This is a great activity to do with students with some surprising results. However, it is definitely recommended that you try the activities yourself first before exploring with your students!

When sticking strips together, it is useful to stick the whole width of the strip, even better the whole width and both sides. This becomes more important during the more challenging tasks.

If there is an even number of twists, the strip turns in to two strips. If there is an odd number of twists, the strip remains one piece. A good discussion point is to see whether the resulting bands have one or two sides, and how many twists they have.
Adding extra cuts

- Take a Möbius strip.
- Draw a dividing line \( \frac{1}{3} \) of the way in to the strip, and continue all the way round (this divides the strip in to thirds).
- What do you think will happen when you cut along the line?
- Cut along the line – were you right?

Try to divide the Möbius strips, into thirds, quarters, fifths and so on.
You will need a thick strip, and to divide the strip by measuring.

<table>
<thead>
<tr>
<th>Fraction of line</th>
<th>Resulting shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td></td>
</tr>
<tr>
<td>1/4</td>
<td></td>
</tr>
<tr>
<td>1/5</td>
<td></td>
</tr>
<tr>
<td>1/6</td>
<td></td>
</tr>
</tbody>
</table>

This is a lovely activity to enable students to realise the effect of travelling around the band. When you try and divide the band in to quarters, the line continues back on to the other ‘side’ and divides the strip in to \( \frac{1}{4}, \frac{1}{2}, \frac{1}{4} \).
You can divide it in to fifths by dividing using two loops, one takes the two ‘outside’ fifths, then repeating the process to divide the middle remaining 3/5s in to three 1/5s. This is a fun exercise.
Slide 8

Adding extra strips
- Möbius bands have a chirality – direction.
- You can add a twist clockwise, or anticlockwise.
- We will stick strips together and investigate.
  - Take two 0 twist strips and stick them together at right angles.
  - Cut them down the middle including the join – cut each band first to the join then leave the join until last.
- What shape do you think you will get? Were you right?

Ensure students are using sufficient Sellotape to finish the loops and stick them together. If you are modelling this with students make sure you cut up to the join on each band first before cutting the join.

Slide 9

Adding extra strips
- You're now going to do the same process with different strips. Some suggestions are here, but you can continue the process after should you wish.

<table>
<thead>
<tr>
<th>Strips</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 twist and 0 twist</td>
<td>Square</td>
</tr>
<tr>
<td>0 twist and 1 twist</td>
<td></td>
</tr>
<tr>
<td>1 twist and 1 twist (opposite chirality)</td>
<td></td>
</tr>
<tr>
<td>1 twist and 1 twist (same chirality)</td>
<td></td>
</tr>
</tbody>
</table>

With the 0 twist and 1 twist the square comes out folded, but you can unfold it into a square.

Opposite chirality

Same chirality

Discuss with students what would happen if you had no twists. How many sides do they think the shape has? 1 or 2?

Slide 10

Adding a hole
- Take your strip of paper and cut out a 'C' shape so when you join it there is a long oval hole.
- Join the sides, putting in a single half twist in one side.
- Cut out the ellipse.
- What shape do you get?

Discuss with students what would happen if you had no twists. How many sides do they think the shape has? 1 or 2?
Slide 11

Adding a hole

- Continue this way, fill in the following table.
- You may wish to continue with more twists.

<table>
<thead>
<tr>
<th>Twists</th>
<th>Resulting shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>One zero, one single twist</td>
<td>Remains as one piece</td>
</tr>
<tr>
<td>Two single twists (same chirality)</td>
<td>Same chirality twists interlock</td>
</tr>
<tr>
<td>Two single twists (opposite chirality)</td>
<td>Opposite chirality twists separate</td>
</tr>
</tbody>
</table>

Slide 12

Extension

- Can you stick 3 mobius strips together and cut?
- Watch the amazing Vi Hart story: [here](https://youtu.be/4mdEsouIXGM)
- Mobius bands are non orientable. Read [this article](link) and look at the gif to understand what this means.
- Research Klein bottles. It is possible to make a 3D version from paper – but very challenging!