

# Year 8 Electronics

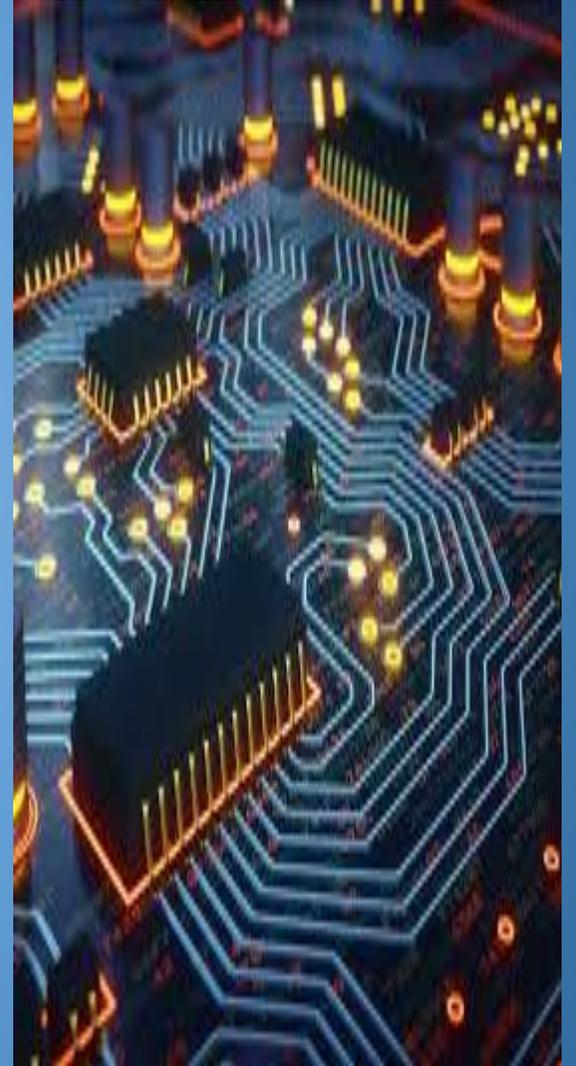


**In this weeks lesson you will learn:**

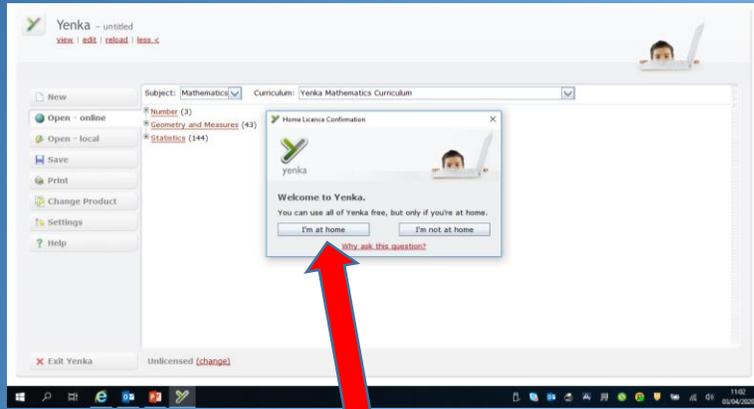
- What is a series circuit
- What is a parallel circuit
- How resistance can effect the current in a circuit

**PLEASE NOTE:** To be able to use Yenka for a continued period of time you will need to verify your email address. When you registered your free Yenka download a verification email will have been sent to you. Go to that email and click the verification link. If you didn't get the email, download the Yenka program again and register your email address. If you cannot find the email check your spam.

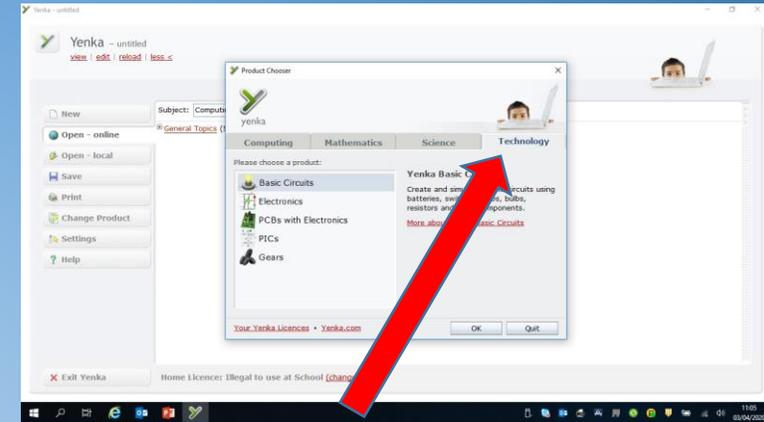
If you have been unable to download Yenka then you should draw out the circuits, make the appropriate notes beside each circuit diagram and answer the questions. All the information needed to answer the questions will be given on the following slide.



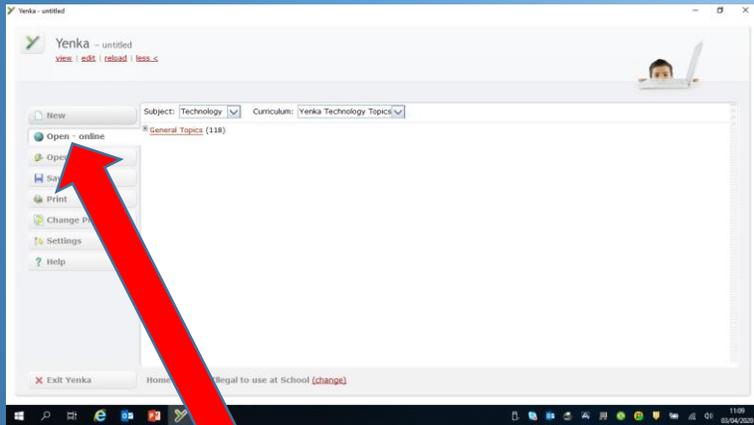
# Year 8 Electronics



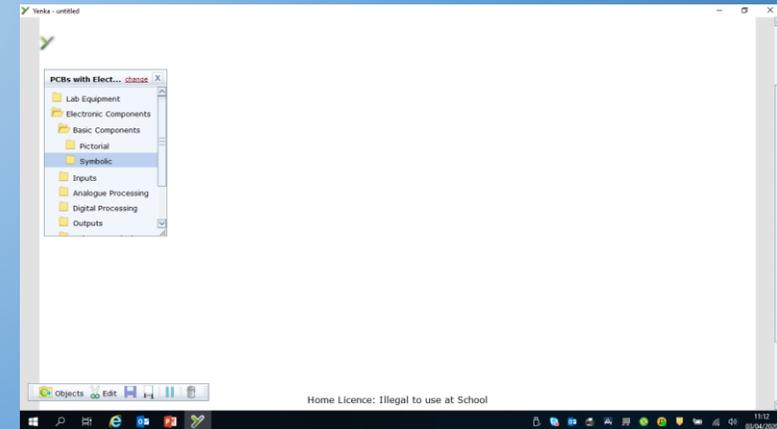
1: Opening up Yenka for continued use. Double click on the Yenka icon and then select "Im at home".



