Electronics
Electric circuits

An electric circuit is made of a power source, which feed electricity to a load. The electricity flows between the elements through the conductors.
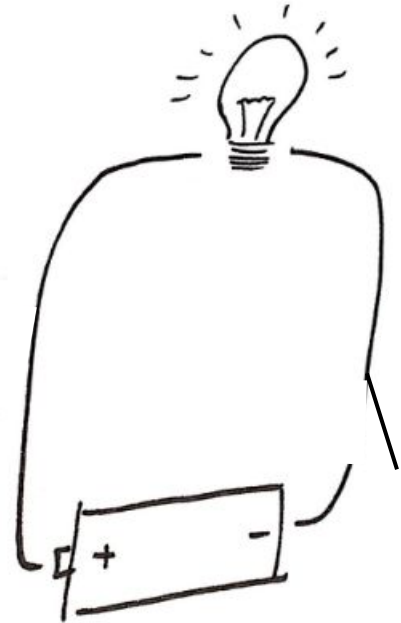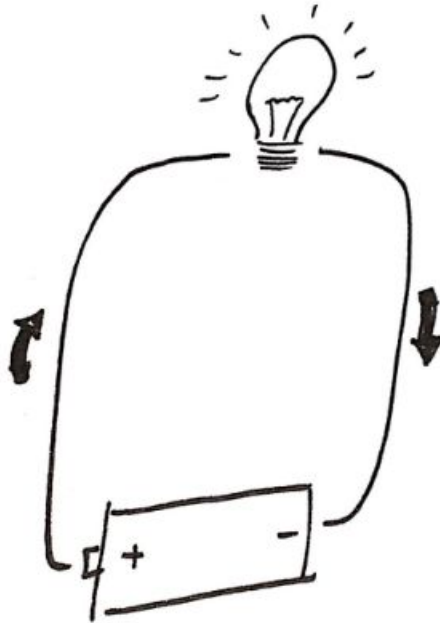
Load (light, motor, sensor)

Conductor (wire, breadboard)
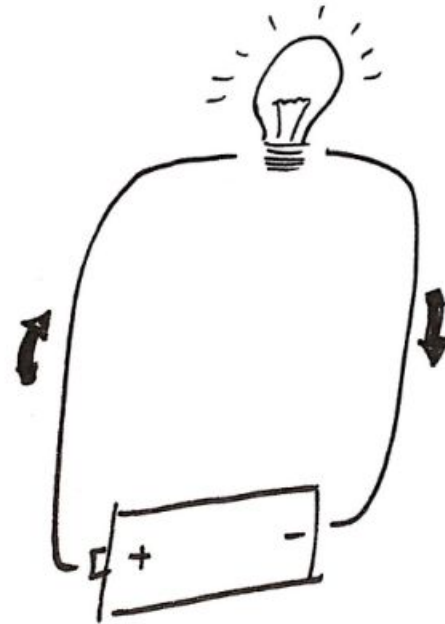
Source (battery, plug)

The electricity flows from the point on the source with the most electricity ('+', power, V) to the point with the least ('-', ground).

There will only be a flow of electrons (=current) if the circuit is closed.

So we can stop the current by cutting off the circuit.

Electric circuits >> Electricity values

The voltage (V) is the potential of energy that the
battery has. In an analogy to water, the more water
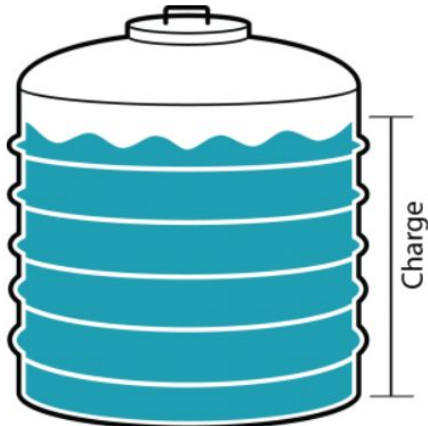in the tank the more pressure the water will have
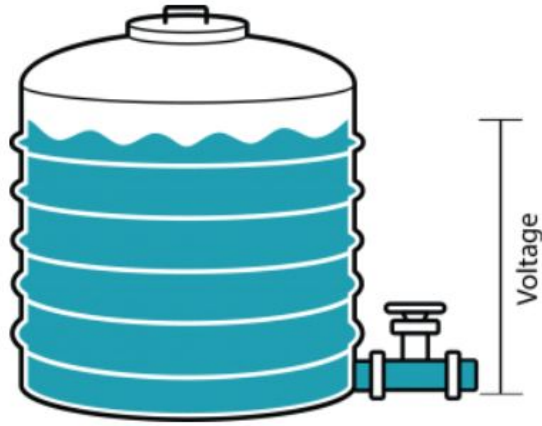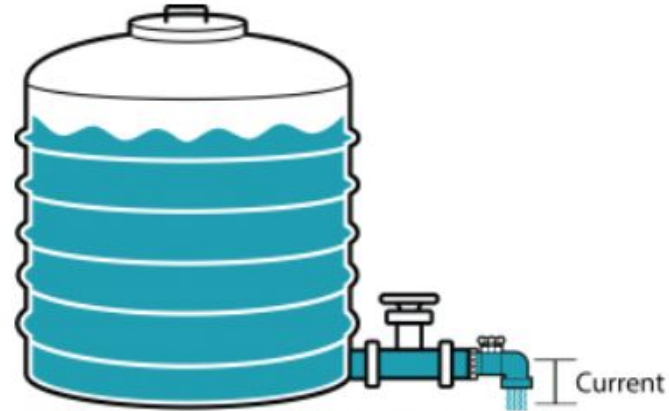when it is opened.

