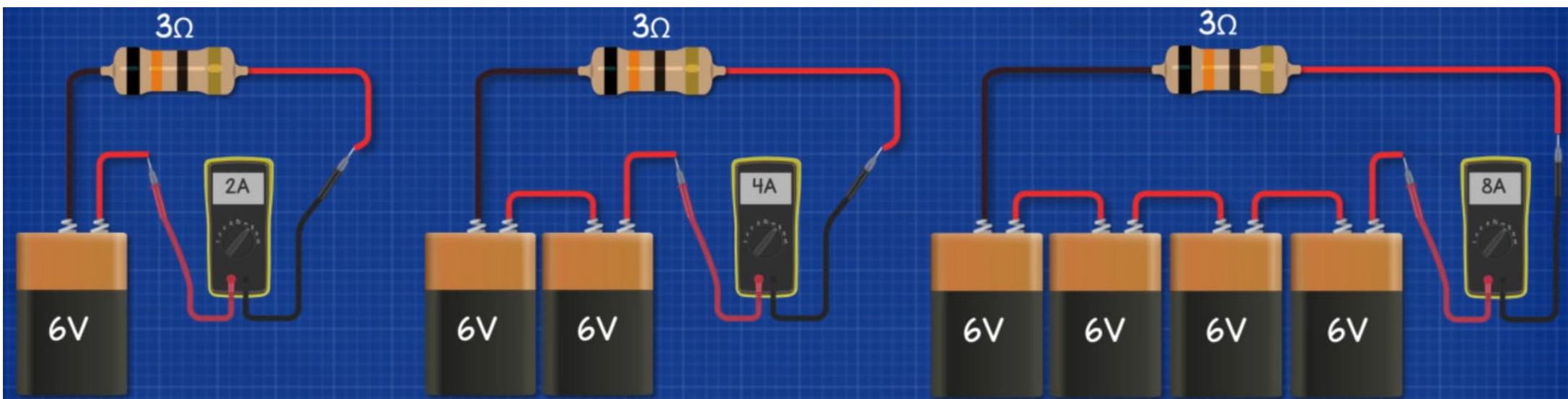
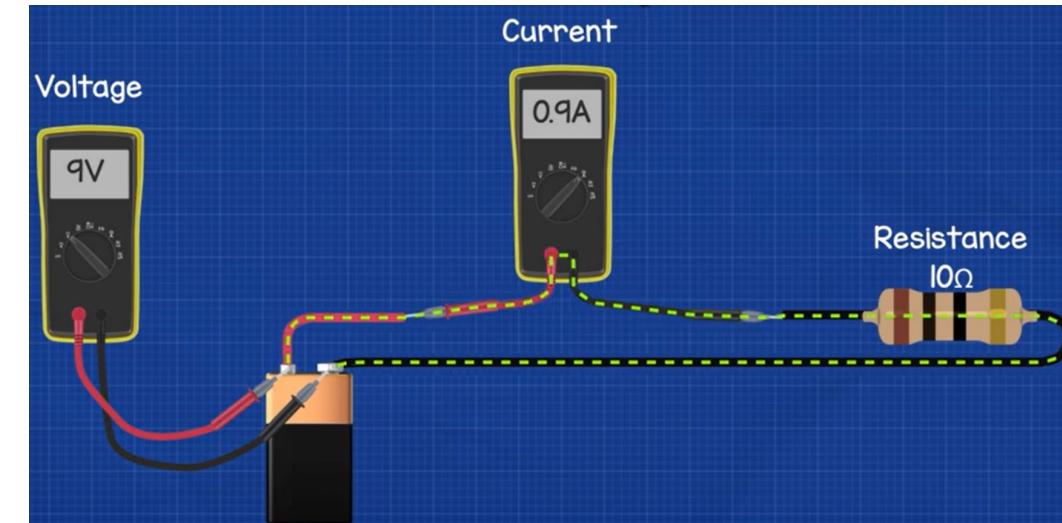
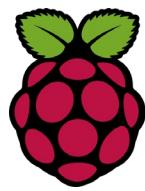


Parallel & Series





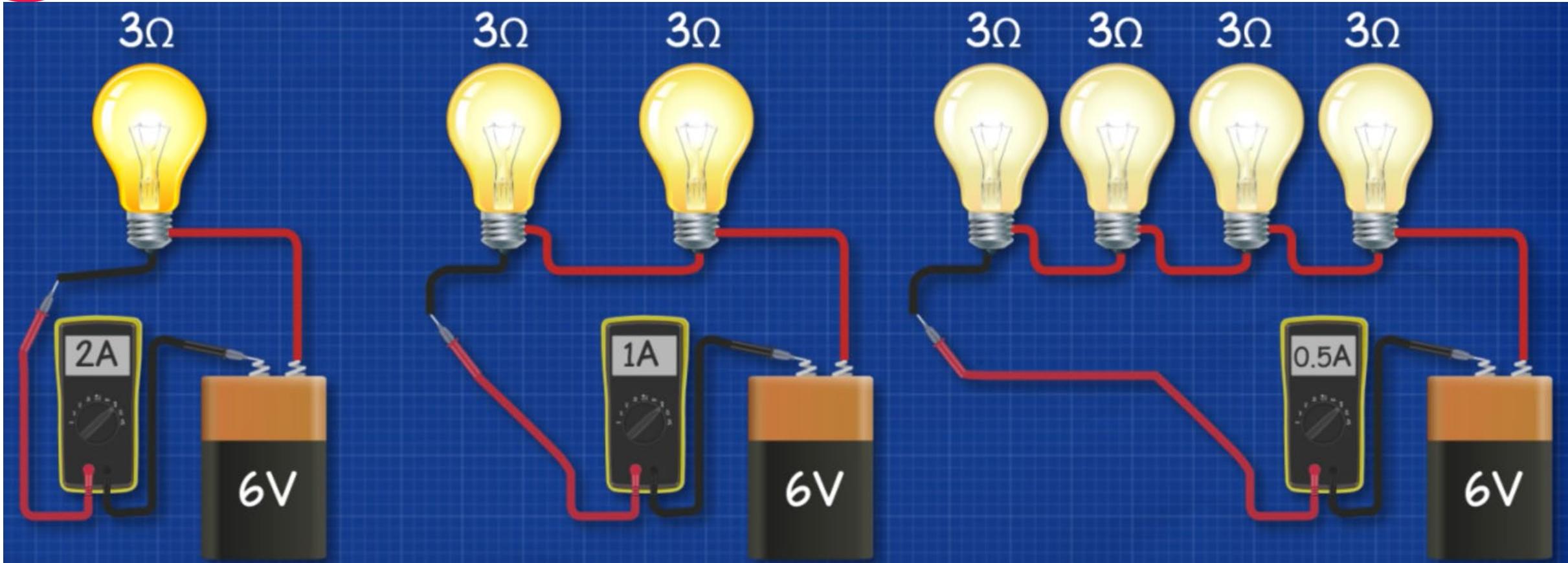
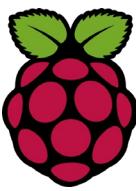
# Ohm's Law



Relationship: current is therefore directly proportional to voltage.