2: Select the "Technology" Tab and then the "PCB's with Electronics" option. Then click "OK".

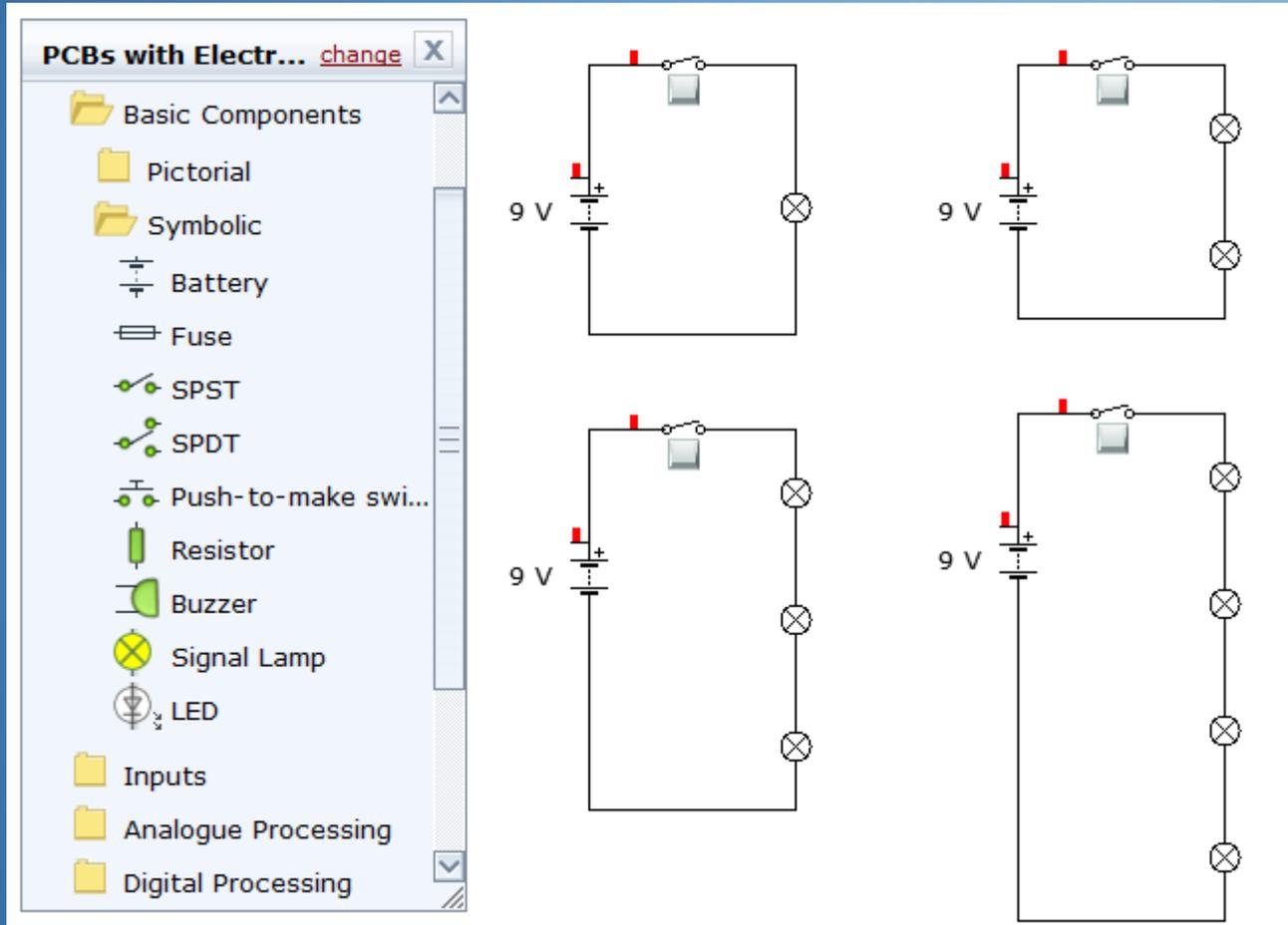


2: Select the "New" tab on the left hand side.



2: Select "Electronic Components", then "Basic Components" and finally "Symbolic". This is you ready to start.

# Year 8 Electronics - Series circuits



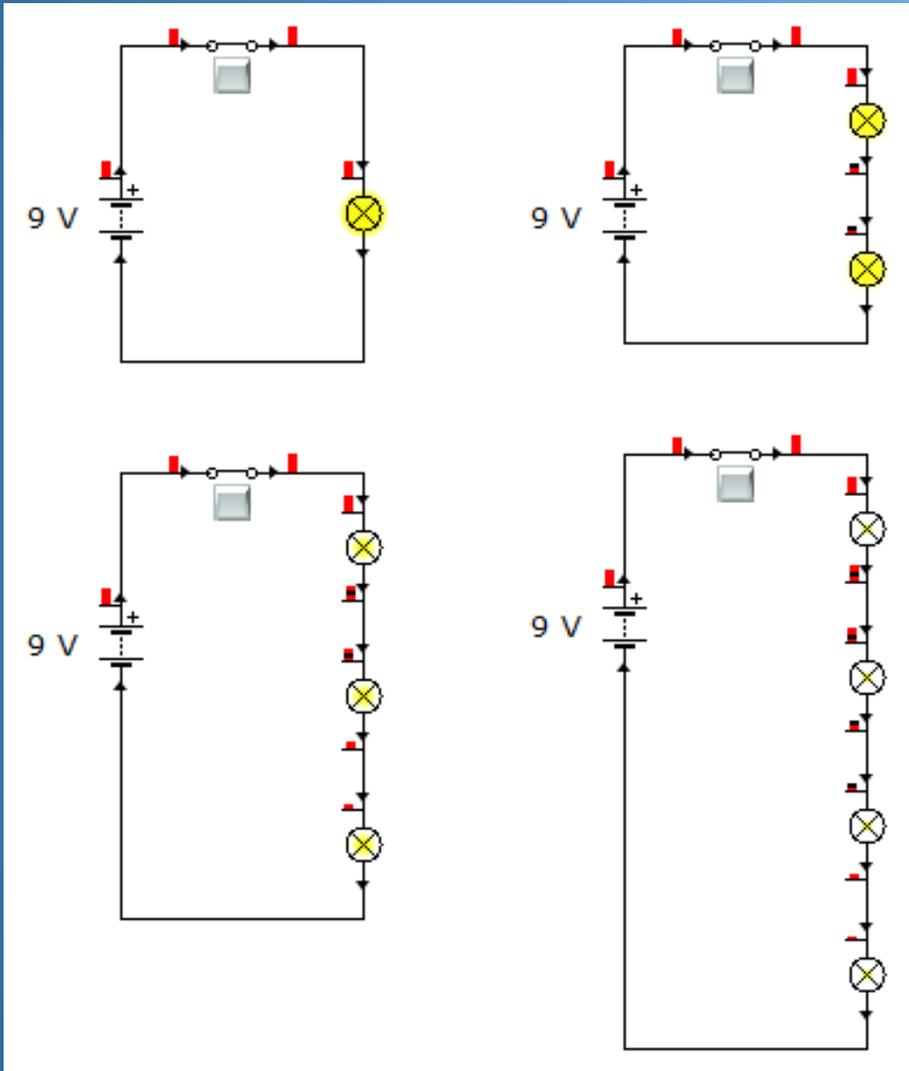
A circuit is described as a "Series" circuit when all the components are connected together in one single loop.