Fig. 1: Charge

Fig. 2: Voltage

Fig. 3: Current

https://www.ecosoch.com/understanding-electricity/

Electric circuits >> Electricity values

The current (**Ampere(A))** is how much water we're allowing to go through the pipe. We can increase and decrease this by changing the width of the pipe.
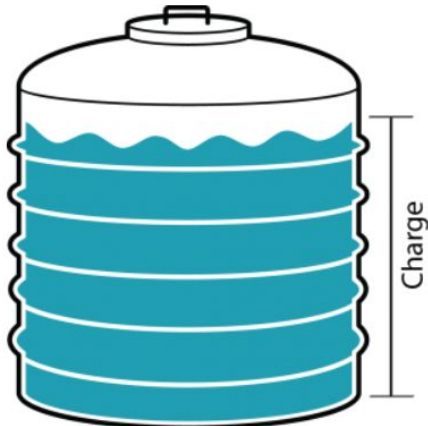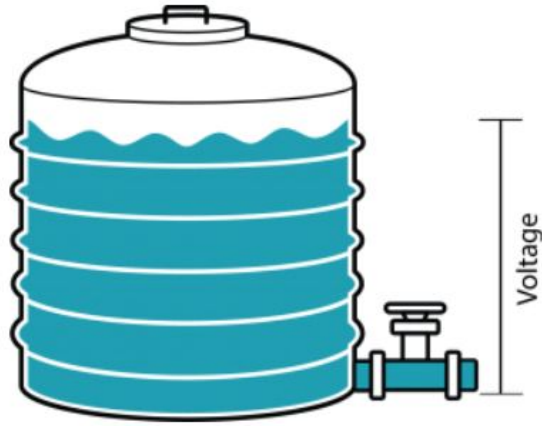

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Fig. 2: Voltage

Fig. 3: Current

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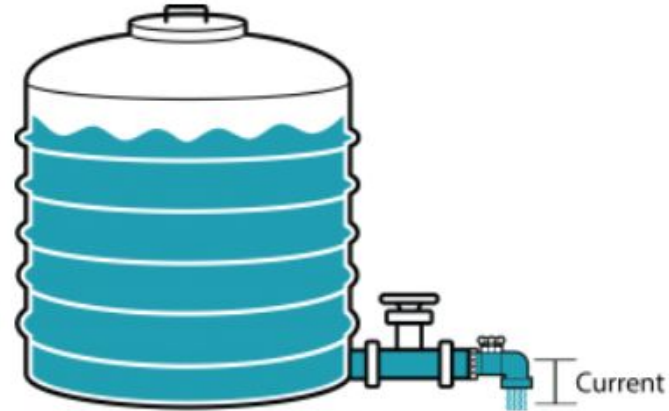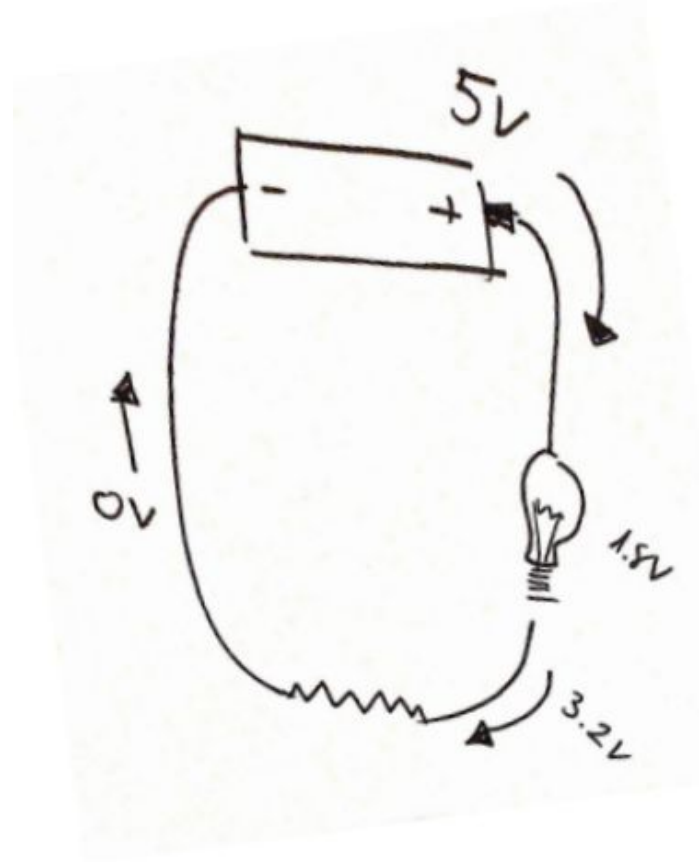
Electric circuits >> Loads, resistors

Not all loads are the same,
and sometimes they need
less current than the
source provides.

But, if the current is too
strong, it can ruin the load.

In order to "use up" the
rest of the power we use a
resistor.