Double the Voltage, double the current

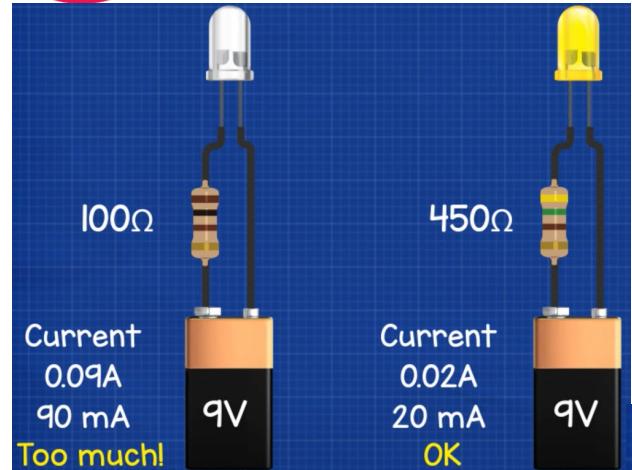
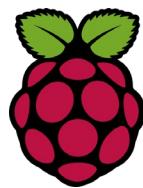
# Ohm's Law Application



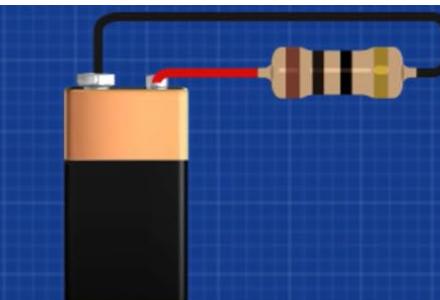
Relationship: Current is inversely proportional to resistance

Double the resistance, half the current

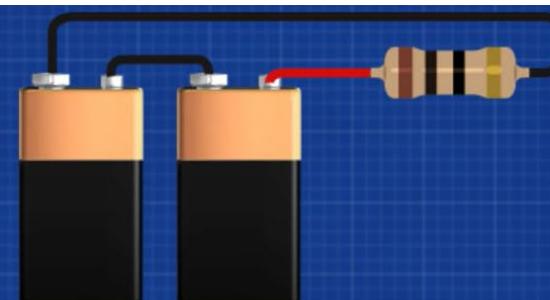
# Ohm's Law



Increase current by increasing the voltage



Low voltage, low current

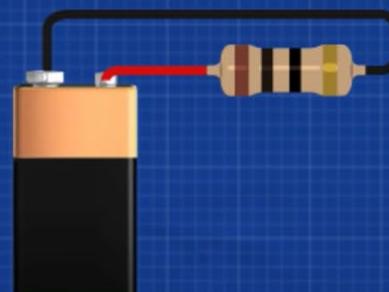


Higher voltage, higher current

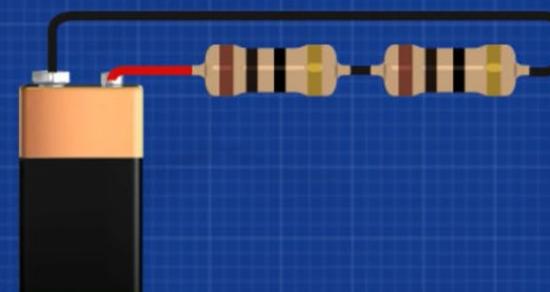
Increase current by reducing the resistance

