Grades Middle School and Up
Journey to NYC Monuments

Broadway Circuits

Inspired by bright lights of the Broadway Marquee, children will learn more about how lights are able to brighten the various billboards of the city, and then make their own light up cards!

What Will You Learn?
- What is a marquee?
- How do circuits work?

Materials:
- Colored paper
- Cardboard
- Copper tape strips
- Coin cell battery
- LED lights
- Pencil
- Hole puncher

Instructions:
1. On your cardboard rectangle, mark where you will place the LEDs. First draw a dot in each of the 4 corners, Then 1 dot in the center of each long edge. Draw the dots about 1/2 an inch away from the border.
2. Hole punch each of the dots that you just marked.
3. Take a strip of copper tape and stick it to the outer border of your cardboard rectangle, on the outside of the holes you made. When you need to turn a corner you can rip the tape, but make sure there’s no gap in the circuit and that all pieces of copper tape touch. When you reach the end of your border, overlap the copper tape ends so that your border is a closed circuit. Tape that flap down with masking tape.

4. Repeat step 4 to create a border on the inside of the holes. This way you have two copper tape borders on your cardboard rectangle with holes between the borders.

5. Rip a 1 inch piece of copper tape with the backing so that you can connect the outer border to a battery. Tape the 1” copper tape to the cardboard face down so that the copper side is touching the outer copper border with masking tape. This will act as your switch.

6. Place a battery with the negative (-) side down on top of the inner copper tape border. Use masking tape to secure it. Now the inner border is the negative border.

7. Then bring the "switch" copper tape down so that it is touching the positive (+) side of the battery. Use masking tape to tape it in place.

8. Take your LED and identify the negative (-) leg, it is the shorter one. You will want to make sure that the negative (-) leg is touching the negative (inner) border. Check by holding the legs against the battery; the LED should light up. Bend the LEDs’ legs so that it can sit flat. Pass your LED through the hole punched hole so that it is sticking out on the empty side and the legs are touching the copper tape loops. It should light up!

9. Tape down the LED and make sure it stays lit up.

10. Continue to bend the LEDs and place them into the holes. Ensure that all the shorter LED legs are touching the inner copper border and that the
longer LED legs are touching the outer copper border. Tape them all down in place.

   a. You may have to troubleshoot if not all your LEDs light up. They are very sensitive and need to make strong contact with both copper tape LEDs. One solution is to bend the LED leg into an L-shape so that the entire leg is bent onto the copper tape and makes contact. Make sure to use masking tape to secure all the LED legs down tightly.

11. Once you have your circuit complete, place your sign to the side. Now you can work on your design for your sign.

12. Cut a piece of construction paper so that it will fit on your cardboard rectangle inside the LED loop.

13. Write your name on the paper in a fun font!

14. Glue your name onto your sign.

15. Enjoy your new name marquee!

Reflection Questions:

- Why do you think billboards and marquees often use light as part of their designs?
- If younger friends want to participate, have them decorate their marquee and have a grownup connect and attach the lights.
- For older/bigger friends, can you manipulate the lights to make a picture rather than attaching the lights at the border?

Explanation:

- The design of Broadway marquees has evolved over time. In the 1930s, movie marquee designs were often referred to as "electric tiaras." During World War II, materials like steel, copper, bronze, and aluminum were limited, leading to the use of concrete, glass, and striking visual effects. Today, Broadway marquees continue to be an iconic feature of the Theater District. The marquees display the names and artwork of the shows currently playing, contributing to the vibrant atmosphere of Broadway.
In a series circuit, components are connected one after another, forming a single pathway for electric current to flow. The same amount of current flows through each component. This is because there is only one path for the current to follow. The total current in a series circuit is equal to the current flowing through any individual component. In a series circuit, the functioning of each component is crucial for the circuit to be complete. If one component fails or is removed, it breaks the circuit, and the flow of current stops.

Further Reading Recommendations:

Where Is Broadway?
Electronics for Kids
Blackout

Borrow these books and more: borrow.nypl.org