Electric circuits >> Loads, resistors

Not all resistors are the
same, and we need to
calculate which one we
need to use, which will
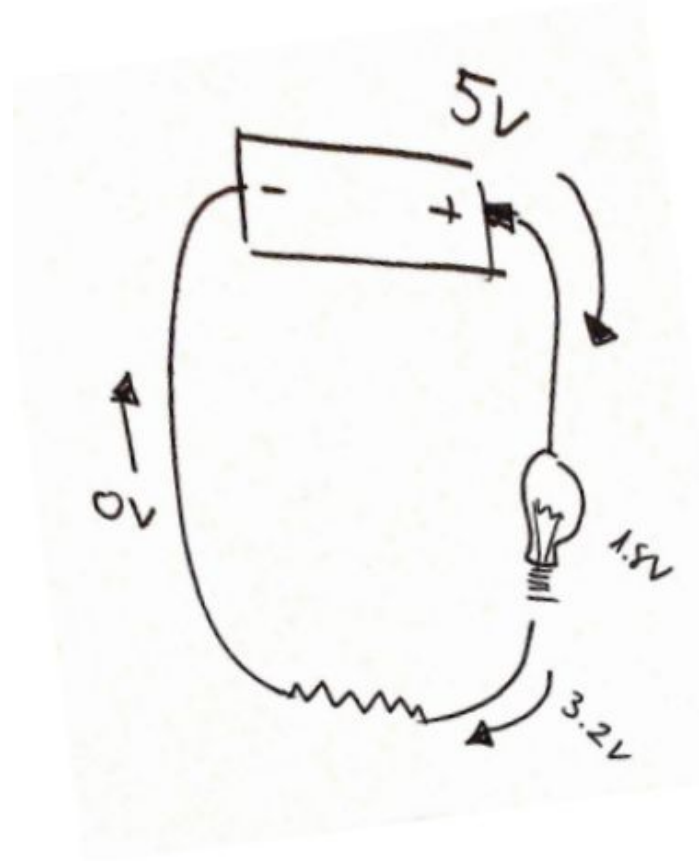depend on the source and
the load.

For this calculation we use
Ohm's law:
V= IR

V = Voltage
I = Current
R= Resistance

Electric circuits >> Loads, resistors

V= IR

V in this case is the
amount of the voltage left
in the circuit after the load
has used its share.
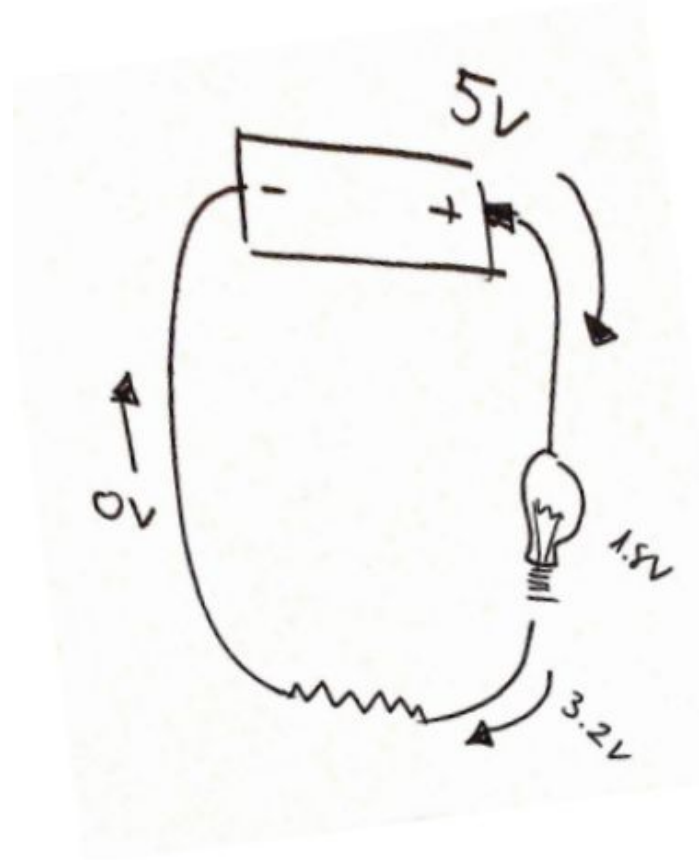Therefore, the V value we
need will be:
V= V (source) - V(load)

I will be the current
needed for the load.

Once we have these two
we can calculate the R.
R= V/I

Electric circuits >> Loads, resistors

We need to know the specific values of the V and I of our load.
These will appear on its data sheet, which can easily be found on the internet.

LED - Basic Red 5mm
⊙ COM-09590 ROHS✔ J5 📄 3D

$0.45
Volume sales pricing

- 1 +   **ADD TO CART**

Quantity discounts available

DESCRIPTION **FEATURES** DOCUMENTS

- 1.8-2.2VDC forward drop
- Max current: 20mA
- Suggested using current: 16-18mA
- Luminous Intensity: 150-200mcd

Electric circuits >> Loads, resistors

Our LED uses between
1.8-2.2 volts, so we'll say
V (load)= 1.8

The max current is 20 mA,
which is milli-Ampere.
We need the value in
Ampere, so we divide by
1000. Therefore,
I = 0.02