or

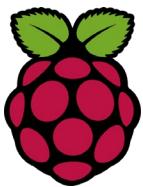
Reduce current by increasing resistance



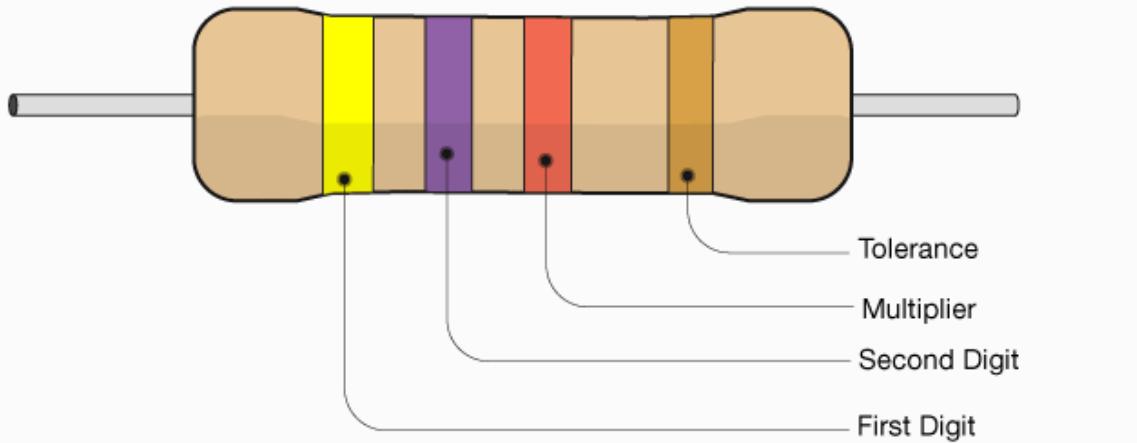
Low voltage, low current



Low voltage, high resistance, low current



# Resistor Colour Code



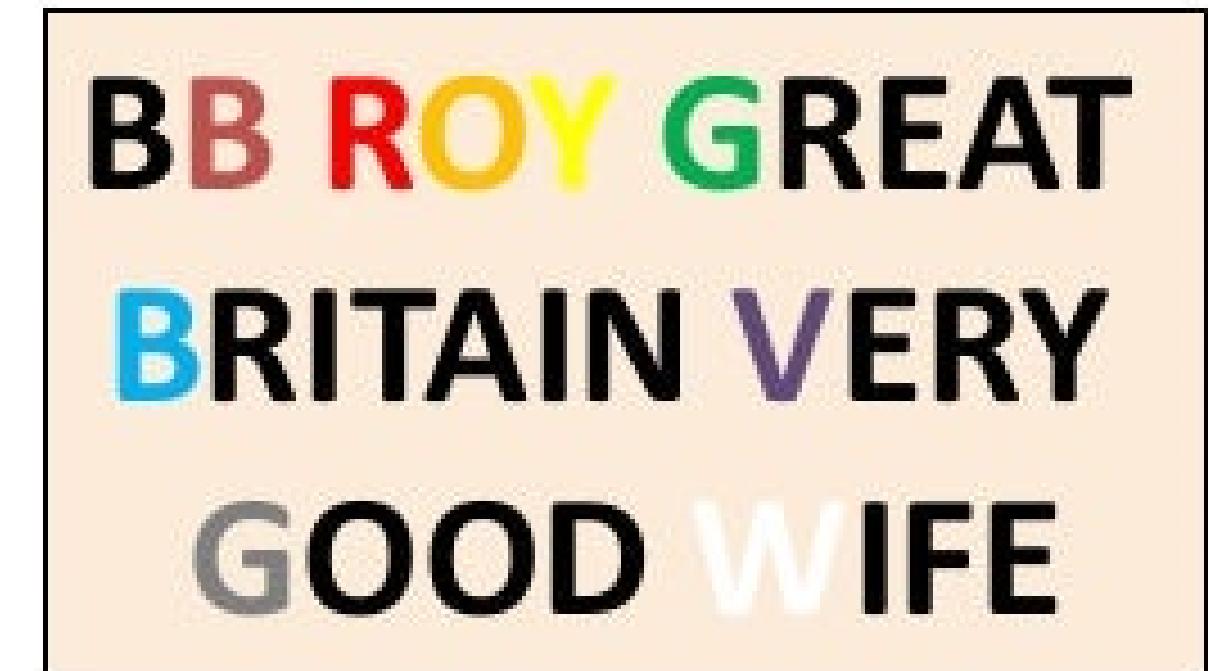
	1st Digit	2nd Digit	Multiplier	Tolerance
Black	0	0	x 1	Silver $\pm 10\%$
Brown	1	1	x 10	Gold $\pm 5\%$
Red	2	2	x 100	
Orange	3	3	x 1000	
Yellow	4	4	x 10000	
Green	5	5	x 100000	
Blue	6	6	x 1000000	
Violet	7	7		
Grey	8	8		
White	9	9		

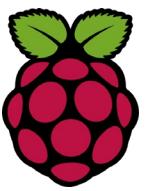
Example Shown :

Yellow	Violet	Red	Gold
4	7	$\times 100$	$\pm 5\%$

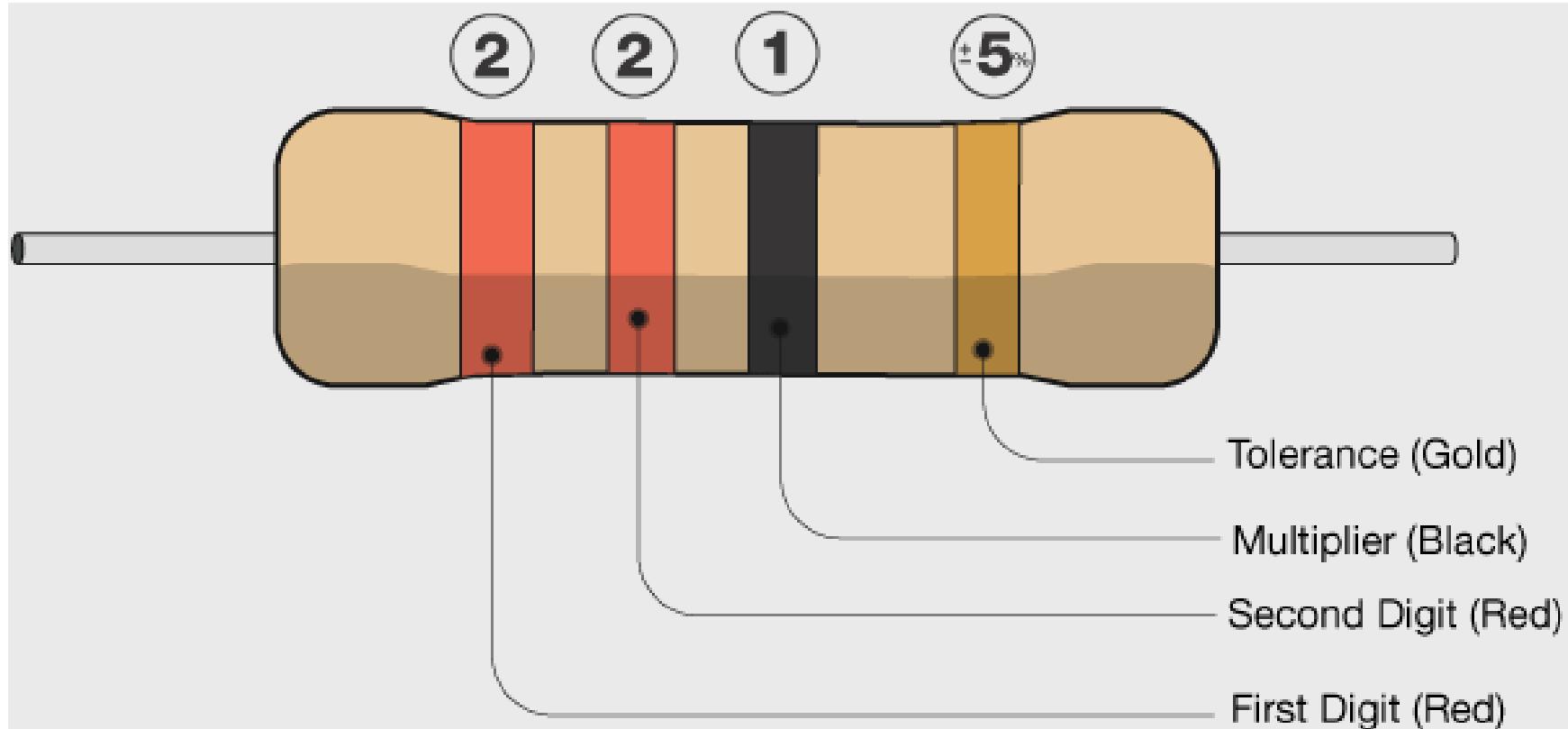
$4700 \Omega \pm 5\%$

## Mnemonic

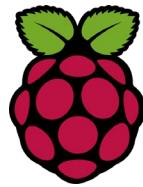




# Resistor Colour Code Examples



Band colours in order	RED	RED	BLACK	GOLD
Digit representation	2	2	1	±5%
Value	$22 \Omega \pm 5\%$			



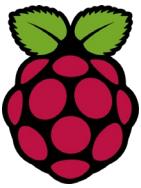
# Tolerance Limit

Band colours in order	RED	RED	BLACK	GOLD
Digit representation	2	2	1	$\pm 5\%$
Value	$22 \Omega \pm 5\%$			

The tolerance limit values represent by how much the resistance can vary from its mean value in terms of percentage.