## TASK 1:

Use the bank of components to connect the four different circuits shown.

Switch on all the switches and describe how the brightness of the bulbs have been effected by the having more bulbs in the circuit?

# Year 8 Electronics - Series circuits



You should have noticed that the more bulbs that are in the circuit the duller they become?

## TASK 2:

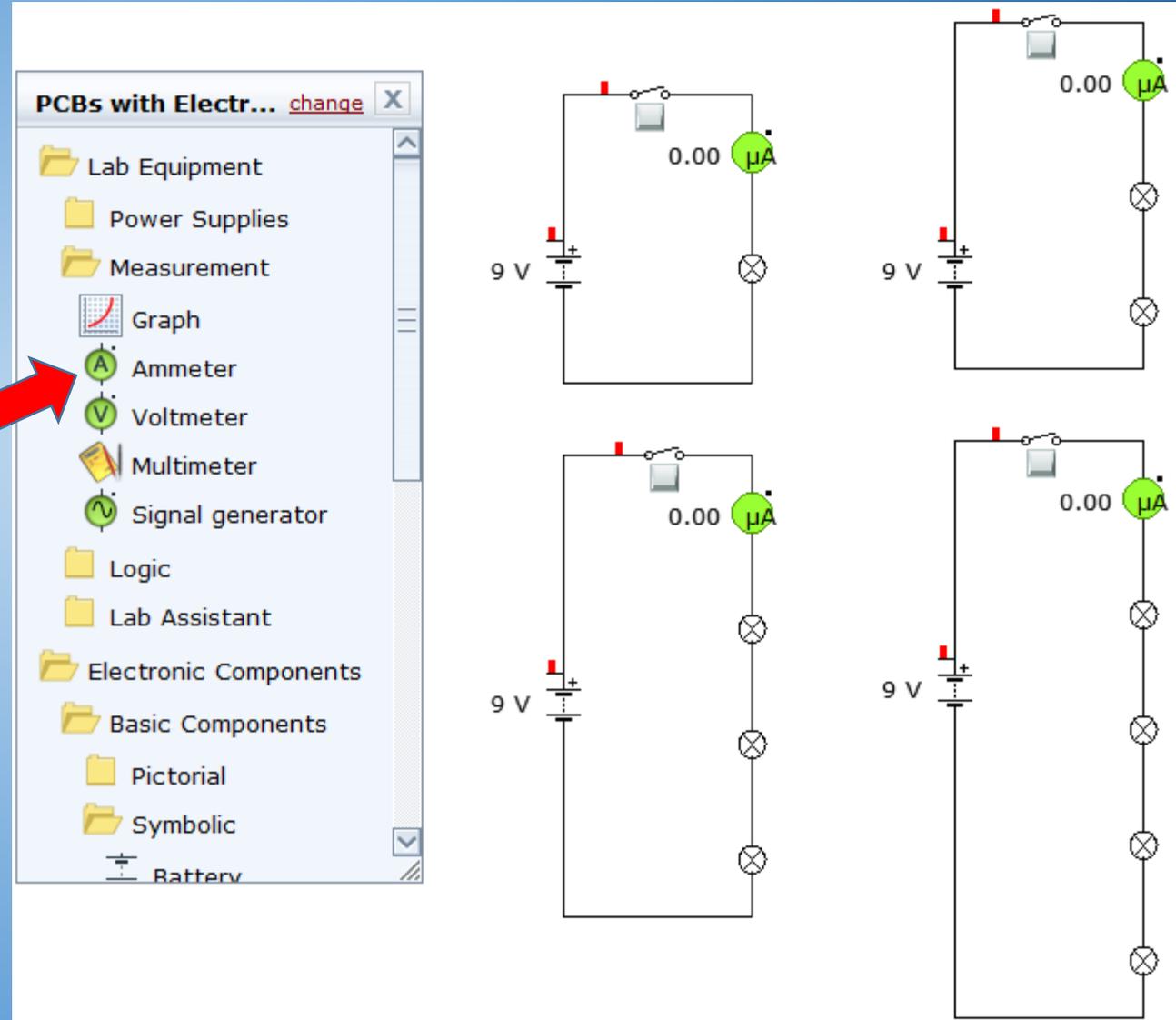
How many bulbs do you need to add before none of them light up?

# Year 8 Electronics - Series circuits

## TASK 3:

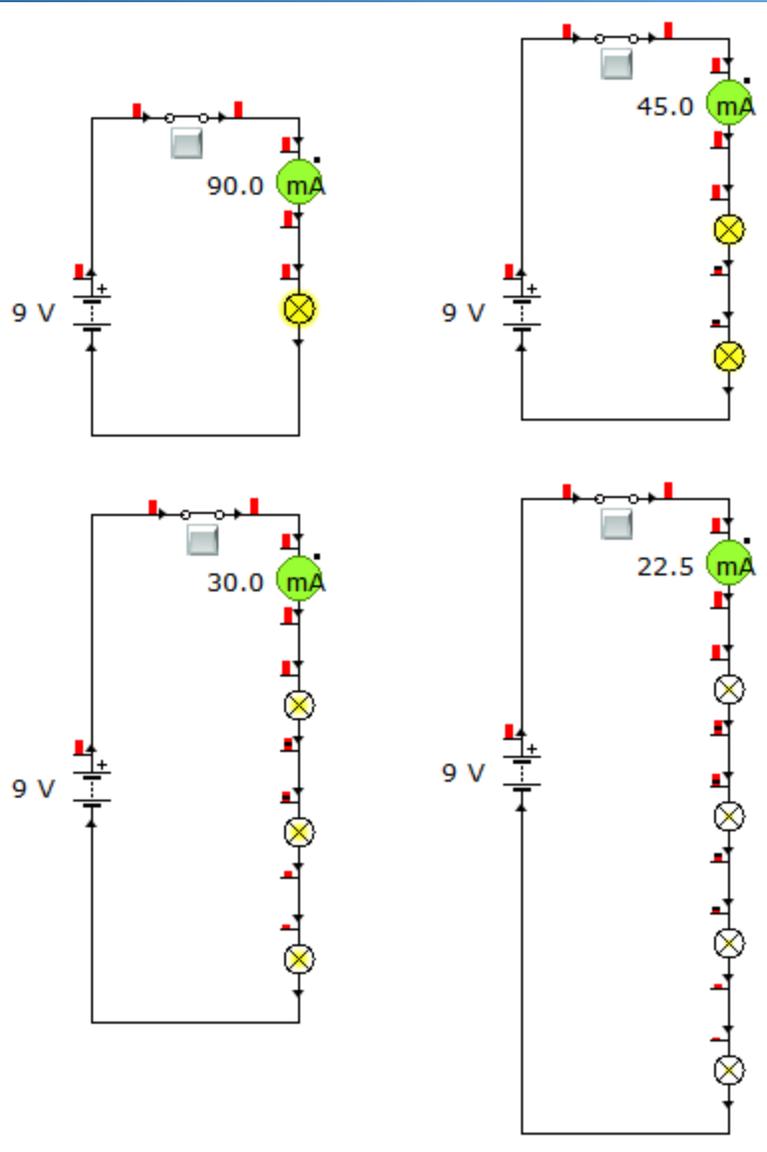
Use an Ammeter, this is a device used to measure how much current is flowing in a circuit. Connect it into the circuits as shown and fill in the table below. Remember current is measured in Amperes (A) but because we are using a small battery we tend to work in MilliAmps (mA)

The Ammeter can be found in the measurement folder .