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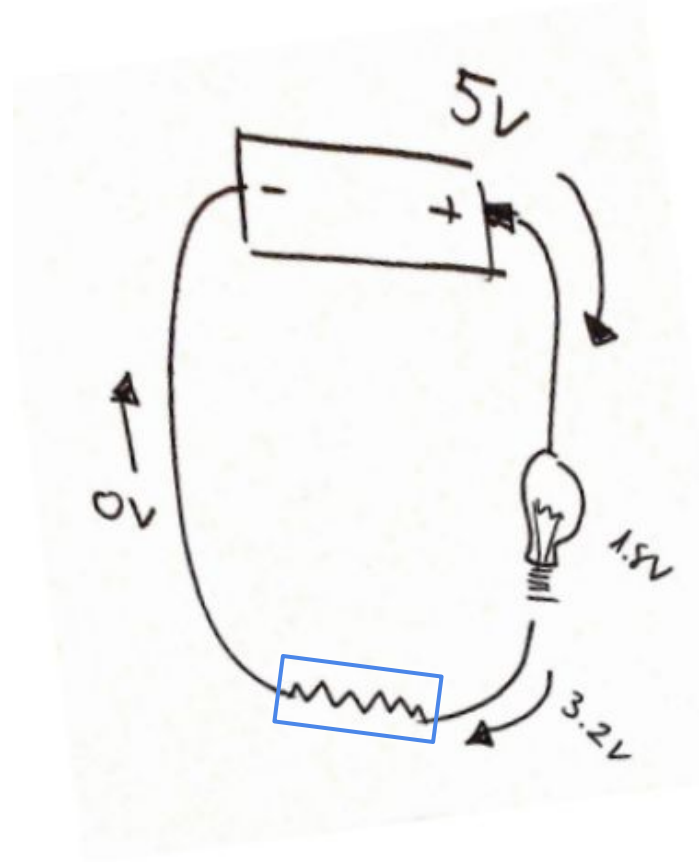- Luminous Intensity: 150-200mcd

Electric circuits >> Loads, resistors

Now that we know the I
and V values of the load,
we can calculate the R.

V= 5V(source)-1.8V(load) =
3.2V

R= 3.2V/0.02I
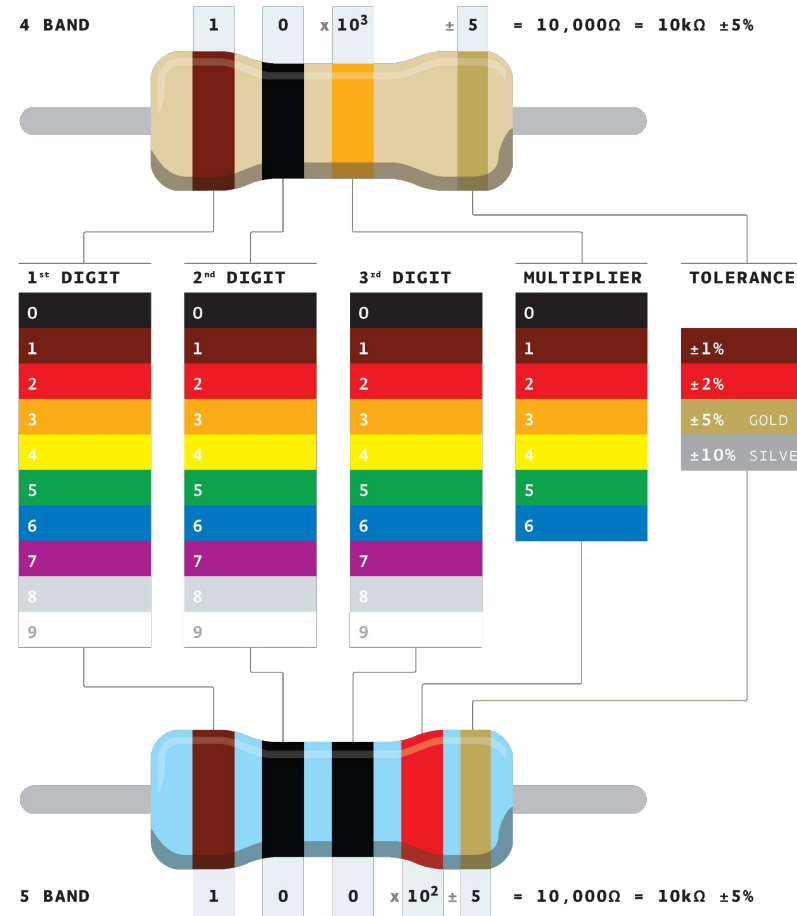R= 160 ohm

We need to use a resistor
of 160 ohm.

Electric circuits >> Loads, resistors

We'll use the closest resistor we have. Resistors are coded by colour:

4 BAND   1   0   x 10^3 ± 5   = 10,000Ω = 10kΩ ±5%

1st DIGIT	2nd DIGIT	3rd DIGIT	MULTIPLIER	TOLERANCE
0	0	0	0	
1	1	1	1	±1%
2	2	2	2	±2%
3	3	3	3	±5% GOLD
4	4	4	4	±10% SILVER
5	5	5	5	
6	6	6	6	
7	7	7		
8	8	8		
9	9	9		

