A Möbius strip is an intriguing 3D shape which has only one side. Try to think of any other surface and you will find that it has two sides: a piece of paper has a front and back; a tabletop has a top and bottom; a beachball has an inside and an outside. How can we possibly make a shape which has only one side?

You can make a Möbius strip using knitting, crochet, or paper and glue! You may enjoy trying multiple methods, as each reveals its own secrets of the Möbius strip.

**Paper and Glue**

Making a Möbius strip out of paper is the fastest way to explore this magical shape. Take a long strip of paper, give it a half-twist as shown in the picture, and tape or glue the ends together securely. Can you predict what will happen if you cut along the dotted line? What about if you cut a third of the way in from the edge? How about cutting it in half, then in half again?

**Crochet**

You can use any needles, yarn and gauge with this project. Take your favourite yarn and an appropriate crochet hook, and chain a number of stitches depending on how big you’d like your project to be. For example, you may like to make a bracelet or brooch as a first project, and the initial chain is the circumference of the Möbius strip. When your chain is long enough, lay the chain on a flat surface and run your finger along it so that all stitches are facing the same way. Then give the chain a half-twist and join the last stitch to the first with a slip stitch. (Note: if you don’t do the twist correctly here, you can always fix it after the first round of crochet.)

Begin to double crochet into the bottom of all the stitches in the chain, until you get back to the join. At this point you should check that there is indeed a half-twist. You should be able to continue double crocheting, now into the tops of all the stitches. Once you get back to the beginning again the project is easy: continue crocheting around and around until your strip is the desired width. Notice that the project will grow outwards on both ‘sides’ at the same time!

A final interesting thing to do is to crochet the outermost row in a different colour so as to highlight that it is one continuous loop.
**Knitting**

There are two ways to knit a Möbius strip. The first way is to knit a long strip and then graft the ends together with a half-twist, as in the ‘paper’ description. This will give a vertical seam, perpendicular to the stitches.

The second method, which is harder but more mathematically pleasing, is to use a special cast-on which introduces the twist in the very first row (much like the crochet method). This creates an almost invisible seam along the circle of the Möbius strip.

The Möbius cast-on we recommend is designed by Cat Bordhi and is brilliantly described by her in this video: [https://youtu.be/LVnTda7F2V4](https://youtu.be/LVnTda7F2V4). Written instructions, with diagrams, are available at [http://bit.ly/1WsRh8F](http://bit.ly/1WsRh8F).

As with the crochet pattern, it does not matter what yarn, gauge, or size of needle you use. The stitch pattern that you use does matter: since there is no ‘front’ or ‘back’ to the work, you need to use a stitch pattern which is reversible. Using garter stitch (knit every stitch) is an easy option for your first Möbius strip. Another easy option is seed stitch, which alternates knit and purl stitches. You could also try a ribbed pattern, as shown in the picture above. The instructions for this will depend on whether you are using the first or second method for making the Möbius strip – can you figure out the difference?

**The Maths of Möbius strips**

Run your finger around the surface of your strip. You should find that your finger ends up on the ‘back’ of the knitting, crochet or paper even though it never went over an edge. This is because the Möbius strip has only one side, and likewise only one edge.

The one-sided nature of the Möbius strip means that, for any creature living in it, there is no concept of ‘left’ or ‘right’. By travelling once around the surface, a right hand is transformed into a left hand and vice versa. If a shape has this property mathematicians call it non-orientable. Is it possible that our universe could be like this, so that we could fly off in one direction from the Earth and return from the other side with our heart on the right-hand sides of our bodies? Scientists think this is unlikely, but they haven’t ruled it out!

If you attach two Möbius strips together along their edges, you create a strange object called a Klein bottle which has no inside or outside. It cannot be made without intersecting itself in 3 dimensions: its true home is 4-dimensional space.

A Möbius strip with three twists forms the symbol for recycling in Australia. Try making one out of paper and cutting in half down the middle – the result should surprise you! Can you figure out how to crochet one?