Voltage	Number of bulbs	Ammeter Reading in mA
9	1	
9	2	
9	3	
9	4	

# Year 8 Electronics - Series circuits



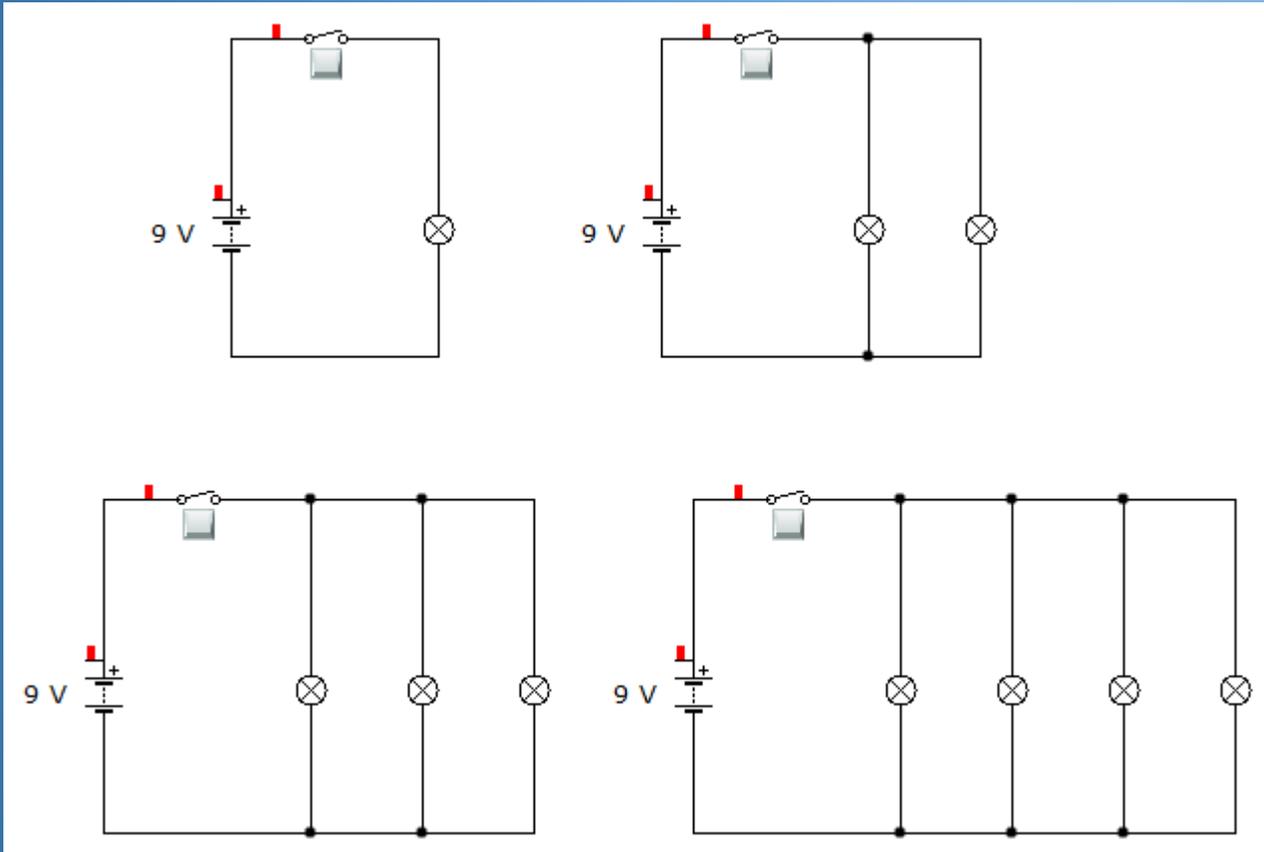
Hopefully you have realised that the more bulbs you put into the circuit the less current you will have.

The reason for this is because each of the bulbs creates **resistance** within the circuit. The poor battery is having to work harder to push the current around. The more **resistance** you have in a circuit the less current you will have.

Each time we add a bulb in series (in a row) the more resistance we are adding, therefore reducing the overall current in the circuit. **This is the main disadvantage of Series circuits.**

