

# RAFT IDEAS

**Topics:** Topology,  
Problems Solving, 3-D  
Shapes

## Materials List

- ✓ Paper strip
- ✓ Tape
- ✓ Highlighter pen
- ✓ Tools: pen or pencil, scissors
- ✓ Optional: stickers, pens, and other materials to decorate strip

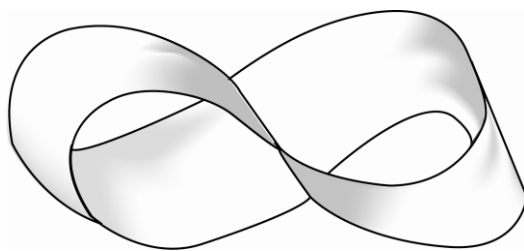
This activity can be used to support the teaching of:

- Apply geometric methods to solve design problems (Common Core Math Standards: High School, Geometry, Modeling With Geometry, 3)
- Problem Solving and Reasoning (Common Core Math Standards: Mathematical Practices Grades 3-12)



# The Magical Strip

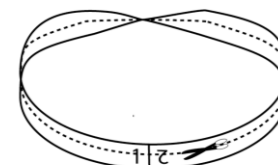
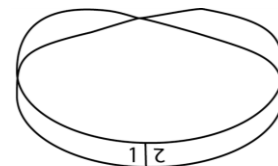
Möbius's Investigations in the Field of Topology



This curious surface is called a Möbius Strip has only one side and one edge.

## To Do and Notice

1. To create a Möbius strip, take a strip of paper, give it a half twist, and tape the two edges together. You have taken an object that had two sides and made it into an object that has only one side and only one edge.
2. To explore its one-sidedness, place the point of a pencil midway between the "edges" of a Möbius Strip and draw a line down its center; continue the line until it returns to the starting point. Examine the strip. Is there part of the strip which does not have a line down the center? Does the line ever cross an edge?
3. To demonstrate that it only has one edge, hold the edge of a Möbius Strip against the tip of a felt-tipped highlighter pen. Color the edge of the Möbius Strip by holding the highlighter still and just rotating the Möbius Strip around. Were you able to color the entire edge?
4. Use scissors to cut the Möbius Strip along the center line drawn in step 2. Then draw a center line around the resulting band and cut along the new line. Did you predict what would happen?



## The Math Behind the Activity

The Möbius Strip or Möbius Band is named after August Ferdinand Möbius, a nineteenth century German mathematician and astronomer who was a pioneer in the field of topology. (The strip was discovered independently by Johann B. Listing at about the same time.) The unique property of this strip is that it only has one side and only one edge! In addition to its interesting mathematical properties, his idea has also had practical applications in industry. Giant Möbius Strips have been used as conveyor belts (to make them last longer, since "each side" gets the same amount of wear) and as continuous-loop recording tapes (to double the playing time).

## Taking it Further

Try twisting the strip two, three, and more times before taping the two edges and explore what happens in each case. See the pattern?

**Web Resources** (Visit [www.raft.net/raft-idea?isid=198](http://www.raft.net/raft-idea?isid=198) for more resources!)

- Movable computer model - <http://mathworld.wolfram.com/MoebiusStrip.html>
- Dutch artist M.C. Escher immortalized the Möbius in two woodcuts. View these and other of his works at - <http://www.mcescher.com/>