

Project: Light-up Greeting Cards

Introduction – 5 minutes

Today we are going to all be Electrical Engineers. Electrical engineering is a field of [engineering](#) that deals with the study and application of [electricity](#) and [electronics](#). Electrical engineers work in teams or individually to design new and better electronics; they also test equipment, solve problems, and design digital computers. Today, we are going to create circuits.

Does anyone know what a circuit is? See if the girls have any answers.

A circuit is a path for electricity. If a circuit is closed, electricity will flow. If a circuit is open, electricity will not flow and an electrical device such as a flashlight will not work. Switches are used to open and close circuits. Electrical power can do things such as make light, sound, and movement.

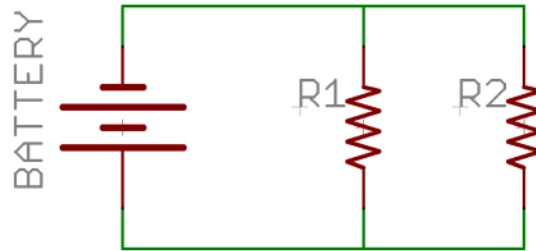
Today we will learn about the 2 most common electric circuits, the series circuit and the parallel circuit. Then, each girl will make a Light-up Greeting Card (series circuit).

In parallel circuits, each light has its own branch, so all but one light could be burned out, and the last one will still function.

In a series circuit, each light must function to complete the circuit. If one light burns out, a series circuit breaks and none of the lights will work.

An electric circuit is described in a picture called a schematic. The schematic is a simple pictorial representation of all the components of the circuit.

Parallel Circuit

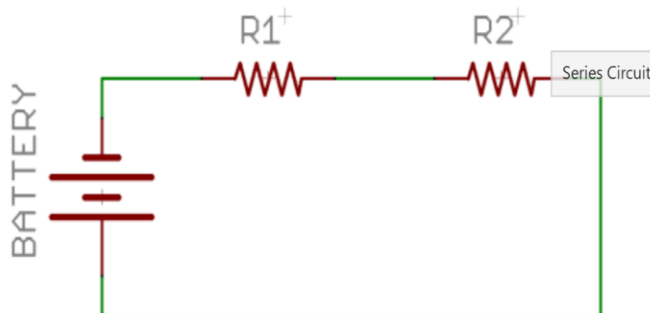


R1 stands for Resistor 1, and is representative of one LED (light emitting diode).

R2 stands for Resistor 2, and represents the second LED.

The battery voltage (V) is the same across R1 and R2. The electric current from the battery flows across both LEDs, half of the current flowing through LED 1 (R1) and half of the current flowing through LED 2 (R2). Note since we are using LEDs with the same (equal) resistance the current is the same across each LED.

Serial Circuit

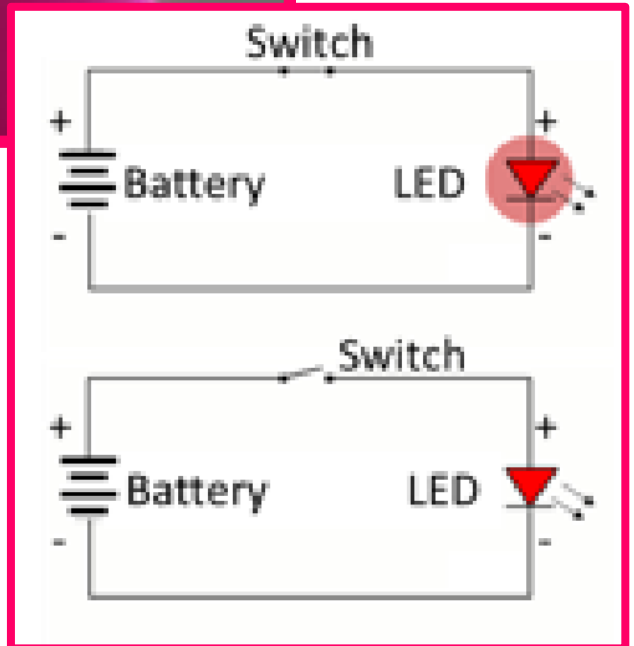


R1 stands for Resistor 1, and is representative of one LED (light emitting diode).

R2 stands for Resistor 2, and represents the second LED.

In a series circuit, current flows through one component then the next component and so on. In a series circuit, the current is the same across every element and the total voltage across each component adds up to the voltage of the battery.

