Through the Looking Glass

Alice changes sizes numerous times throughout her journey in Wonderland. Sometimes she feels as though she is "shutting up like a telescope," and at other times, she is "opening out like the largest telescope that ever was." Telescopes use mirrors to help scientists see further. In this activity, children will experiment with symmetry and reflection using mirrors in many creative ways.

Did You Know?

- ♣ Mirrors are scientific tools used in telescopes to help scientists see further and in microscopes to help them see very small objects.
- ♦ When everything is exactly the same on both sides of an imaginary line, it's called *symmetry*.
- ♠ Periscopes in submarines use mirrors to reflect light and objects down a long tube to the person under the water.

To Get Ready:

You might want to tape a few small mirrors together with a piece of duct or masking tape to create a hinged mirror.

To Start, Ask:

If you draw a line down the center of your face, from your forehead to your chin, does your face look the same on both sides? If you draw a line from one cheek to the other, does your face look the same on both sides? If you draw a line through the center of a circle, does it look the same on both sides?

What you'll need:

- ♣ Small rectangular mirrors (some hinged) (4"X6" or so; some taped together)
- ♦ Rulers
- ♠ Paper
- ♥ Pencils
- ♣ Protractors
- ♦ Photocopies of:
  - ♠ Geometric shapes
  - ♥ Silhouettes of natural shapes displaying symmetry/asymmetry (like leaves)
  - ♣ Alphabet letters with a range of lines of symmetry (A, E, O, S, 1, 8)
- ♠ An assortment of small three-dimensional items

Try It!:

- ♣ Mirrors can be fun for play and experimention, and can help us to find or create lines of symmetry. Spend some time playing around with mirrors and see what you discover.
- ♦ Try placing the edge of a single mirror on different shapes and alphabet letters. What happens to the letters? How many of the letters are symmetrical? Are there any shapes or letters with no lines of symmetry?
- ♠ Try putting the hinged mirrors on the shapes and the alphabet letters. Change the angle of the hinged mirrors. What happens? Hold the hinged mirrors up to your face. How many of you are there? Can you find more of you by moving the mirrors around?
- ♥ Use the protractor to measure the angle of the mirrors while observing different reflections. What do you notice?
- ♣ Draw a squiggly line on a piece of paper. Set the mirror up next to the line and look in the mirror at the squiggly line. Now, looking only in the mirror, use your finger or a pen to retrace the pattern of the line. What do you notice about direction when you are looking into a mirror?
- ♦ Place a small mirror between your eyes and look into another mirror. What do you see?
- ♠ Try making a type of kaleidoscope by placing three or four mirrors together to make a triangle or square. Put an object inside the kaleidoscope. What do you notice?

Questions to think about and ask:

- How many images of yourself can you see using two mirrors?
- Can you figure out a way to see yourself upside-down using two mirrors?
- Using a mirror and a drawing of a geometric figure, how many different shapes can you make? Can you use the mirrors to adapt a square into a different shape?
- What do you think makes it so difficult to trace a squiggly line when you are looking into a mirror?

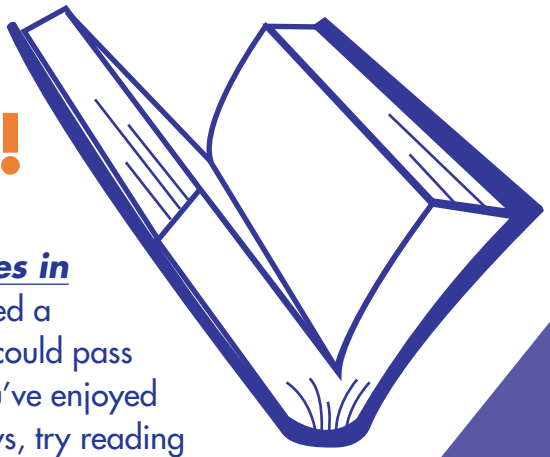
Assess What Happened (Students reflect):

Encourage students to think about the symmetry present in their bodies and faces. Invite students to write about how life would be different if their arms and legs were not symmetrically placed on their body. How might their face be different?

Connect it to Standards:

Students "ask a question about objects, organisms, and events in their environment. This aspect of the standard emphasizes students asking questions that they can answer with scientific knowledge, combined with their own observations."
(National Research Council Science Education Standards)

Connect it to the Story!



In his sequel to ***Alice's Adventures in Wonderland***, Lewis Carroll featured a special fireplace mirror which Alice could pass through to enter another land. If you've enjoyed learning about Alice and her journeys, try reading ***Through the Looking Glass***. You might be surprised to learn that Tweedle Dee and Tweedle Dum and Humpty Dumpty don't actually appear in Alice's story until this second book!

Career Corner:

Astronomers use giant mirrors in their telescopes to collect light from far away in space. The light is reflected to a special computer or lens so that they can study distant planets, stars and other things in the universe. If you enjoy finding out about the universe, you might want to become an astronomer.