



CEMC at Home

Grade 11/12 - Friday, March 27, 2020

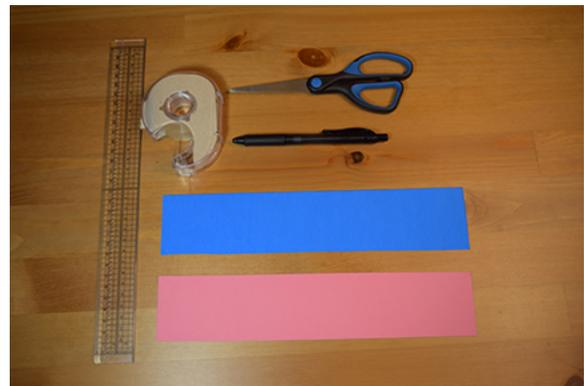
The Möbius Strip

A Möbius strip is a mathematical object that has interesting properties. It is a surface with only one face (or side) and only one edge (or boundary). In this activity we will build a Möbius strip and investigate its curious properties. The purpose of this activity is not to fully understand the mathematics of a Möbius strip, but rather to hopefully surprise and intrigue you!

You will need:

- A pencil
- A ruler
- Scissors
- Tape
- Two rectangular strips of paper of different colours.

Strips of around 6 cm wide and 30 cm long will work well. We will use one blue strip and one pink strip, but you can use any colours you want.



How to construct a Möbius strip:

1. Use your ruler to draw a line along the blue strip that divides the strip into two equal parts. Do the same on the other side of the strip.
2. Use your ruler to draw two lines along the pink strip that divides the strip into three equal parts. Do the same on the other side of the strip.
3. Grab the blue strip by the two short edges. Twist one end of the strip half of the way around and join the two short edges together. (Make sure this is a “half twist” and not a “full twist”.) Line up the short edges and tape them together from end to end.
4. Repeat the same process with the pink strip. You now have two Möbius strips.



Let's explore some properties of our Möbius strips!



1. Take one of the strips you made and answer the following questions:
 - (a) How many faces does the Möbius strip have?
You might need to spend some time thinking about what is meant by a “face” here.
 - (b) How many edges does the Möbius strip have?
You might need to spend some time thinking about what is meant by an “edge” here.
 - (c) Does the Möbius strip have an “inside” and an “outside”?

2. Take the blue Möbius strip and answer the following questions:
 - (a) What do you think will happen if you cut the strip along the line drawn in the middle of the strip? How many detached pieces do you think you will you get? Will they be Möbius strips? Make your predictions.
 - (b) Let’s verify your predictions. Cut the blue strip along the middle line. You will need to carefully cut or puncture the strip somewhere along this line in order to start the cut. What happens once you cut along this line? Is it what you predicted? How many edges does each detached piece have? How many faces?
 - (c) After making your cut, you may have ended up with an object that surprised you. Looking back, can you explain why you ended up with this object?

3. Take the pink Möbius strip and answer the following questions:
 - (a) What do you think will happen if you cut the strip along one of the two lines that we drew down down the strip? How many detached pieces do you think you will you get? Will they be Möbius strips? Make your predictions.
 - (b) Let’s verify your predictions. Cut the pink strip along one of the lines. When you cut, you might notice that it doesn’t actually matter which of the two lines you chose to cut along. Is the result what you predicted? How many edges does each detached piece have? How many faces?
 - (c) After making your cut, you may have ended up with an object that surprised you. Looking back, can you explain why you ended up with this object?

More Info:

Check the CEMC at Home webpage on Friday, April 3 for further discussion on The Möbius Strip.