**Another disadvantage is that if one of the bulbs were to break none of the other bulbs would light.**

# Year 8 Electronics - Parallel circuits

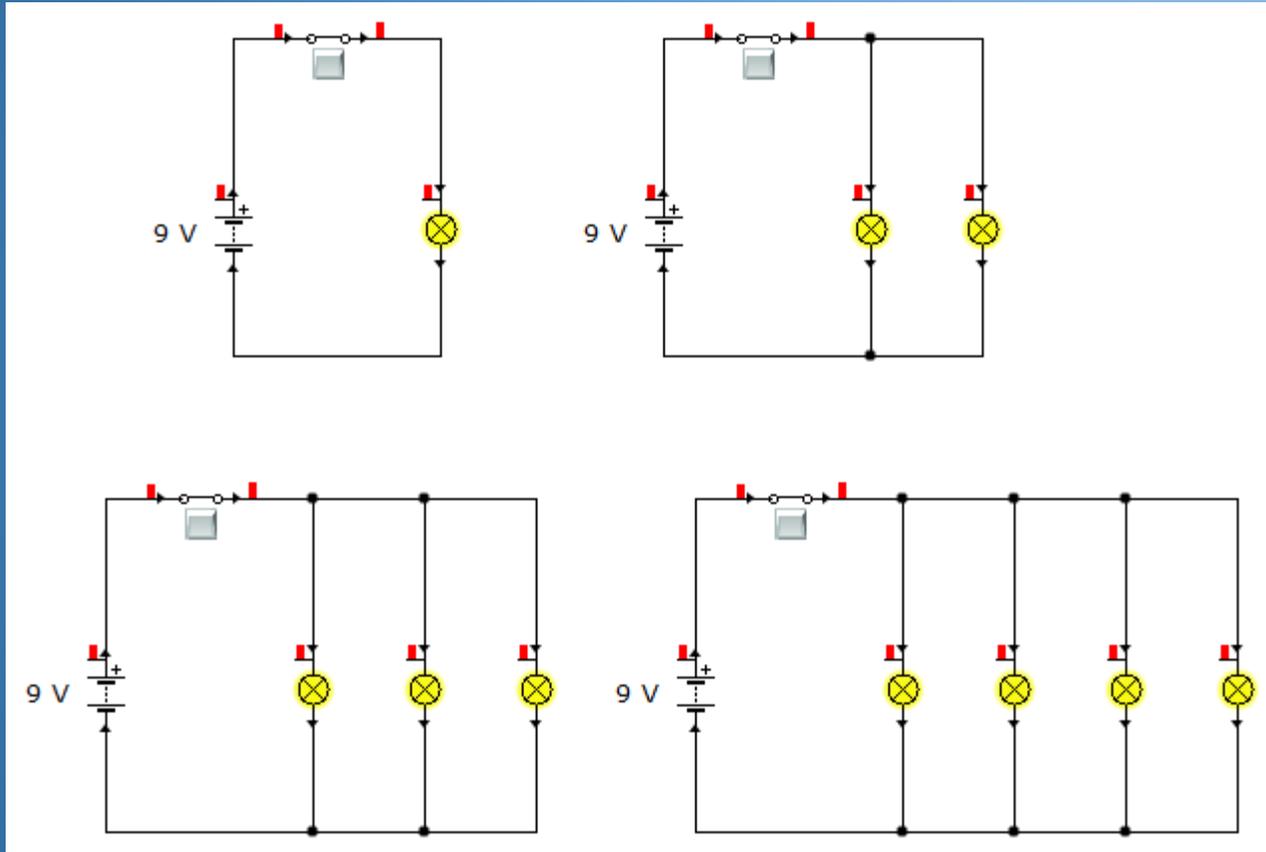


## TASK 4:

Use the bank of components to connect the four different circuits shown.

Switch on all the switches and describe how the brightness of the bulbs have been effected by the having more bulbs in the circuit?

# Year 8 Electronics - Parallel circuits

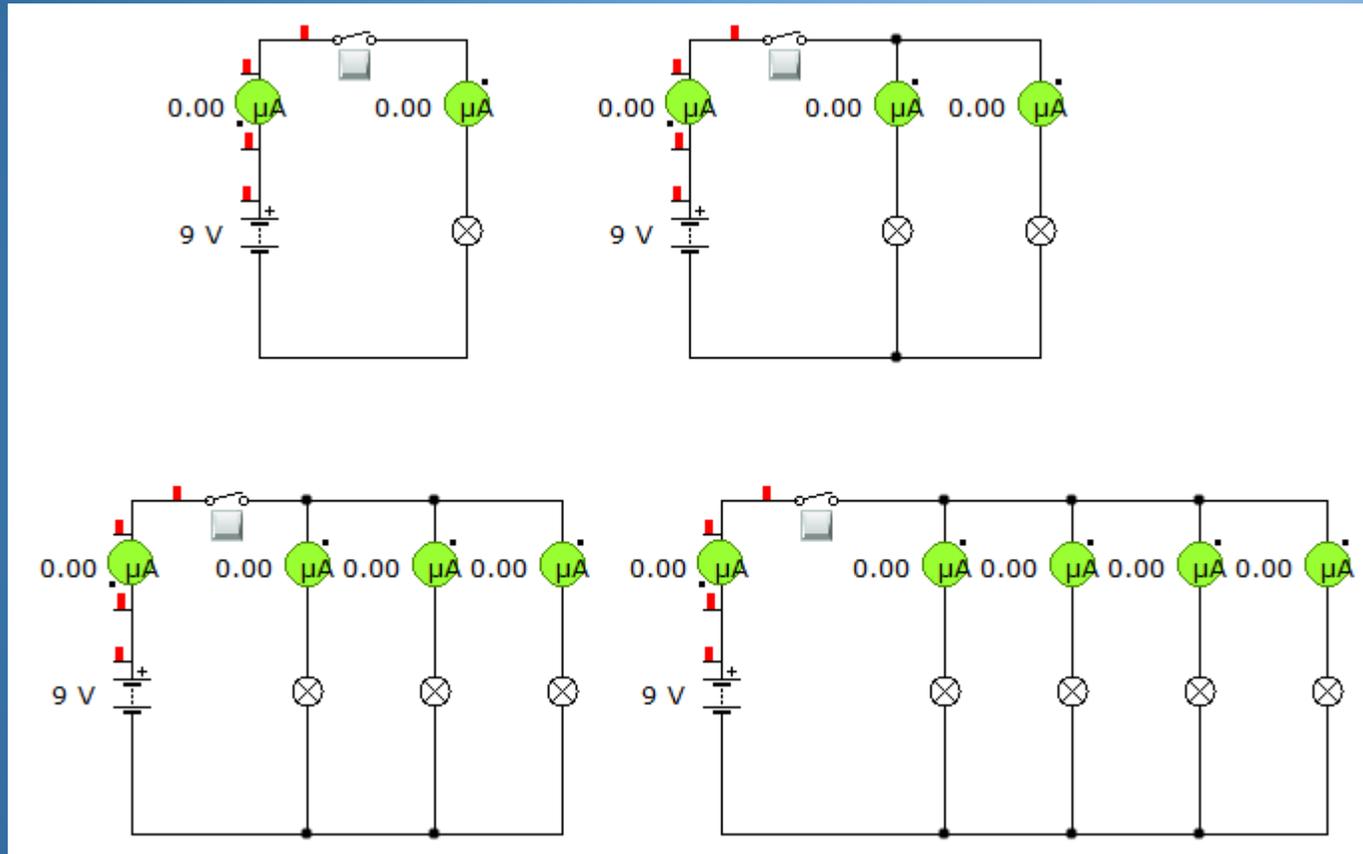


You should have noticed that the bulbs are all the same brightness?

## TASK 5:

If you added twenty bulbs would their brightness still be the same?

