mobius strip

…adapted from **MATH LAB #07** by TOPS Learning Systems

1. Cut 1 meter of adding machine tape with neat, square ends. Hold the ends together to make a closed loop.

2. Turn *one* end over to make a half twist, and tape the seam together all the way across to make a Mobius strip.

HALF TWIST   TAPE

Keep going…
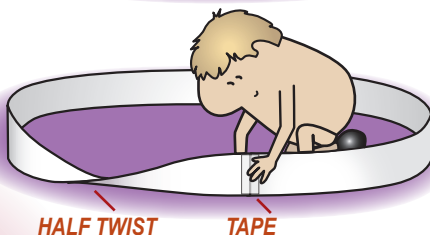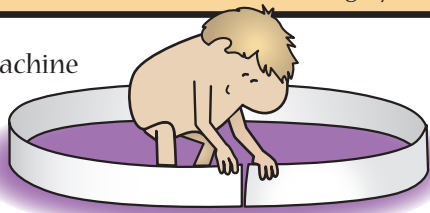
3. Draw a straight line along the center of your loop. Continue until you meet your starting point.

4. Argue that your Mobius strip has only one side!

5. Cut along your pencil line with scissors. What do you get? Does it still have only one side?

OBJECTIVE

To be surprised by the unusual topographical properties of a Mobius strip.

LAB NOTES

Copy the lab for each student or lab team.

Step 3. Continue drawing the unmarked side even if you can see the center line through the paper.

Step 4 variation: A single side has a single edge. Confirm by cutting along the edge with pinking shears, or punching pinholes – all the way around.

Step 5 variation: Instead of cutting along the center line, cut $1/4$ of the way from the edge. The result is two interlocking loops. One is still a Mobius strip, the original length but half as wide. The narrow loop is twice as long, with two sides and two full twists.

ANSWERS

4. The Mobius strip has only one side: there was no unmarked "side" left when my pencil point met its starting point again.

5. When cut along the middle, I get one loop, double-twisted, twice as long and half as wide. The longer loop now has 2 sides; a line drawn the length of the loop leaves one side unmarked.

EVALUATION

Q. a. Explain how to make a Mobius strip from a one-meter strip of paper.

b. How many sides does this strip have?

c. If an ant travels in one direction along this strip, how far must it crawl before returning to its starting point?

A. a. Turn the strip a half twist and join the ends.

b. A Mobius strip has only 1 side.

c. The ant must travel 2 meters in the same direction to return to its starting point.

EXTENSION

Investigate paper loops that have…
…no twist;
…1 half twist;
…1 full twist (2 half twists);
…1 full and 1 half twist (3 half twists).

What can you generalize? *Closed loops with an odd number of half-twists have only one side.*

MATERIALS

- Adding machine tape and a meter stick.
- Scissors and clear tape.

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