9 Adding to the loop

You can have as many bulbs in a circuit as you like. You just need to match them to the batteries.

When you connect up electrical equipment using a single loop, you are making a **SERIES CIRCUIT** (Picture 1).

In a series circuit, the same amount of electricity flows through each bulb, and so they all glow with the same brightness. If there are too few batteries or too many bulbs, all the lights are dim. The electricity is NOT all used up by the first bulb, leaving nothing for the next.

Instead, the bulbs have to share the electricity, so there is not enough electricity to light up the bulbs brightly.

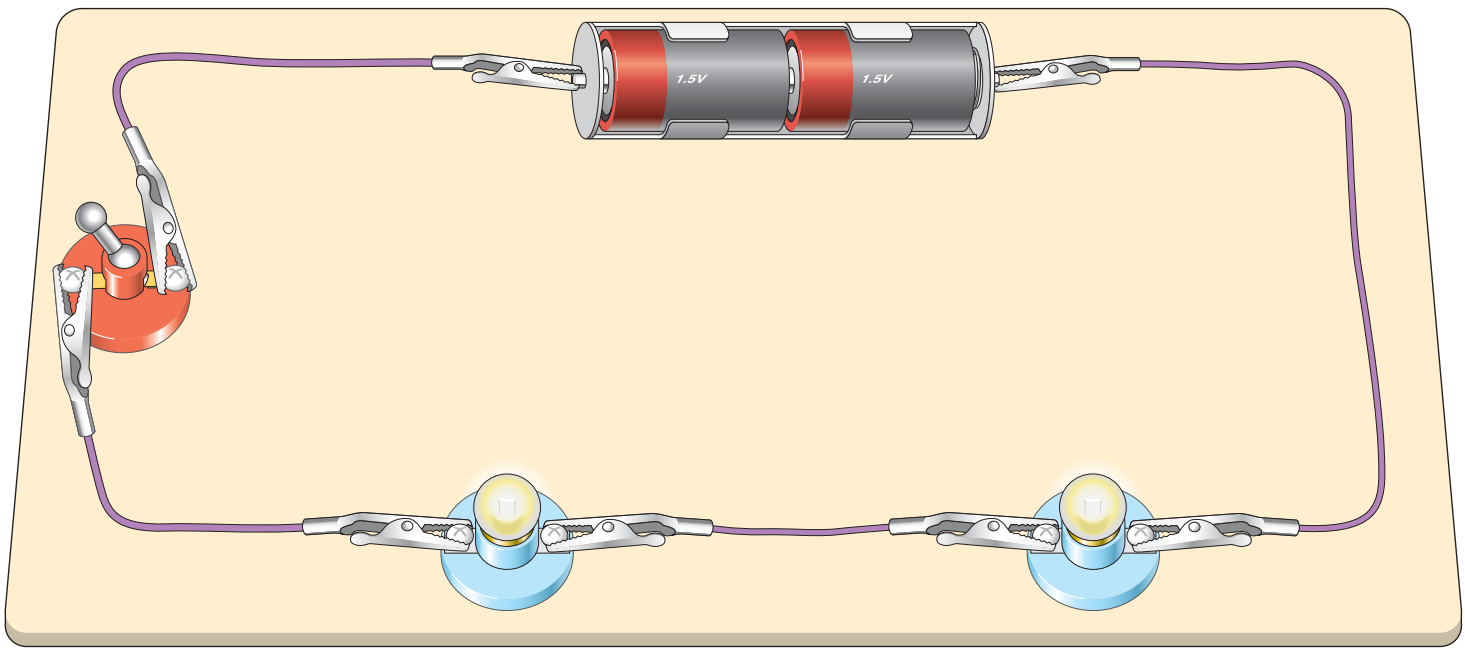
Adding bulbs

Picture 1 shows two batteries connected in a loop to a switch and two light bulbs. Notice that both of the light bulbs form part of a single loop.

If you were to make this circuit and switch it on, you would find the bulbs shine with a dimmer light than if the circuit had just one bulb.

This shows that, the more bulbs (or any other components) you have strung together in a line (in series), the more batteries are needed to keep the items working at full strength.

▼ (Picture 1) This is a series circuit with two bulbs (3V + 3V = 6V) in a continuous loop with two batteries (1.5V + 1.5V = 3V). The voltages do not match, so the bulbs are dim.