# Year 8 Electronics - Parallel circuits

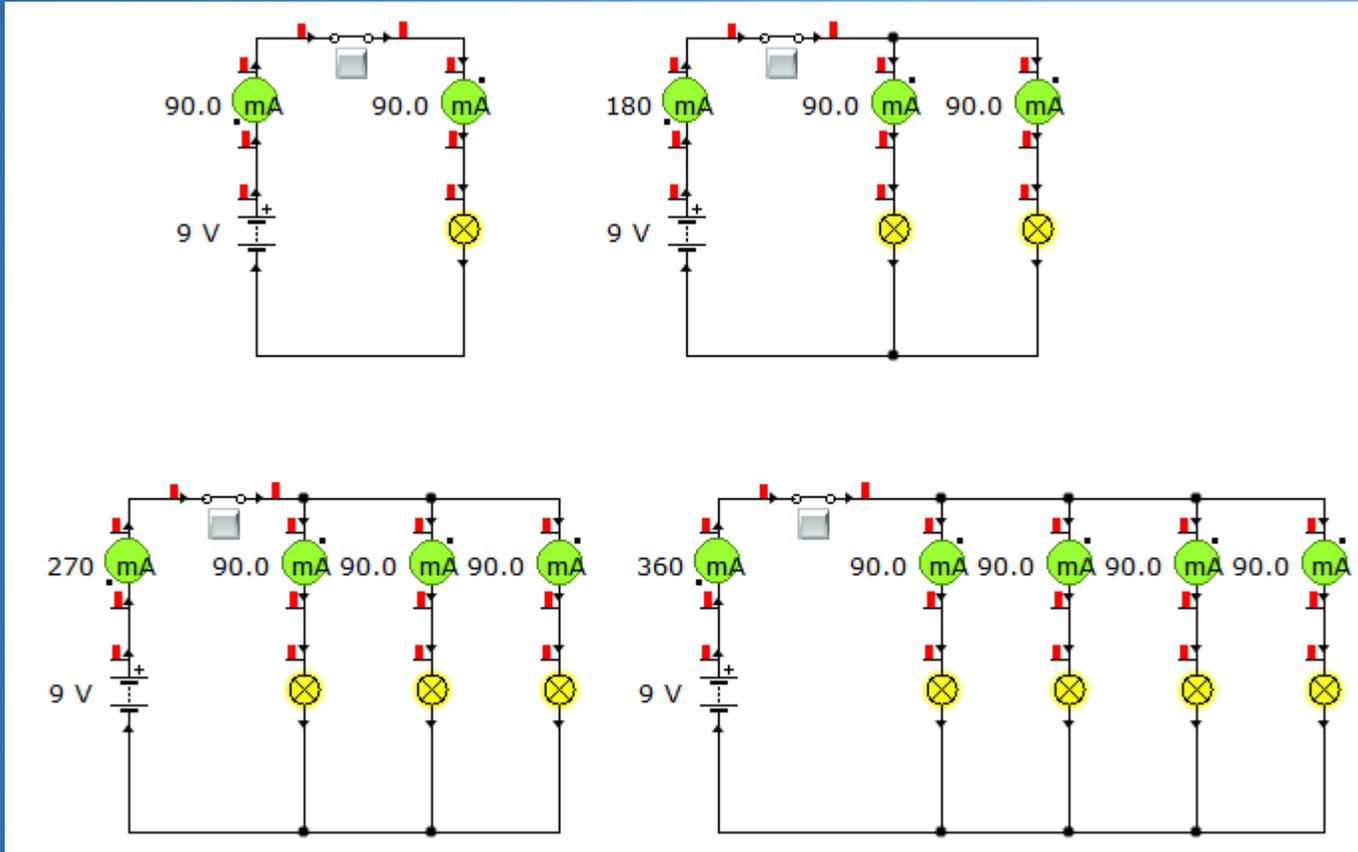


## TASK 6:

Use the Ammeter to see how much current is flowing in each of the circuits. Connect it into the circuits as shown and fill in the table below. The reading you should use in the table is from the Ammeter that is positioned directly after the battery.

Voltage	Number of bulbs	Ammeter Reading in mA just after the battery
9	1	
9	2	
9	3	
9	4	

# Year 8 Electronics - Parallel circuits



In a parallel circuit there is more than one path for Voltage and Current to take. As a result, a lot more current can flow in a Parallel circuit. This makes it ideal for powering more than one device. Notice how all the bulbs now get a full 90mA each so they are all fully lit. **This is the main advantage of Parallel circuits.**

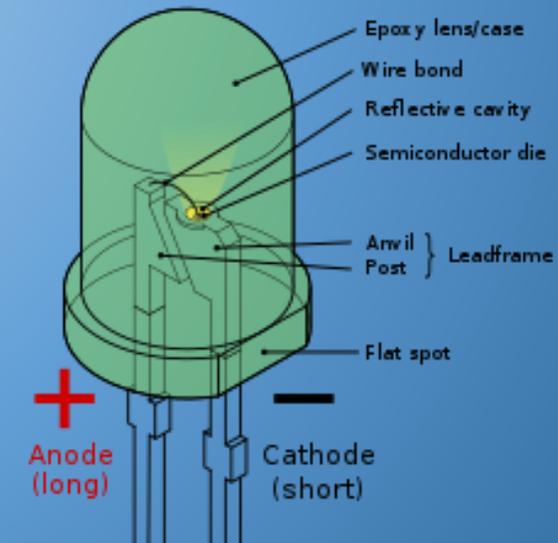
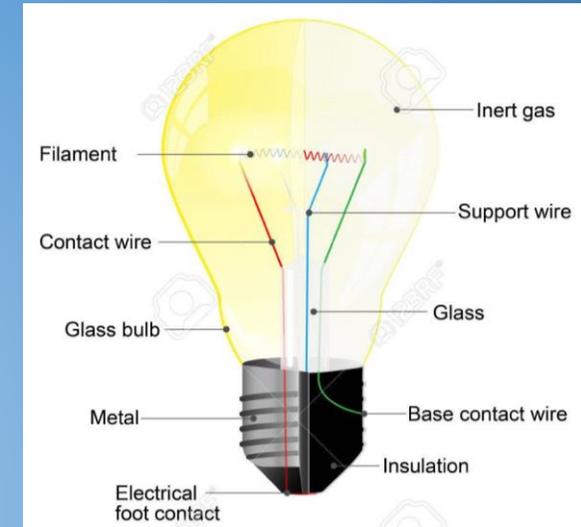
**The other advantage to parallel circuits is if one bulb breaks the others can still work.**

# Year 8 Electronics - Creating light

A bulb is not the only way to create light in an electronic circuit. An alternative to a bulb is using a Light Emitting Diode (LED).

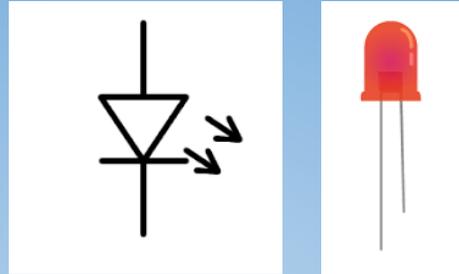
## Why use LED's instead of bulbs?

1. An LED uses approximately 90% less energy to fully light so in the long run they are much cheaper for you to use. Remember you pay for all your electricity.
2. Because they use 90% less energy they are much better for the environment.
3. They last approximately 40 times longer than a standard incandescent light bulb.
4. They come in an almost endless range of colours.
5. They can come in very small sizes.



# Year 8 Electronics - Creating light using an LED

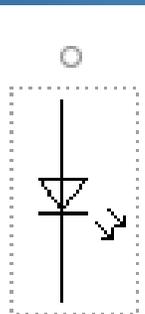
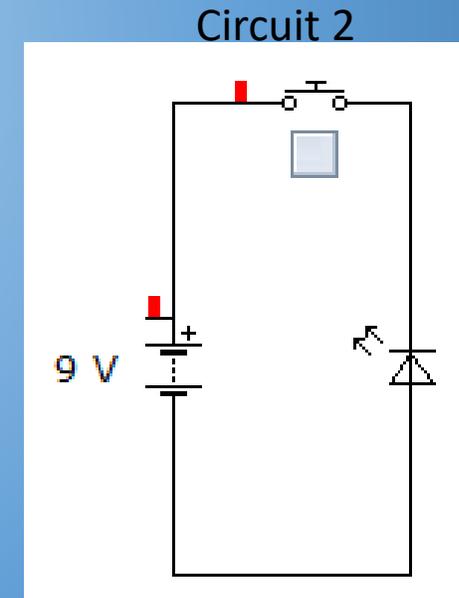
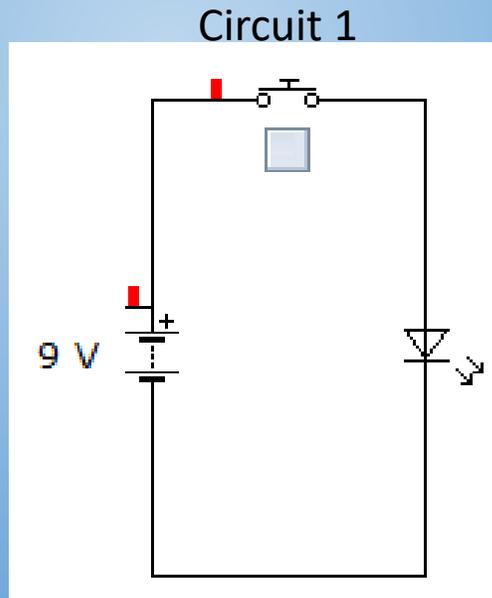
The circuit symbol for an LED is shown here.