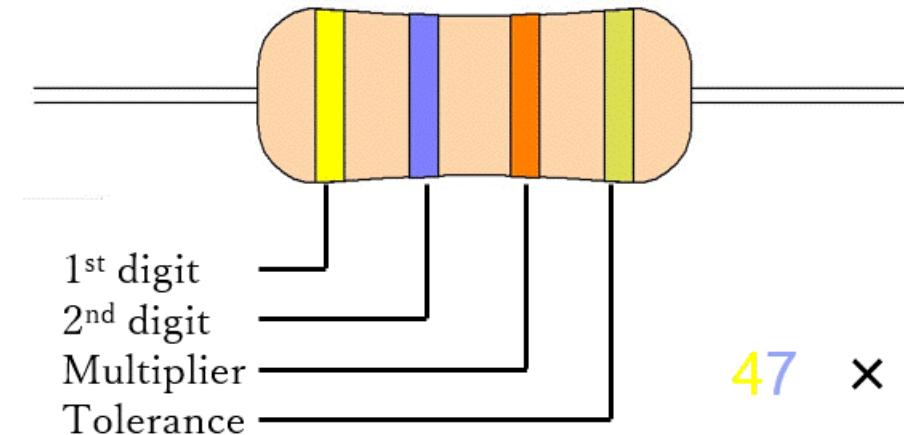
$$\begin{aligned} \text{Tolerance} &= \text{Value of resistor} \times \text{value of tolerance band} \\ &= 22 \Omega \times 5\% = 1.1 \Omega \end{aligned}$$

22 Ω resistor with a tolerance value of 1.1 Ω could range from the actual value as much as 23.1 Ω to as little as 20.9 Ω.



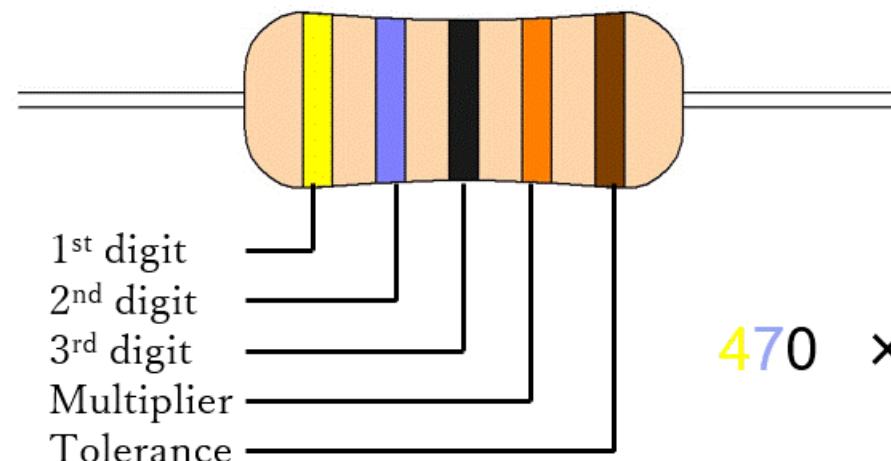
# Resistor Colour Code Examples

4-Band Code

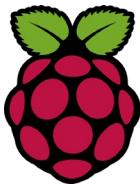


$$47 \times 10^3 = 47000 = 47\text{k}\Omega \pm 5\%$$

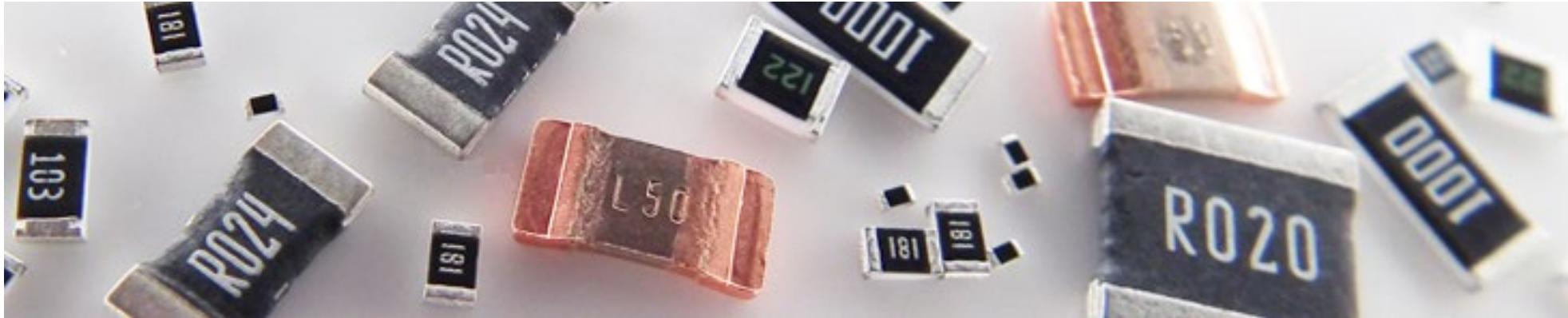
5-Band Code



$$470 \times 10^3 = 470000 = 470\text{k}\Omega \pm 1\%$$



# Chip Resistors conversion rules



**102** →  $10 \times 10^2 = 1000\Omega$  ( $1k\Omega$ )

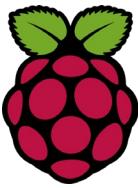
**1002** →  $100 \times 10^2 = 10000\Omega$  ( $10 k\Omega$ )