5 BAND   1   0   0   x 10^2 ± 5   = 10,000Ω = 10kΩ ±5%

Electric circuits >> Loads, resistors

It doesn't matter if we put the resistor before or after the load, because it restricts the flow of the current for the entire circuit.
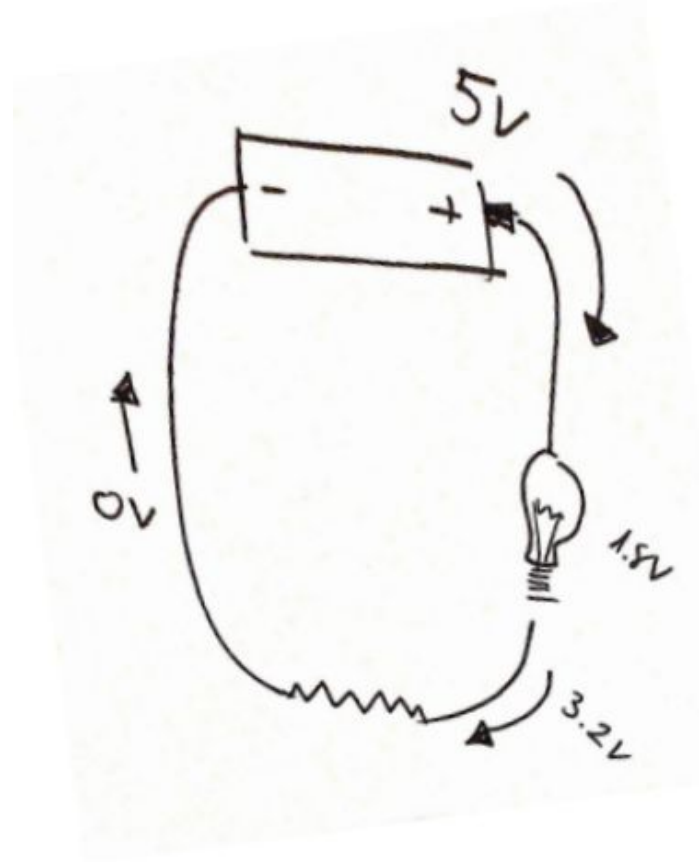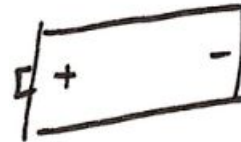
If we want to have more
than one load in our
circuit, we can incorporate
them in two ways:

Series circuit

Parallel circuit

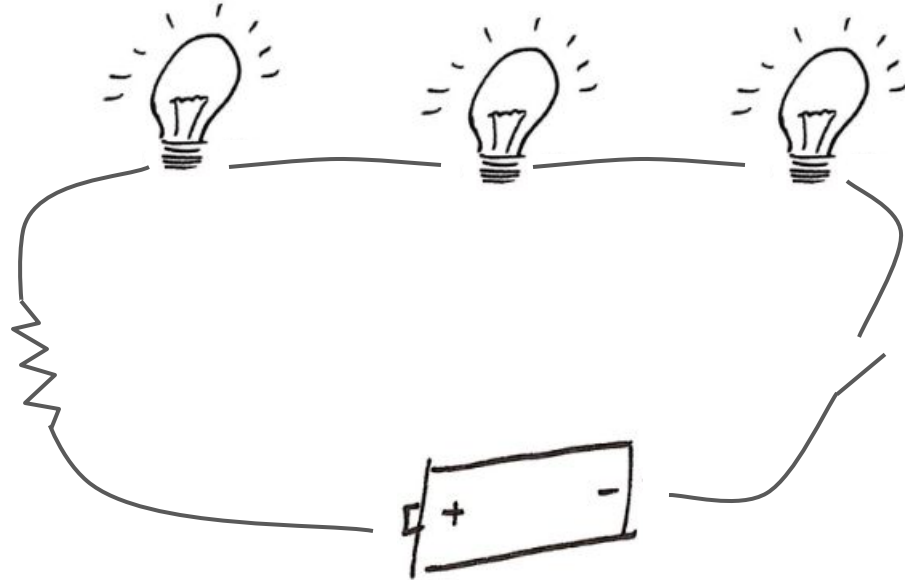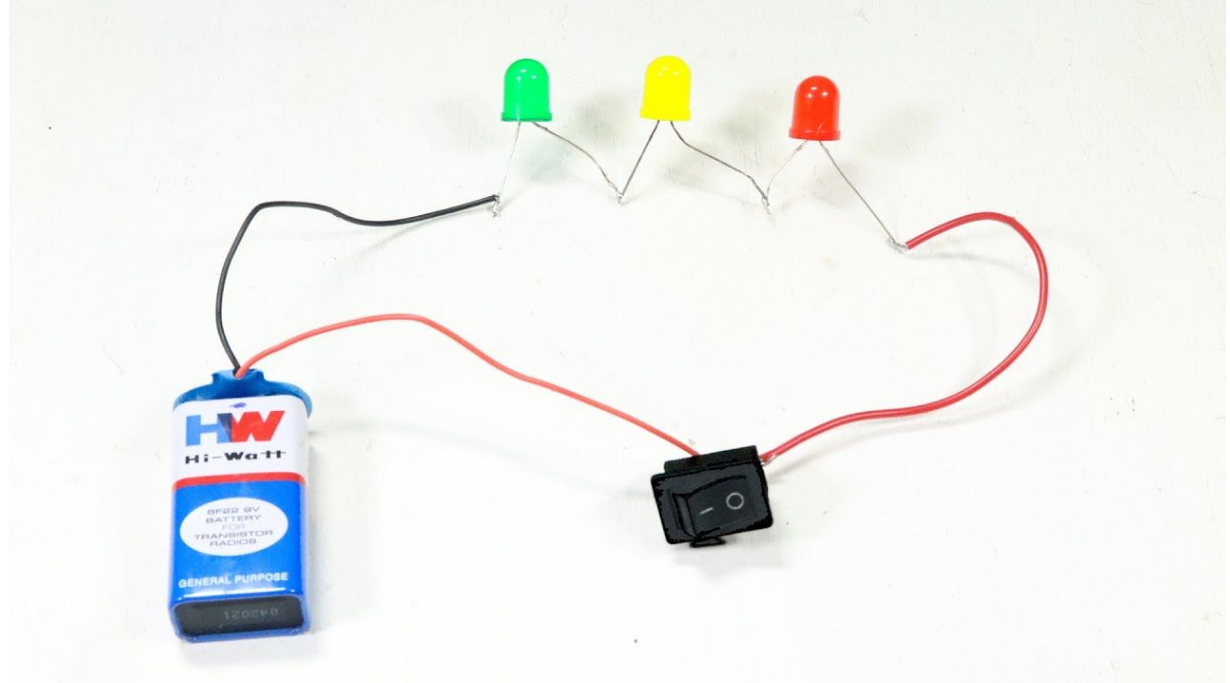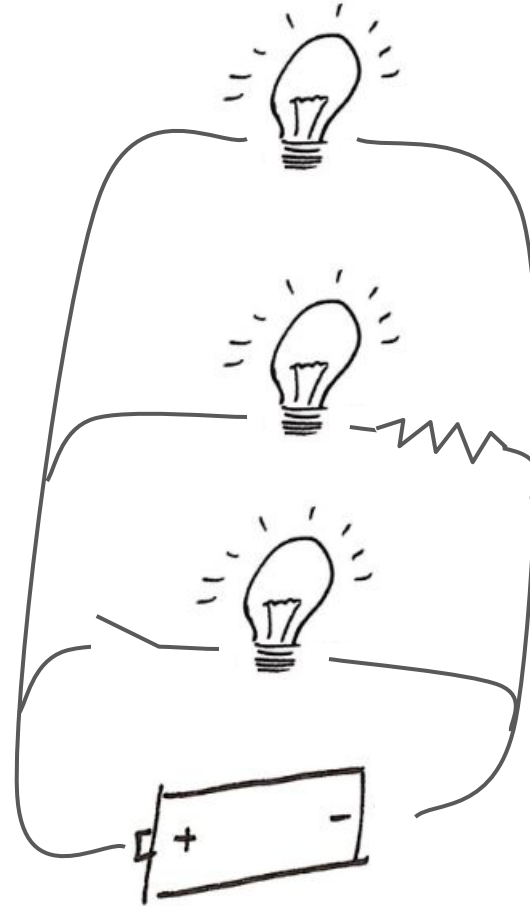Series circuit means we connect the loads one after the other.