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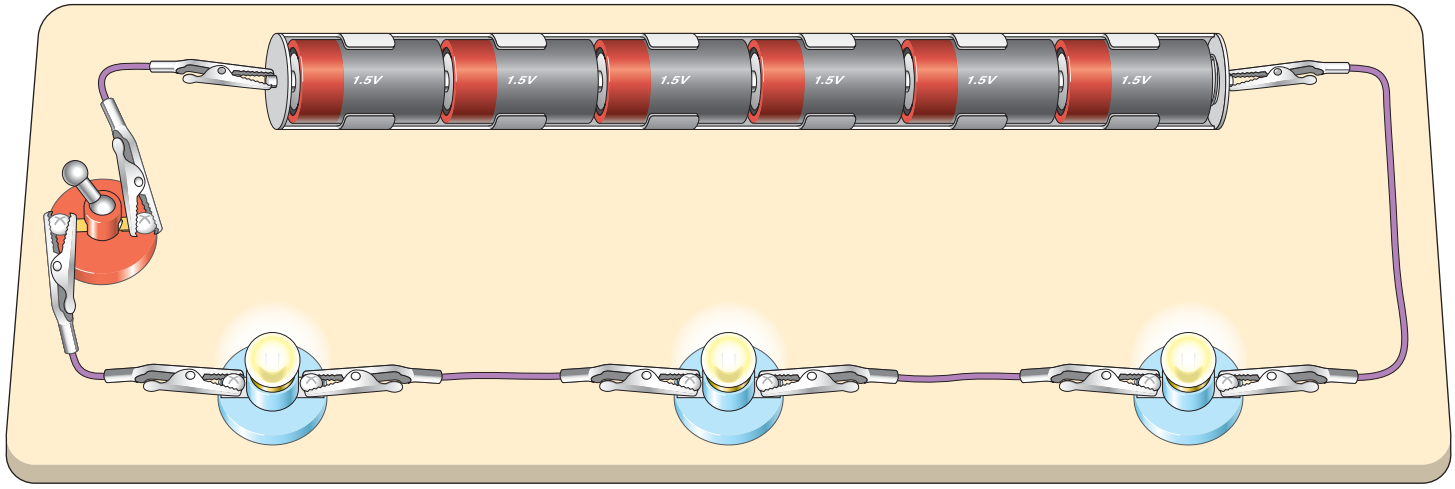
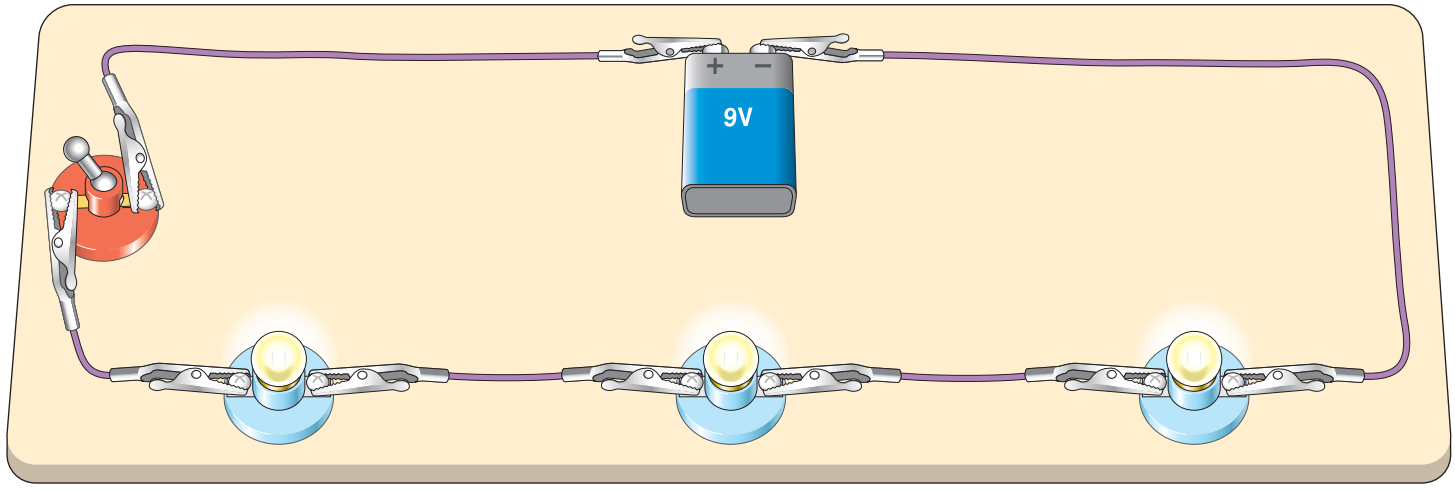


▲ **(Picture 2) A series circuit with six 1.5V batteries (1.5+1.5+1.5+1.5+1.5+1.5=9V) and three 3V bulbs (3+3+3=9V). The sum of the voltages match, so the bulbs will shine brightly.**



▲ **(Picture 3) How does this work? There are three bulbs and only one battery? The answer is that the battery says 9V on the side!**

Matching batteries to bulbs

To get a bright light, you have to make sure that the sum of all the numbers on the bulbs is the same as the sum of all the numbers on the batteries.

This is shown in Pictures 2 and 3.

As you can see, when there are lots of bulbs in a series circuit, lots of voltage is needed.

Summary

- **A circuit will work best if the sum of the voltage numbers on the batteries matches the sum of the voltage numbers on the bulb.**