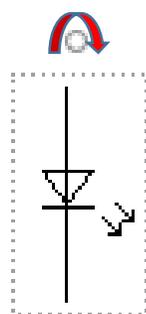
## TASK 7:

Use Yenka to simulate the two circuits shown. Then switch them on using the Push to Make switch.

What happens when you press the switch on both circuits?



To rotate the LED click on the symbol and then use the dot at the top to rotate.



# Year 8 Electronics - Creating light

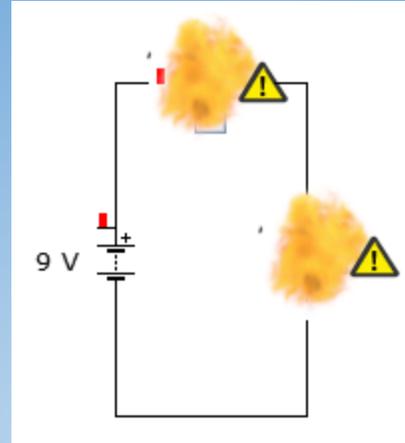
## Circuit 1.....OH DEAR!!!

When you pressed the switch on the first circuit the LED blew up. It doesn't actually blow up in real life but it does break and stop working.

### Why does it break?

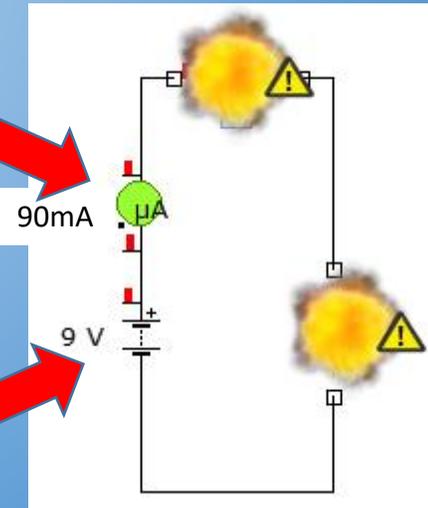
It stops working because it only requires a tiny amount of energy to light up. To be more exact, it only needs 3v and 30mA to fully light. Can you see the problem in the circuit?

In this circuit you are using a 9v battery but the LED can only take 3v!!! The 9v battery also pushes 90mA but the LED only needs 30mA.



90mA is  
too much  
current

9v is too  
much  
voltage



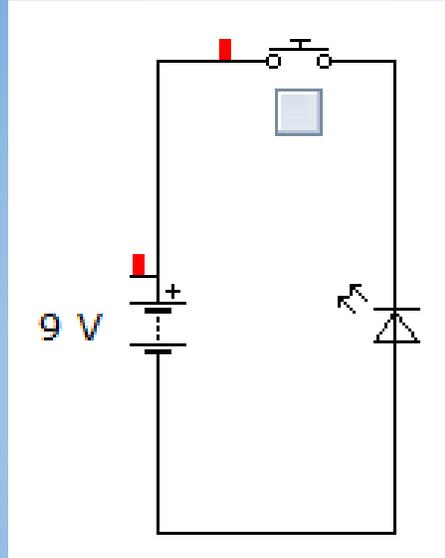
# Year 8 Electronics - Creating light using an LED

## Circuit 2.....OH DEAR!!!

When you pressed the switch on the second circuit the LED didn't light up.

### Why did it not light up?

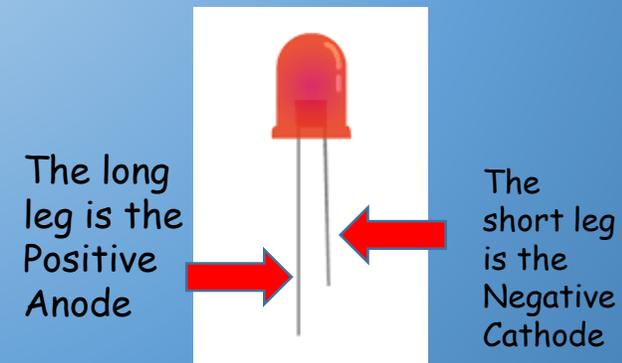
The LED is a polarised component, meaning it has a positive and a negative. A bit like a battery, **an LED must go into the circuit the correct way round or it will not work.**



The arrow part of the LED symbol is a great way to see what direction the voltage and current can flow through it. In the circuit you just connected up the arrow is pointing in the opposite direction to the flow of voltage and current therefore it is the wrong way round and wont work.

The positive side of the LED is given the technical name Anode and the negative is called the Cathode. The symbol shows you which side is which.

So how do you identify the Anode and Cathode in an actual LED?



# Year 8 Electronics - Creating light using an LED

## How can you use an LED in a 9v circuit?

To help use a LED in a circuit you will need to use a new component called a resistor.

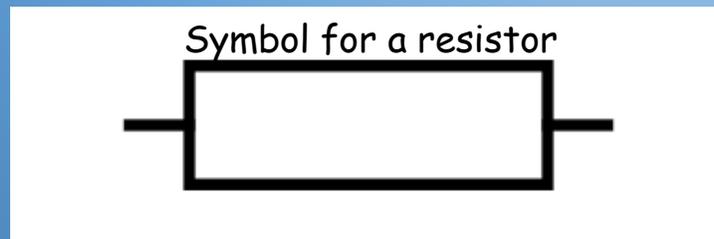
A resistor has two main functions:

1. To reduce the amount of current flowing in a circuit.
2. To create a voltage drop.

This is perfect to help us use the LED because it needs less current so that it doesn't break.