**R047** → Read "R" as a decimal point. →  $0.047\Omega$  ( $47m\Omega$ )

**0K47** → Read "K" as a decimal point. →  $0.47K\Omega$

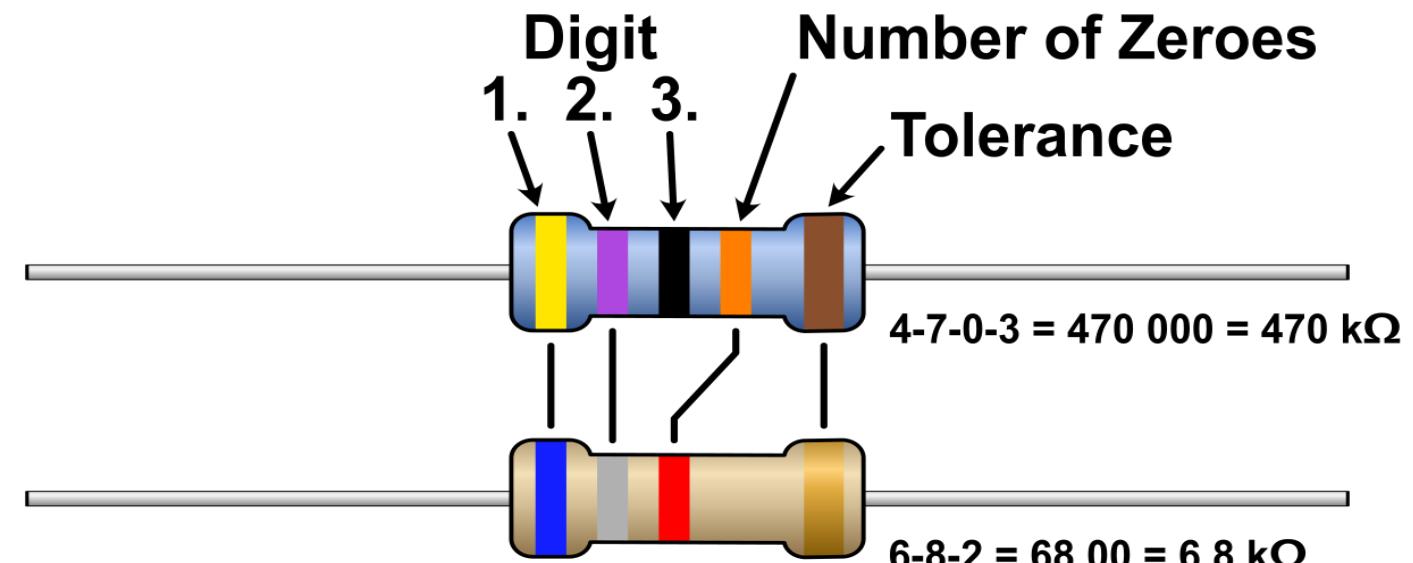
**4M7** → Read "M" as a decimal point. →  $4.7M\Omega$

**10L0** → Read "L" as a decimal point of  $m\Omega$  →  $10m\Omega$



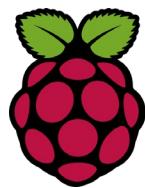
# Most commonly used Resistors

Resistor Value	Common Resistor	Color Band
100 Ohm		Brown Black Brown 1 0 0
220 Ohm		Red Red Brown 2 2 0
330 Ohm		Orange Orange Brown 3 3 0
470 Ohm		Yellow Violet Brown 4 7 0
1 K		Brown Black Red 1 0 00
2.2 K		Red Red Red 2 2 00
3.3.K		Orange Orange Red 3 3 00
4.7 K		Yellow Violet Red 4 7 00
5.6 K		Green Blue Red 5 6 00
6.8 K		Blue Grey Red 6 8 00
10 K		Brown Black Orange 1 0 000
22 K		Red Red Orange 2 2 000
33 K		Orange Orange Orange 3 3 000
47 K		Yellow Violet Orange 4 7 000
100 K		Brown Black Yellow 1 0 0000
150 K		Brown Green Yellow 1 5 0000



Digit      0    1    2    3    4    5    6    7    8    9

Tolerance      Silver ±10 %    Gold ±5 %    ±1 %    ±0.5 %    ±0.1 %



# Extended Tolerance Limit

Color	Value	Multiplier	Tolerance
Black	0	$\times 10^0$	$\pm 20\%$
Brown	1	$\times 10^1$	$\pm 1\%$
Red	2	$\times 10^2$	$\pm 2\%$
Orange	3	$\times 10^3$	$\pm 3\%$
Yellow	4	$\times 10^4$	
Green	5	$\times 10^5$	$\pm 0.5\%$
Blue	6	$\times 10^6$	$\pm 0.25\%$
Violet	7	$\times 10^7$	$\pm 0.10\%$
Gray	8	$\times 10^8$	$\pm 0.05\%$
White	9	$\times 10^9$	
Gold	-	$\times 10^{-1}$	$\pm 5\%$
Silver	-	$\times 10^{-2}$	$\pm 10\%$

## 4-band resistor

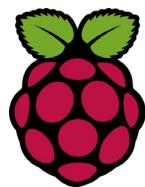


**270 ohms  $\pm 5\%$**

## 5-band resistor



**100k ohms  $\pm 1\%$**



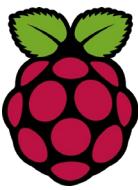
# Resistor Colour Code Examples

4 Bands			1.2 Ω 10%		
5 Bands			68 KΩ 5%		
6 Bands			560 KΩ 5%		
1st Digit	2nd Digit	3rd Digit	Multiplier	Tolerance	Temperature Coefficient
0	0	0	1		
1	1	1	10	1%	100ppm
2	2	2	100	2%	50ppm
3	3	3	1 K		15ppm
4	4	4	10 K		25ppm
5	5	5	100 K	0.5%	
6	6	6	1 M	0.25%	
7	7	7	10 M	0.1%	
8	8	8			0.05%
9	9	9		0.01	10%
			0.1		5%

  Resistor Color Codes

1K = 1 000  
1M = 1 000 000

Color Codes		4 Band Resistors	5 Band Resistors	6 Band Resistors
0	Black			
1	Brown			
2	Red			
3	Orange			
4	Yellow			
5	Green			
6	Blue			
7	Purple			
8	Grey			
9	White			
±1%	Brown			
±2%	Red			
±5%	Gold			
±10%	Silver			
±1%	Black	27K	15K	620K
±2%	Brown			
±5%	Gold			
±10%	Silver			
EXAMPLE				
0 x 1				
1 1 x 10				
2 2 x 100				
3 3 x 1000				
4 4 x 10000				
5 5 x 100000				
6 6 x 1000000				
7 7 x 10000000				
8 8 x 100000000				
9 9 x 1000000000				
÷10				
÷100				



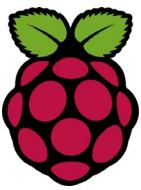
# Quizzzz

**1) The Color Coding is used to indicate \_\_\_\_\_ value/rating of Resistor.**

- a) Numerical
- b) Alphabetical
- c) Resistance
- d) a & c are correct

**2) The Resistor Color Code was developed by \_\_\_\_\_.**

- a) International Organization for Standardization (ISO)
- b) Electronics Industries Alliance (EIA)
- c) Radio Manufacturers Association (RMA)
- d) a & b are correct



