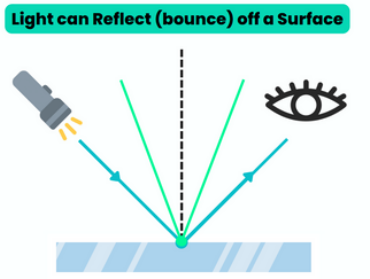
Kaleidoscope

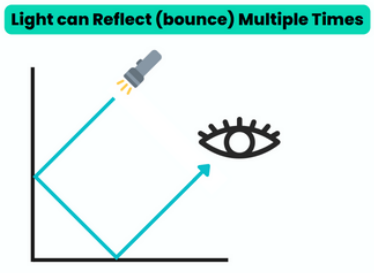
Visit the Science Circus Website for additional information about our materials list.

Using the Power of Reflection in Kaleidoscopes

Light interacts with materials in different ways. Light can pass through a material (we would call this material transparent). Light can be absorbed into the material. Finally, light can be reflected off the surface of the material. Mirrors are made to be reflective, which is why we can see ourselves so well in them. Have you noticed other reflective surfaces around your home (i.e. surfaces that you can see yourself in)?

A kaleidoscope is a toy that makes spinning patterns. The inside of a kaleidoscope is made of multiple highly reflective surfaces. With this activity, you will explore how the number of reflective sides inside a kaleidoscope impacts what you can see.





Materials

- 1 Empty cardboard tube (ex. toilet paper roll)
- 3 sheets of reflective cardstock (or mylar), cut to the length of your cardboard tube.

If using standard toilet paper roll:

- Dimensions for Triangle Insert: 4 inches x 4 ½ inches
- Dimensions for Square Insert: 4 inches x 4 ½ inches
- Dimensions for Circle Insert: 4 inches x 5 inches
- 1 Straw
- 3-5 Skewers 4 ½ inches long
- 3-5 White paper disks (4-inch diameter, if using a toilet paper roll)

Cups and plastic containers are sometimes 4 inches in diameter so you could use this as a template to make your paper disks.

- Scissors
- Clear Tape
- Markers/Crayons
- Decoration for the outside of the tube

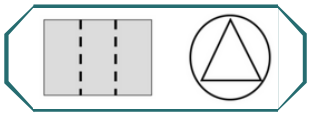
This activity is intended for use by adults and children who can read and follow directions and warnings. Adult supervision advised

Creating Reflective Cardstock Inserts

Remember that you want your reflective inserts able to easily slide into and out of the cardboard tube.

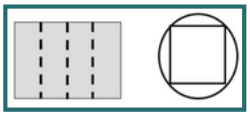
Circular Reflective Insert

1. Roll the cardstock into a tube with the reflective surface facing inward.
2. Check to make sure that the round reflective insert can fit inside your cardboard tube.
3. Lightly secure the circular reflective insert together with tape.



Triangular Reflective Insert

1. Fold the cardstock into thirds.
2. Arrange the thirds into a triangle.
3. Check to make sure that the triangular reflective insert can fit into your tube.
4. Lightly secure the triangular reflective insert together with tape.



Square Reflective Insert

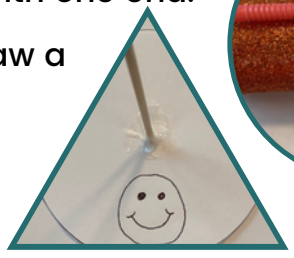
1. Fold the cardstock into fourths.
2. Arrange the fourths into a square.
3. Check to make sure that the square reflective insert can fit into your tube.
4. Lightly secure the square reflective insert together with tape.

Exploration: How do the number of sides of your reflective insert impact what you see in your kaleidoscope?

Step 1: Decorate the outside of your cardboard tube (ex. you could wrap it with self-adhesive foam in a fun color).

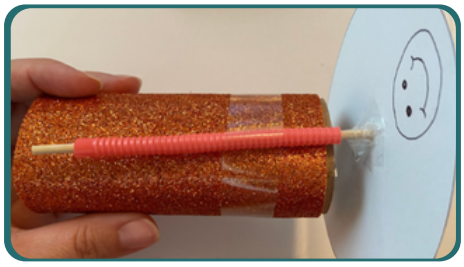
Step 2: Cut 2-inch length of the straw. Tape the straw to the cardboard tube so that it lines up with one end.

Step 3: Take one of the paper disks and draw a smiley face on one side.



Step 4: Take one of the skewers and attach it to the center of your paper disk. This can be done with tape OR by gently poking a hole through the disk.

Step 5: Slide the triangular reflective insert into the cardboard tube.



Step 6: Slide the skewer through the straw so that the paper circle is flush with the end of the cardboard tube.

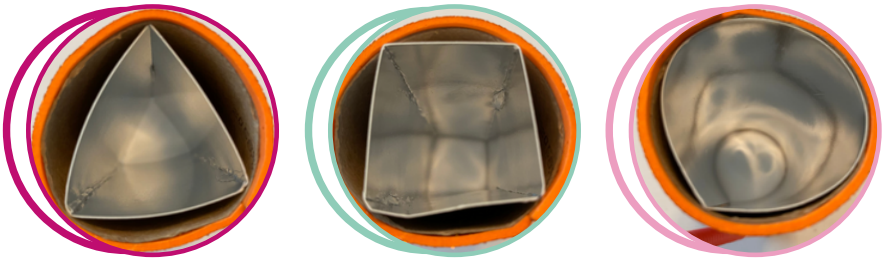
Step 7: Point your kaleidoscope toward a lightsource and spin the paper disk. What do you notice when the smiley face you drew on the paper disk passes by? Count how many smiley faces you see at the end of the kaleidoscope.

Step 8: Replace the triangular reflective insert with the square reflective insert. Look through the kaleidoscope again. What do you notice now when the smiley face you drew on the paper disk passes by? Count how many smiley faces you see at the end of the kaleidoscope.

Stop & Think: What changed in the way your smiley face looked inside the kaleidoscope as you changed from the triangular to the square reflective insert? Why do you think that is?

Prediction Time!

Before you replace the square reflective insert with the round reflective insert, what do you think the inside of your kaleidoscope will look like?



Step 9: Replace the square insert with the circular reflective insert. Look through the kaleidoscope again. How does the inside of the kaleidoscope look now? Why do you think that is?

How can you use the concept of reflection of light to explain how light traveled along the inside of your kaleidoscope?

If you'd like to review this concept in a little more depth than what we provide on the first page, consider watching this PBS Kids video about the reflection of light (available in English and Spanish).

Get Creative!

- Create designs on your remaining paper disks. You can use crayons, markers, color pencils (and more!). You could draw a pattern, explore the difference between straight and curvy lines, and/or use as many colors as you want.
- Once you've created your paper disk, attach it to a skewer and give it a spin. Remember to try out the different reflective inserts for each of your designs to see how they might change.