- The current has to flow through one before continuing to the next

- The loads have to have the same electrical consumption

- If one load fails, the circuit won't be complete and none of them will work

- A switch will turn all of them off together

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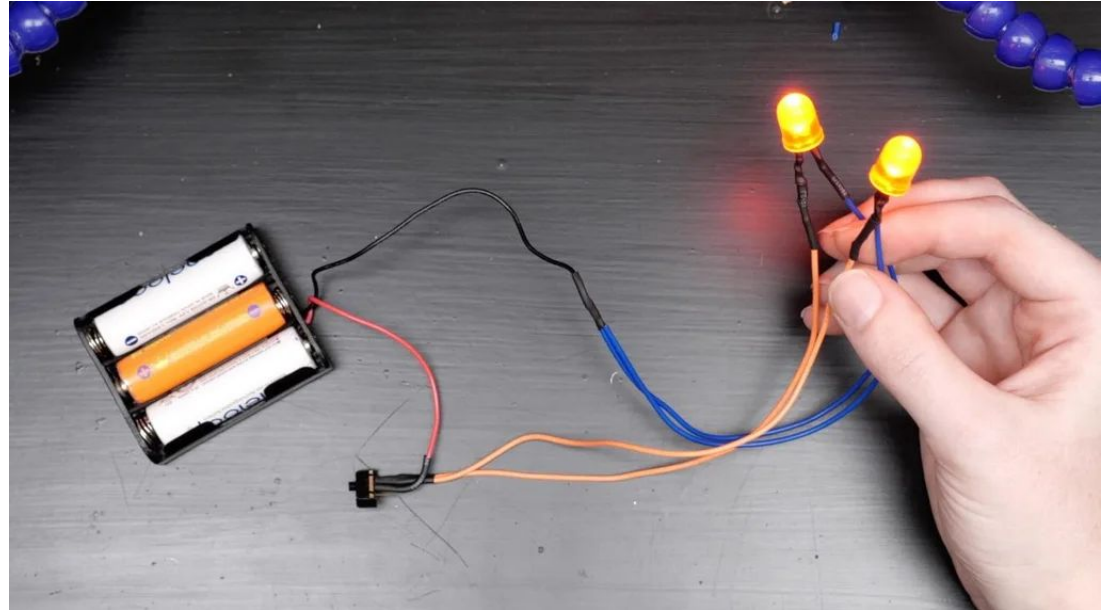connect the loads in different
loops