Real life resistor

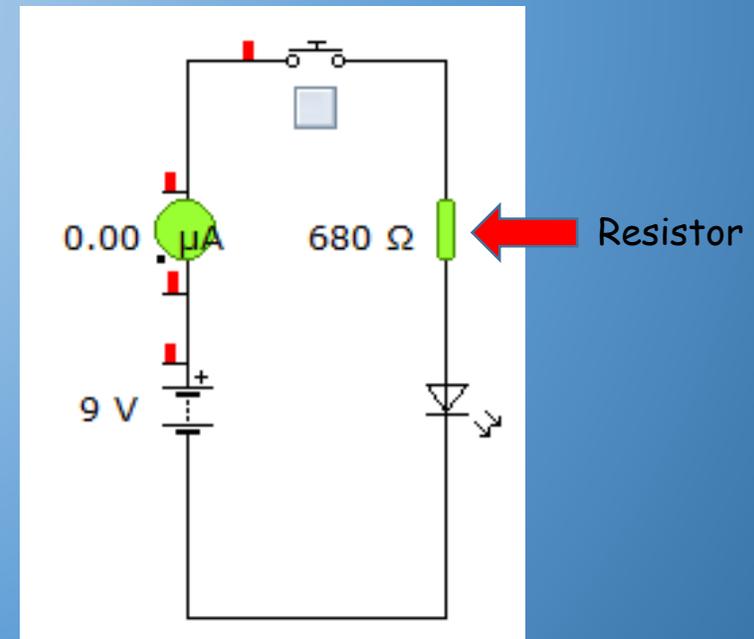


Symbol for a resistor

## TASK 8:

Use Yenka to simulate the circuit shown below. Then switch it on using the Push to Make switch.

What happens this time when you press the switch?



# Year 8 Electronics - Creating light using an LED

Are Resistors like wooly hats... One size fits all? NO!!!



Resistance is measured in OHMS and is given the symbol  $\Omega$ . So a resistor can come in a whole range of values from 1 to literally millions.

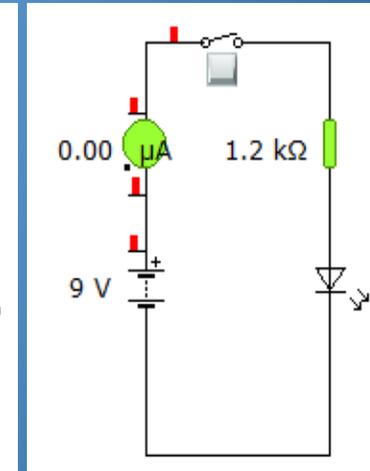
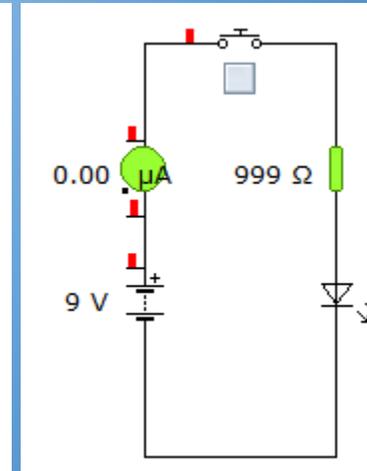
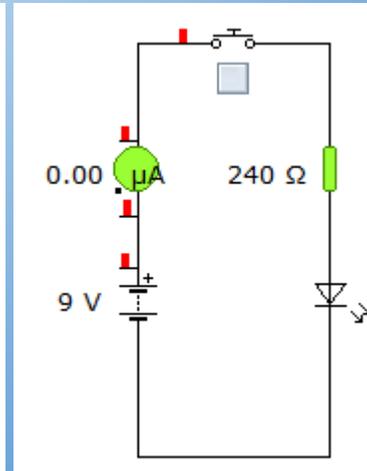
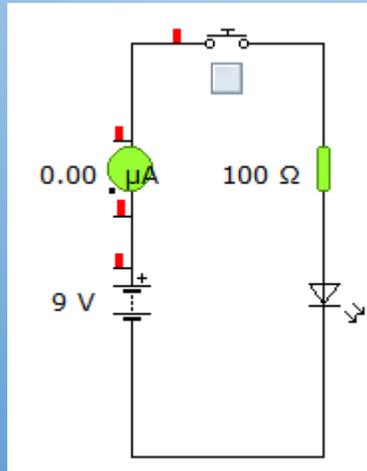
## TASK 9:

Use Yenka to simulate the four circuits shown. Then switch it on using the Push to Make switch.

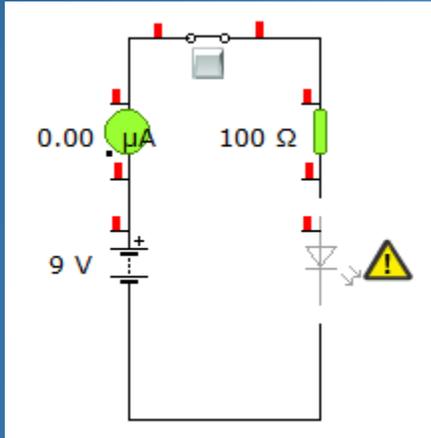
How does the resistor value effect the light from the LED?

Fill in the table to show how much current flowed in each of the circuits.

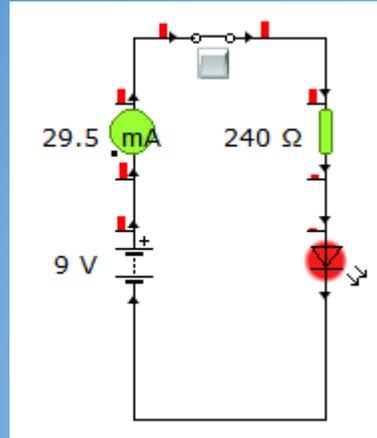
Voltage	Size of resistor	Ammeter Reading in mA just after the battery
9	100	
9	240	
9	999	
9	1.2K (1200 $\Omega$ )	



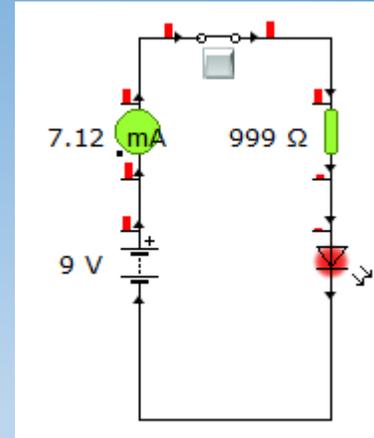
# Year 8 Electronics - Creating light using an LED



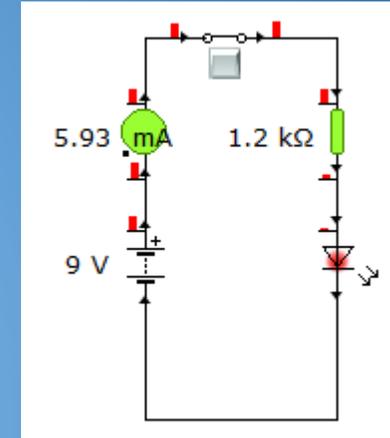
In Circuit 1 the resistor is not big enough to reduce the current enough to protect the LED. Remember the LED only needs 30mA. So in this circuit the LED still failed.



In Circuit 2 the resistor is almost perfect to protect the LED. Remember the LED only needs 30mA and with this 240Ω resistor 29.5mA is reaching the LED so it is fully lit.



In Circuit 3 the resistor is too big for the LED. Remember the LED only needs 30mA and with this 999Ω resistor only 7.12mA is reaching the LED so quite dim.



In Circuit 4 the resistor is way too big for the LED. Remember the LED only needs 30mA and with this 1.2KΩ (1200Ω) resistor only 5.93mA is reaching the LED so even dimmer.

**Lesson learned: The bigger the resistor the less current will flow.**