# Quizzzz

**3) Recently, \_\_\_\_\_ standard Color Coding is used for Resistor's values.**

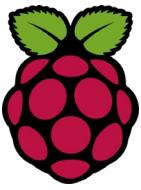
- a) World Standardized Corporation (WSC)
- b) Electronics Industries Alliance (EIA)
- c) Radio Manufacturers Association (RMA)
- d) International Organization for Standardization (ISO)

**4) The color code standard was developed in \_\_\_\_\_.**

- a) 1890
- b) 1920
- c) 1940
- d) 1900



# Quizzzz



**5) Why is Color Coding used for Resistors ?**

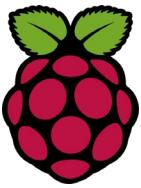
- a) Small Size
- b) Cylindrical Shape
- c) Due to Through Hole Component
- d) a & b are correct

**6) How many colour bands used on Resistors** \_\_\_\_\_

- a) 4
- b) 5
- c) 6
- d) 7



# Quizzzz

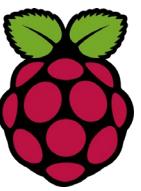


**7) How to read color bands on Resistors ?**

- a) Right to Left
- b) Left to Right
- c) From both sides
- d) All are correct

**8) The first two bands on the resistors are \_\_\_\_\_**

- a) Two digits
- b) Decimal Multiplier
- c) Tolerance
- d) All are incorrect



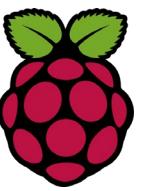
# Quizzzz

9) The tolerance of the Silver band on Resistor is \_\_\_\_\_

- a) 3%
- b) 5%
- c) 10%
- d) 20%

10) The gold band tolerance on Resistor is \_\_\_\_\_

- a) 3%
- b) 5%
- c) 10%
- d) 20%



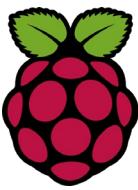
# Quizzzz

11) If there is no band on Resistor then tolerance is \_\_\_\_\_

- a) 3%
- b) 5%
- c) 10%
- d) 20%

12) Which digit is represented by a Green band on a Resistor?

- a) 4
- b) 5
- c) 6
- d) 3



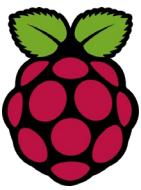
# Quizzzz

**13) The decimal multiplier means, how many \_\_\_\_\_ add after the first digits.**

- a) Zeros
- b) Digits
- c) Tolerance
- d) Resistance

**14) What color is a  $340\text{ K}\Omega$  resistor with 5% tolerance?**

- a) Orange, Yellow and Yellow with Gold
- b) Orange, Green and Yellow with Gold
- c) Orange, Blue and Orange with Gold
- d) Orange, Yellow and Green with Gold



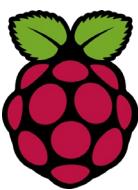
## Quizzzz

**15) A zero-ohm resistor is indicated by a single black color ring around the body of the resistor.**

- a) Yes
- b) No
- c) Zero ohm resistors does not exist
- d) None of these

**16) Why zero ohm resistors are used?**

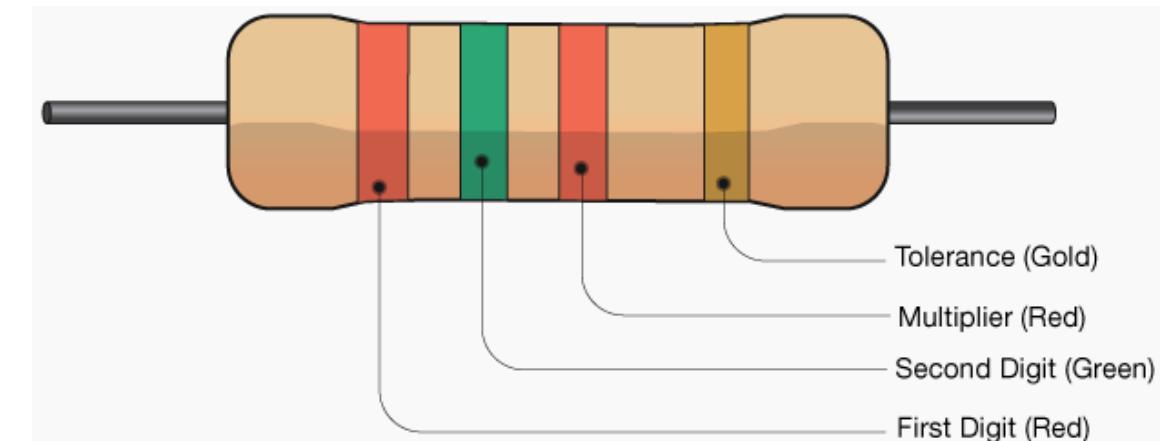
- a) Connect the Tracks
- b) As Jumpers
- c) Increase Machine Production Time
- d) All are correct



# Quizzzz

**17) Determine the resistance of the given resistor with the given colour sequence (Red, Green, Red, Gold).**

- a)  $250 \pm 5\% \Omega$ .
- b)  $25 \pm 5\% k\Omega$ .
- c)  $2500 \pm 5\% k\Omega$ .
- d)  $2.5 \pm 5\% k\Omega$ .

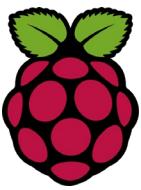


**18) What colour bands would a resistor of resistance value  $1000 \Omega$  with a tolerance level  $\pm 5\%$  have?**

- a) Brown, Black and Orange , Gold
- b) Black, Brown and Orange, Gold
- c) Black, Brown, Black , Red , Gold
- d) Brown, Black , Red , Gold



# Quizzzz



19) The tolerance of the Brown band on Resistor is \_\_\_\_\_

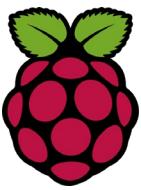
- a)  $\pm 3\%$
- b)  $\pm 5\%$
- c)  $\pm 1\%$
- d)  $\pm 2\%$

