

# Solutions

## Topology

### Cutting the Mobius band

#### Experiment 1

Cutting the band in half will result in a single long twisted loop.

#### Experiment 2

Cutting our new band in half will result in two linked twisted loops.

#### Experiment 3

Cutting a Mobius band from one-third of the way across will separate it into one long twisted loop and one smaller twisted loop, which is actually a Mobius band!

### Extensions

# of half-twists	# of sides	# of edges	What happens when cut in half
2	2	2	Two linked loops
3	1	1	One knotted loop
4	2	2	Two linked loops

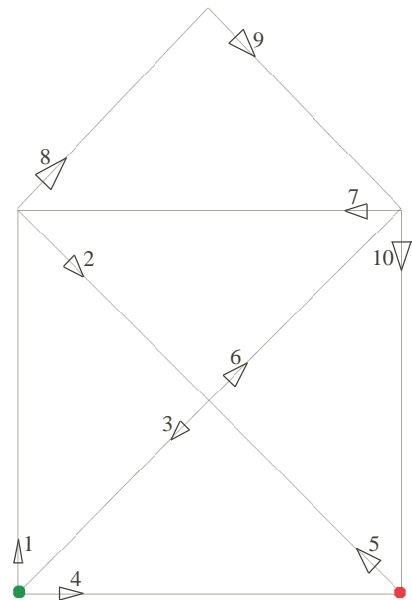
All loops made with an odd number of twists will have 1 side and 1 edge, and all loops made with an even number of twists will have 2 sides and 2 edges.

## Exercises

1. (a) Cutting both loops down their middles will result in a square frame.  
 (b) Same result as part (a)  
 (c) Cutting both Mobius bands down their middles will result in two loops, they may be linked or separated.
2. (a) Your pencil should be facing the opposite direction after one time through the loops, and should return to its original direction after a second time through.  
 (b) The loops have actually become one long twisted loop!

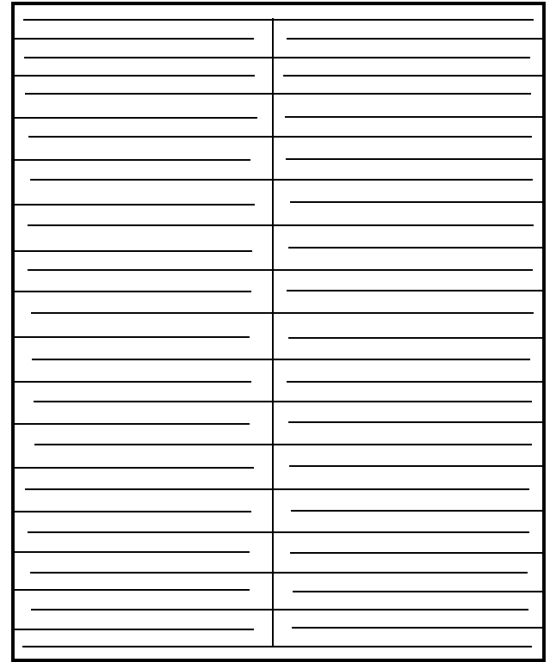
## Puzzles

1. In the diagram, begin at the green circle and follow the arrows in ascending order, changing direction every time you come to an intersect of lines. You will end at the red circle. Did you find a different solution?



2. First fold the piece of paper in half and then drop the coin into the fold. Now, holding the paper at both ends, bring your hands together upwards, and the coin will be squeezed through the hole!
3. There are many different routes Rachel may take, but she must start her walk on one of the islands.

4. The figure shows the required cuts. Begin by making a cut down the middle of the paper, stopping just before the edges. Then fold your paper in half along this line and make alternating cuts into the long edges of the paper. Unfold and your paper should open to form a hole big enough to fit through!



5. The paper clips will actually become linked together!
7. Follow the diagram below, cutting on the solid lines and folding on the dotted line.

