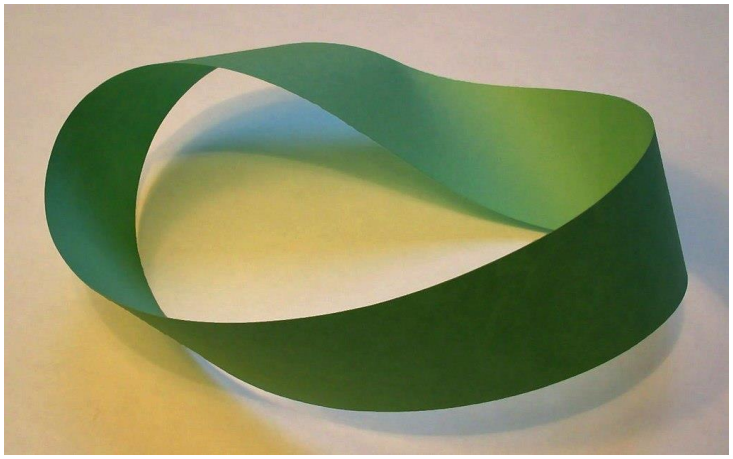
MÖBIUS STRIP

You will need an A4 piece of paper, scissors, a ruler and some sticky tape or glue.
Get an adult to help you when you use the scissors.

Experiment 1.

1. Cut a strip 2cm wide from the long side of an A4 piece of paper.
2. Draw a line in the middle of the strip i.e. 1 cm from each edge. You should draw this line on both sides of the strip of paper.

3. Now make a half twist in the strip of paper before sticking the ends together with sticky tape or glue (see the diagram).



To make the half twist join the ends A to B on the top and B to A on the bottom.

You now have a Möbius loop.

4. Now carefully cut along the line that you drew in the middle of the strip. If you used glue then wait for it to dry first before you start cutting. What do you end up with?

You should end up with one larger but thinner loop of paper but why?

Whats happening?

While it's quite a cool thing to do, the greatest impact of the Möbius strip has been in mathematics, where it helped to spur on the development of an entire field called topology. Topology is the mathematical study of the properties that are preserved through deformations, twistings, and stretchings of objects.

Because the paper is twisted 1/2 turn before it is taped together, the "front" side of the Möbius strip is directly connected to the "back" side of the strip. Therefore the Möbius loop that you created actually has only one side!

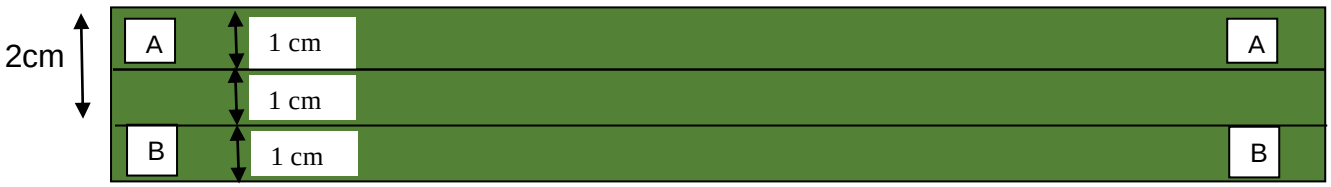
This can be demonstrated quite easily. Make another strip but this time don't draw a line down the middle until you have made the half twist and fastened the two ends together. Now draw a line along the middle of the strip. Did you go all the way round on both sides of the strip without even taking your pen/pencil/felt tip off the paper? Ta da only one side!

The longer thinner loop that you made looks like another Möbius loop but is it?

Draw a line along the middle of this longer, thinner loop. Can you draw a line on both sides without taking your pen off the paper? No only one side is marked so the new loop that you made has 2 sides and is therefore not a real Möbius loop.

Experiment 2.

1. Cut a strip 3cm wide from the long side of the A4 piece of paper.
2. Draw 2 lines along the strip each 1cm from the edges. You should draw the line on both sides of the strip of paper.



3. Now make a half twist in the strip of paper as before and stick the ends together.
4. As before cut along the line. What do you end up with?

You should now have 1 small loop and 1 big loop connected together. Did you notice though that you still ended up cutting one continuous line?

In the second experiment, when the Möbius strip is cut 1/3 of the way from an edge, the cut actually goes around twice before ending up back at the starting point. The result appears to be a long Möbius loop linked with a short Möbius loop. A line drawn along these strips reveals that the **short band has one side** (so it is a real Möbius loop) and the **long band has two sides**, so it is *not* a Möbius loop.