20) The green band tolerance on Resistor is \_\_\_\_\_

- a)  $\pm 0.3\%$
- b)  $\pm 0.5\%$
- c)  $\pm 1\%$
- d)  $\pm 2\%$



# Quizzzz



21) The tolerance of the Red band on Resistor is \_\_\_\_\_

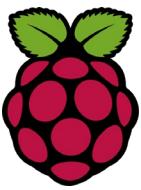
- a)  $\pm 3\%$
- b)  $\pm 5\%$
- c)  $\pm 1\%$
- d)  $\pm 2\%$

22) The blue band tolerance on Resistor is \_\_\_\_\_

- a)  $\pm 0.3\%$
- b)  $\pm 0.5\%$
- c)  $\pm 1\%$
- d)  $\pm 0.25\%$



# Quizzzz

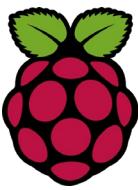


21) The tolerance of the violet band on Resistor is \_\_\_\_\_

- a)  $\pm 0.3\%$
- b)  $\pm 0.5\%$
- c)  $\pm 0.1\%$
- d)  $\pm 0.25\%$

22) The grey band tolerance on Resistor is \_\_\_\_\_

- a)  $\pm 0.3\%$
- b)  $\pm 0.05\%$
- c)  $\pm 0.25\%$
- d)  $\pm 0.1\%$



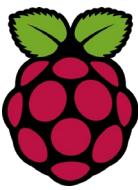
## Quizzzz

23) Three Resistances of  $R_1=20\Omega$  ,  $R_2=57\Omega$  &  $R_3=90\Omega$  are in series then how will the total resistance?

- a)  $167\Omega$
- b)  $157\Omega$
- c)  $147\Omega$
- d)  $177\Omega$

24) When current flows through a resistance, electrical energy is converted into \_\_\_\_\_ energy.

- a) Chemical
- b) Heat
- c) Light
- d) Elastic



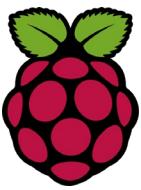
# Quizzzz

**25) The formula to calculate Current (I) in Series Resistance Circuit is \_\_\_\_\_.**

- a)  $I = V/R$
- b)  $I = I^2 \times R$
- c)  $I = V \times R$
- d)  $I = V_{total} / R_{total}$

**26) When components are connected in successive order is called \_\_\_\_\_.**

- a) Short Circuit
- b) Open Circuit
- c) Bypassed Circuit
- d) All are correct



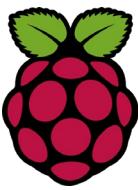
## Quizzzz

27) \_\_\_\_\_ states that the sum of all resistor voltage drops in a series circuit equals the applied voltage.

- a) Ohm's Law
- b) Kirchhoff's voltage law (KVL)
- c) Kirchhoff's current law (KCL)
- d) b & c are correct

28) In a \_\_\_\_\_ Circuit, current is Same in the all part/component.

- a) Series
- b) Parallel
- c) String
- d) a & c are correct



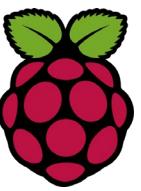
## Quizzzz

29) A combination of \_\_\_\_\_ resistances is often called string.

- a) Parallel Circuit
- b) Series Circuit
- c) Series Parallel Circuit
- d) all are correct

30) The formula to calculate the power dissipates against any Resistor is \_\_\_\_\_.

- a)  $P = W/Q$
- b)  $P = I^2 \times R$
- c)  $P = VR$
- d)  $P = IR$



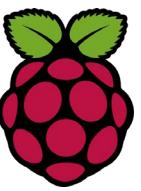
# Quizzzz

31) The resistance of an open series circuit is \_\_\_\_\_.

- a) High
- b) Low
- c) Extremely High (Infinity)
- d) Extremely Low

32) The resistance of the short circuit (comparing to open circuit) is \_\_\_\_\_.

- a) Zero
- b) Maximum
- c) Infinity
- d) Low



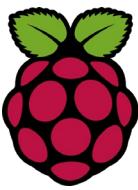
## Quizzzz

33) The \_\_\_\_\_ of a resistor is determined mainly by its physical size.

- a) Resistance
- b) Power
- c) Current
- d) a & b are correct

34) Resistor is an \_\_\_\_\_ component/device.

- a) Active
- b) Passive
- c) Both
- d) Sometimes active and sometimes passive



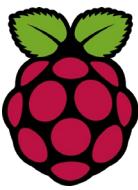
# Quizzzz

35) There are two main characteristics of a resistor are \_\_\_\_\_.

- a) Current and Voltage
- b) Current and Power
- c) Resistance and Power
- d) Resistance and Current

36) Resistors are generally available in the maximum value of \_\_\_\_\_ ohm.

- a) Mega ( $M\ \Omega$ )
- b) Gega ( $G\ \Omega$ )
- c) Kilo ( $K\ \Omega$ )
- d) Tera ( $T\ \Omega$ )



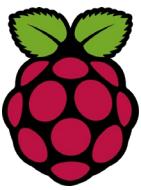
## Quizzzz

37) The power rating of a resistor should be \_\_\_\_\_ than from actual power dissipation (Waste) as heat for the reason of Safety factor (Burning).

- a) Less
- b) More
- c) Equal
- d) None of these

38) Most common type of Resistor is \_\_\_\_\_

- a) Wire Wound Resistor
- b) Carbon Resistor
- c) Film Type Resistor
- d) Fusible Resistor



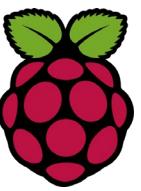
## Quizzzz

39) Resistors are \_\_\_\_\_ components.

- a) Polar
- b) Non-Polar
- c) Both
- d) None of these

40) Power Rating and Physical Size of Resistor is \_\_\_\_\_ proportional.

- a) Directly
- b) In-Directly
- c) Both
- d) None of these



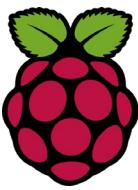
## Quizzzz

41) Resistors Carbon Composition Resistors are most popular because \_\_\_\_\_

- a) Low Price
- b) Small Size
- c) High inductance
- d) a & b are correct

42) Advantages of carbon composition resistor are \_\_\_\_\_

- a) Small Size
- b) Low Cost
- c) Withstand at high energy pulses
- d) All are Correct



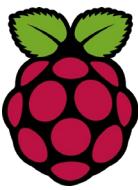
## Quizzzz

43) The value of Carbon Composition Resistor could be changed by \_\_\_\_\_

- a) If not in use for a year (5%)
- b) Soldering (Heat) – 3 %
- c) Operate at 70°C Temperature (15%)
- d) All are Correct

44) Disadvantages of carbon composition resistor are \_\_\_\_\_

- a) Instability of Resistance Value
- b) High Temperature Coefficient
- c) High Noise
- d) All are Correct



# Quizzzz

45) 1mA is equal to \_\_\_\_\_.