- The current flows
  separately to each load

- If one load fails, the other
  will still work

- We can place a switch to
  control each separately

- Each load can have a
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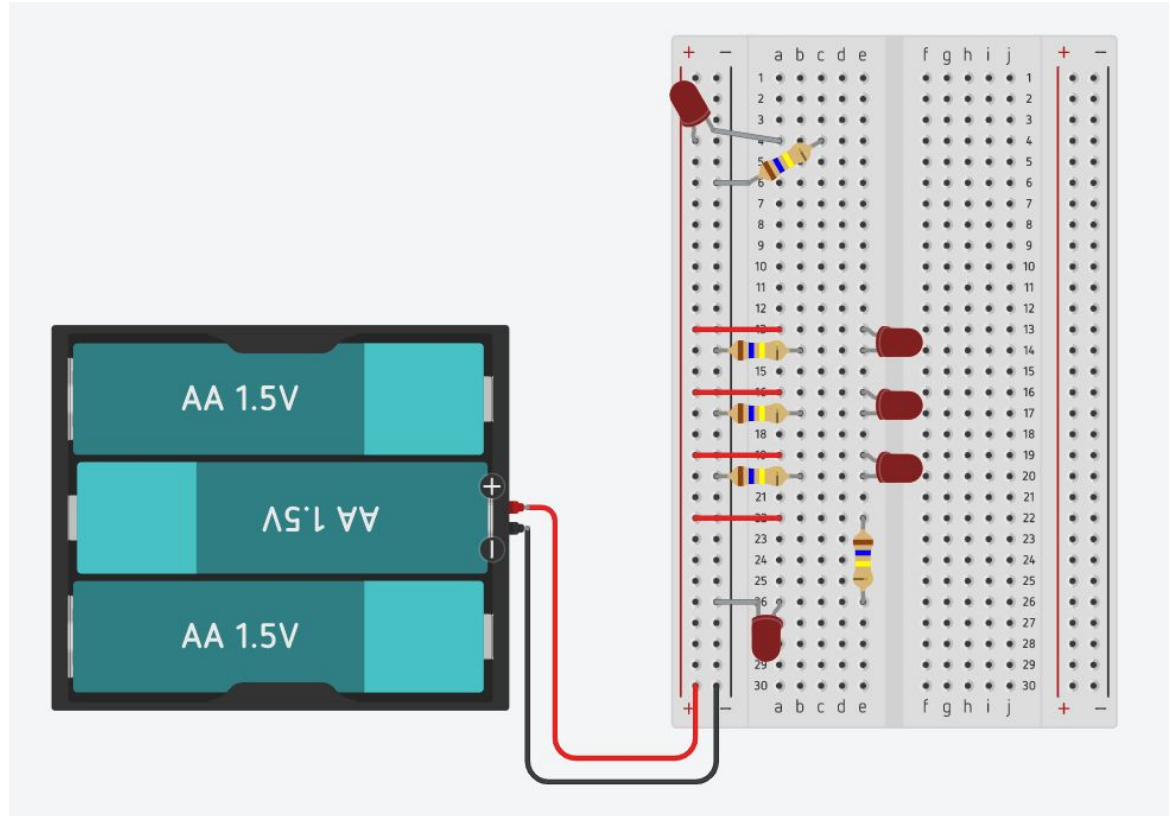Breadboards are used to simplify wiring for either type of circuit, but especially for parallel circuits.

We connect the source power ('+', V) to the red line, and the ground ('-') to the blue line.

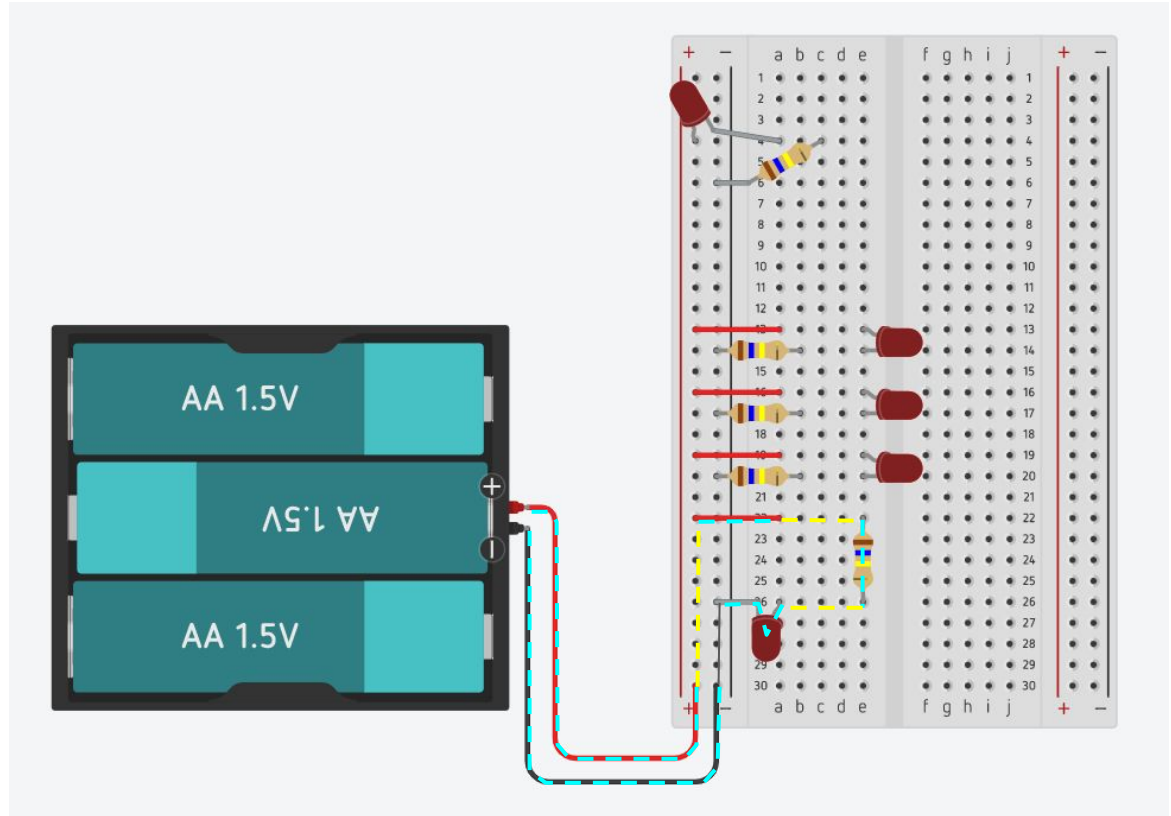This allows us to connect (almost) as many loads as we want.
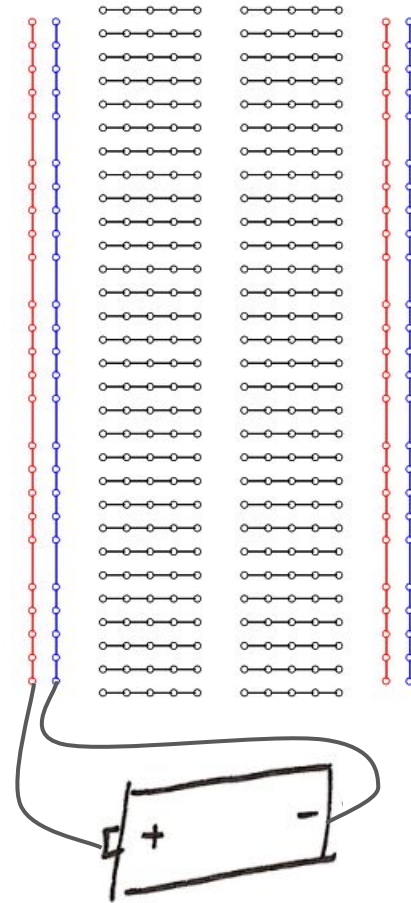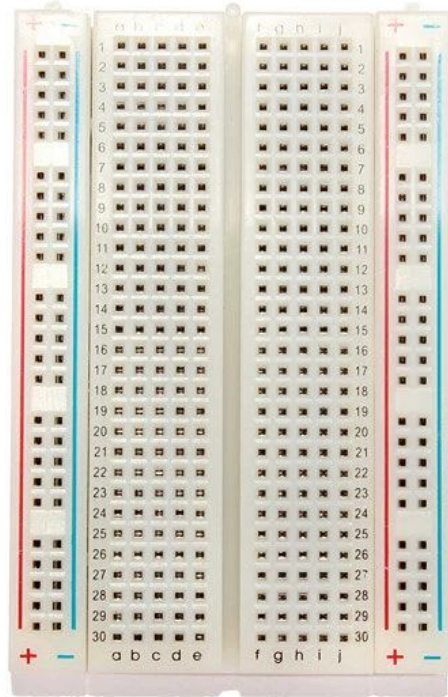
We can use the breadboard in all sorts on ways, and they will all work as long as the load connects to the + line and the - line.