LIGHT UP GREETING CARD INSTRUCTIONS

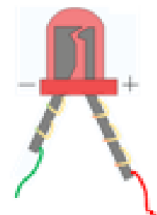


MATERIALS:

- Sandpaper
- Red Wire
- Green Wire
- LED
- Card
- Rectangular Foam Pad
- Battery
- Pencil
- Scissors
- Tape
- Foam decorations
- Square Tracing Paper
- Glue

Series Circuit Holiday Card Instructions:

1. Use sand paper to strip color coating from wire ends. Place wire inside of folded piece of sand paper and pull until color is gone.
2. Attach **red** wire to the LED's **long** lead (**positive**).
3. Attach **green** wire to the LED's **short** lead (**negative**).



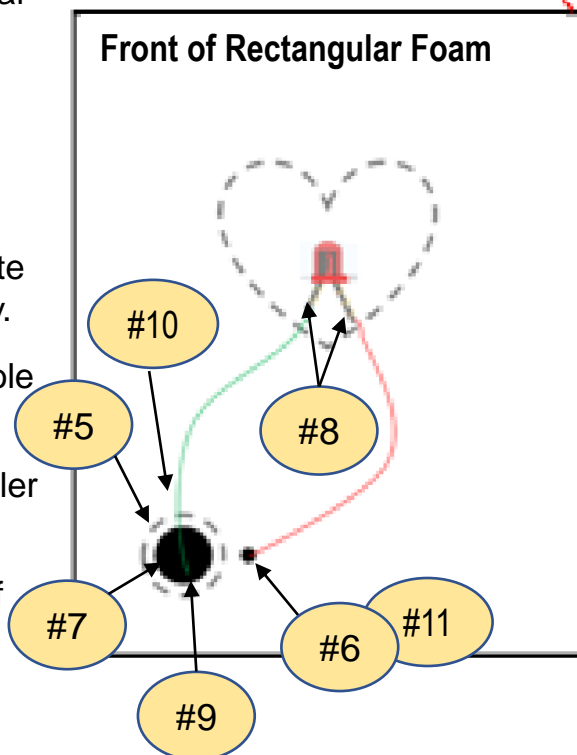
4. Trace the cutout onto the rectangular foam pad using the card (large, folded rectangle).

5. Trace a circle on to the lower, left corner of the foam pad using the battery as a guide. There is a small black dot to indicate the approximate location for the center of the battery.

6. Using a pen/pencil, poke a small hole next to the battery cutout.

7. Within the circular trace, cut a smaller circle.

8. Tape the LED leads to the center of the cutout trace. Ensure the LED's leads do not cross or touch at any point.



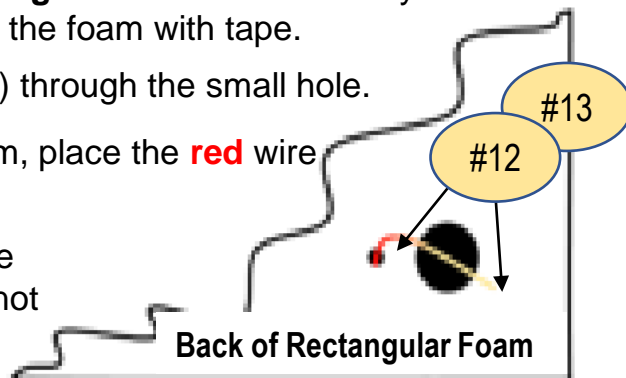
9. Place the battery centered on the battery cutout with the **negative** side up.

10. Place end of **green** wire on to the **negative** side of the battery and secure both the battery and wire to the foam with tape.

11. Thread the **positive** lead (**red** wire) through the small hole.

12. On the back of the rectangular foam, place the **red** wire across the battery cutout.

13. Place tape on both sides of the wire around battery. Ensure the wire is not taped to the battery.



Series Circuit Holiday Card Instructions:

14. Tape square tracing paper to the inside of the card to cover the cutout.
15. Glue front of the rectangular foam to the inside of the card where the cutout is. Ensure the LED lies roughly in the center of the tracing paper.
16. Inside the card, glue foam decoration over the battery to cover the circuitry.
17. On the front of the card, decorate location where the battery is (lower, left corner) to help identify battery location. This is the spot to press to close the circuit and light the card.