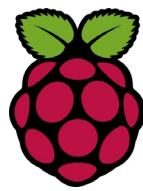
- a) 100 $\mu$ A
- b) 10 $\mu$ A
- c) 1000 $\mu$ A
- d) 10A

46) The electric shock of 0.1 to 0.2 Amp can cause the \_\_\_\_\_.

- a) Mild sensation
- b) Threshold of sensation
- c) Death
- d) Painful



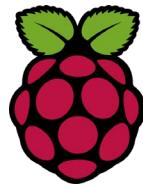
# Morse Code



- ✓ Morse code is a method used in telecommunication to encode text characters as standardized sequences of two different signal durations, called dots and dashes, or dits and dahs. Morse code is named after Samuel Morse, one of the inventors of the telegraph.
- ✓ Morse Code uses an alphabet made up of dots and dashes (for instance, the letter "s" is three dots and "o" is three dashes.) It is used by **tapping the combination of dots and dashes needed and pausing for the correct gap duration**. There are longer gaps between words than letters in a word.



# Morse Code: "SOS"



A	•—	N	—•	1	•—————	?	••—•—••
B	—•••	O	—————	2	••——————	!	—••—•—•—
C	—•—•	P	•—•—•	3	•••—	•	•—•—•—•—
D	—••	Q	—————•	4	••••—	,	—•—•—•—
E	•	R	—•	5	•••••	;	—•—•—•—•
F	••—•	S	•••	6	—••••	:	—•—•—•—•—
G	—•—•	T	—	7	—••••	+	•—•—•—•—
H	•••	U	••—	8	—•••—•	-	—•••—•—•—
I	•..	V	••—	9	—••—•—•	/	—••—•—•—•—
J	•——————	W	•—	0	—•—————	=	—••—•—•—
K	—•—	X	—••				
L	•—••	Y	—•—				
M	—•—	Z	—————				



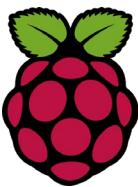
## What Does "SOS" Mean?

### SOS Meaning

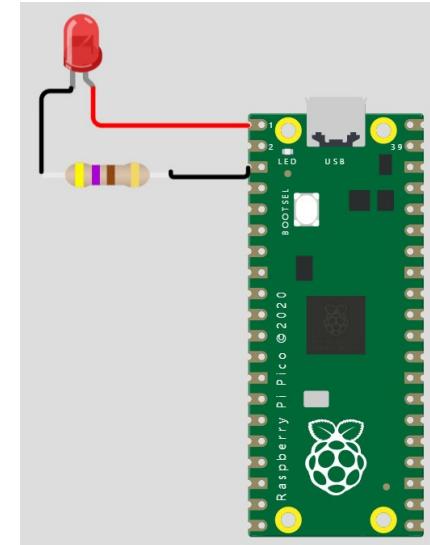
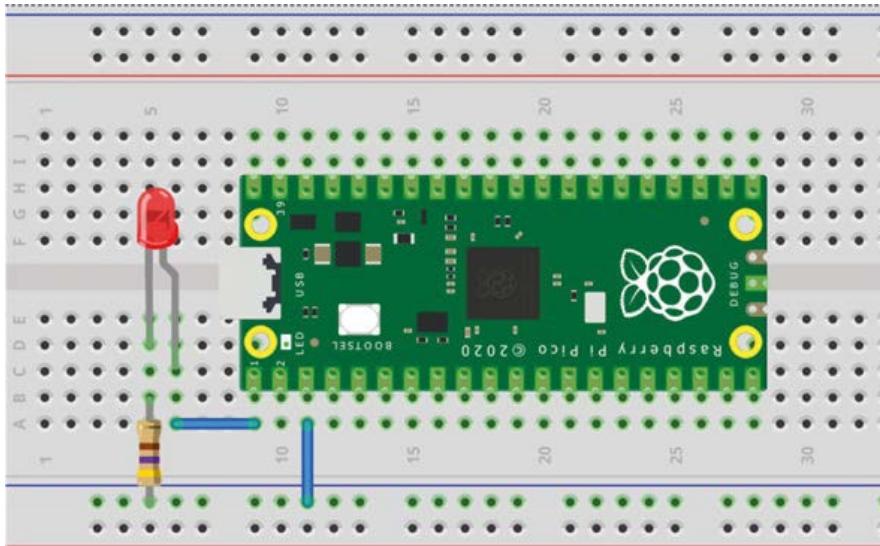
- However, meaning 'Save Our Ship' the phrase 'sos' is more widely known as another way of saying 'please help me now'. On a few occasions and depending on the lore behind each story it has also been known to mean 'Save Our Souls'.



Try to implement a Morse code system by flashing SOS with the help of Electronics Components



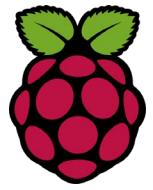
# Flashing SOS in Morse



- ✓ An external LED flashes the SOS signal in **Morse code (three dots, followed by three dashes, followed by three dots)** continuously.
- ✓ In this experiment, a dot is represented with the LED being ON for **0.25 seconds (Dot time)** and a dash is represented with the LED being ON for **1 second (Dash time)**.
- ✓ The delay between the dots and dashes is set to **0.2 second (GAP time)**. This process is repeated continuously after **2 seconds of delay**.



# LED FLASHING SOS



WOKWi

SAVE

SHARE



Docs



diagram.json • main.py Library Manager

```
1  from machine import Pin
2  from utime import sleep
3
4  Dot = 0.25          # Dot time
5  Dash = 1.0          # Dash time
6  Gap = 0.2           # Gap time
7  ON = 1              # ON
8  OFF = 0             # OFF
9  LED = Pin(0, Pin.OUT) # LED at GP0
10
11 while True:          # DO FOREVER (INFINITE LOOP)
12     for i in range(0, 3):
13         LED.value(ON)      # LED ON
14         sleep(Dot)        # Wait Dot time
15         LED.value(OFF)    # LED OFF
16         sleep(Gap)        # Wait Gap time
17
18         sleep(0.5)         # 0.5 second delay
19
20     for i in range(0, 3):
21         LED.value(ON)      # LED ON
22         sleep(Dash)       # Wait Dash time
23         LED.value(OFF)    # LED OFF
24         sleep(Gap)        # Wait Gap time
25         sleep(2)           # Wait 2 seconds
```

Simulation