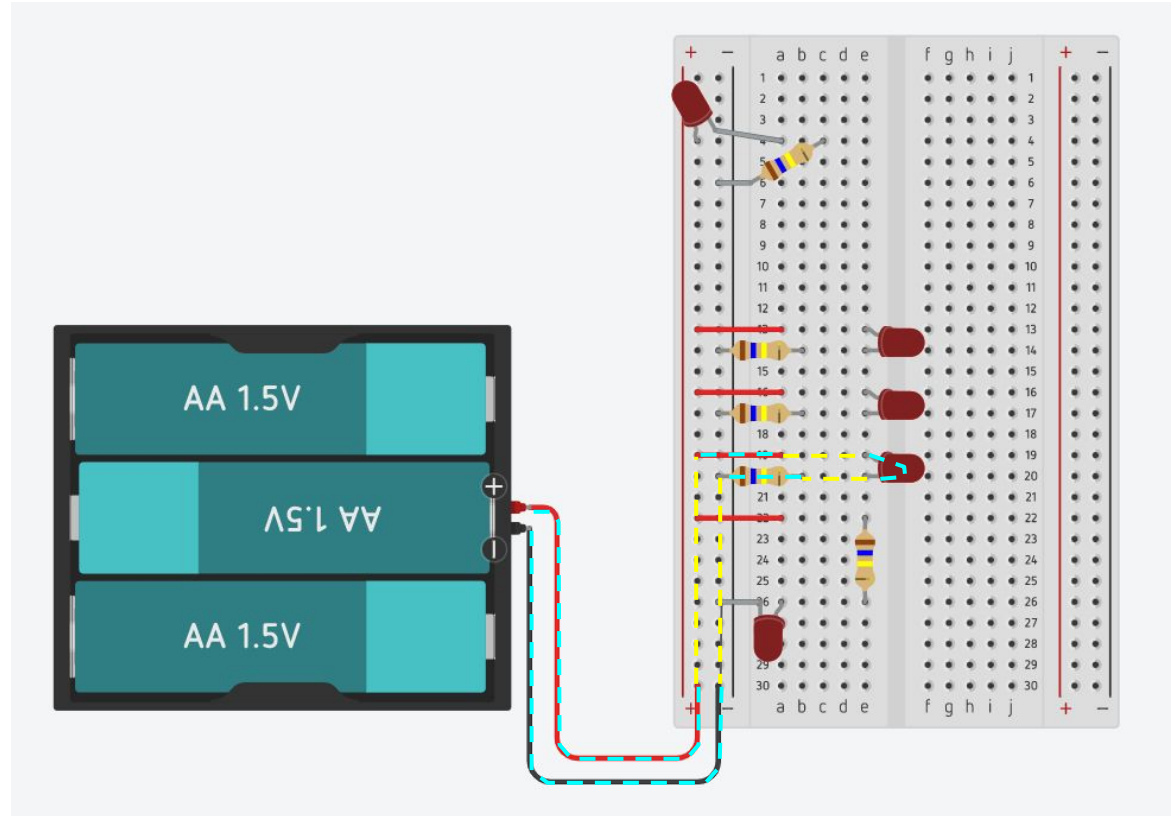The circuit will be completed by our elements, and connections inside the breadboard.

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