




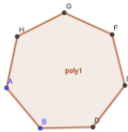

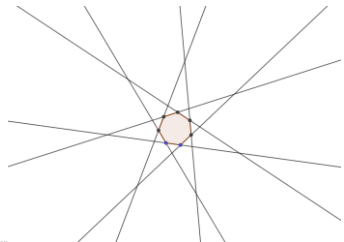
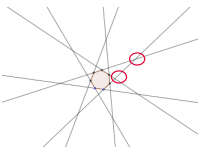
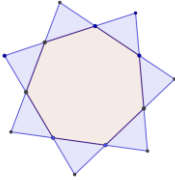

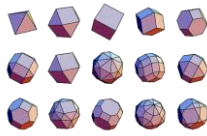
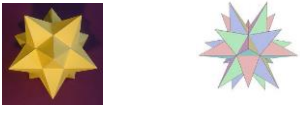



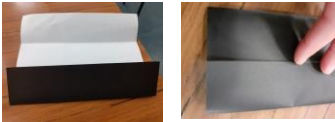







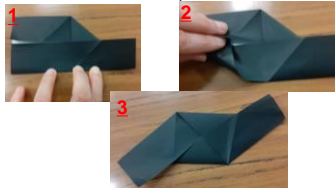



















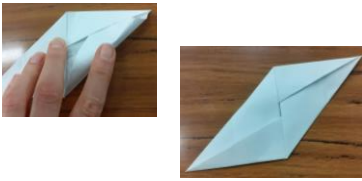


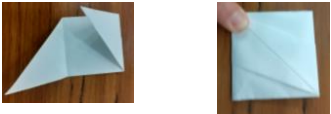


Slide 1	 <p>Advanced Mathematics Support Programme®</p>	
Slide 2	 <p><b>Modular origami</b></p> <p>1 - making the units</p>	
Slide 3	 <p><b>Origami paper</b></p> <ul style="list-style-type: none"> <li>You need square paper for all origami</li> <li>If you have no square paper, there are two methods to make squares in this video</li> <li><a href="https://bit.ly/squarefroma4">https://bit.ly/squarefroma4</a></li> </ul>	
Slide 4	 <p><b>Modular origami</b></p> <ul style="list-style-type: none"> <li>Polyhedrons are 3D shapes made from faces of regular polygons.</li> <li>Stellated polyhedra are shapes which have continued the faces until they meet again outside the original polyhedron</li> <li>You can see how a 2D shape can become stellated here</li> </ul>	There is no worksheet for this activity as the students will be exploring in origami.
Slide 5	 	
Slide 6	 	

Slide 7	 <p>The lines extend out and in this case, they meet in two different places. These meetings create two different shapes</p>	There is a separate activity on stellating polygons, this is more curriculum linked and involves less folding paper!
Slide 8	 <p>This shape is created from the crossings nearest the original polygon</p>	
Slide 9	 <p>This shape is created from the crossings furthest from the original polygon</p>	
Slide 10	<p><b>Stellated polyhedra</b></p> <ul style="list-style-type: none"> <li>▪ Polyhedra are 3D shapes where every face is a polygon.</li> <li>▪ Here are some examples of polyhedra</li> </ul> 	
Slide 11	<p><b>Stellated polyhedra</b></p> <ul style="list-style-type: none"> <li>▪ Polyhedra are 3D shapes where every face is a polygon.</li> <li>▪ Here are some examples of stellated polyhedra</li> </ul> 	
Slide 12	<p><b>Modular origami</b></p> <ul style="list-style-type: none"> <li>▪ The traditional method of making origami is making a shape out of one sheet of paper.</li> <li>▪ There is a recreational maths area which makes origami models out of modules – more than one copy of the same shape.</li> </ul>	We will be making sonobe units. These can be used to make some very large origami polyhedra.

<p>Slide 13</p>	 <p><b>Modular origami</b></p> <ul style="list-style-type: none"> <li>We will make a shape (two different options)</li> <li>With this shape you can use <ul style="list-style-type: none"> <li>6 shapes to make a cube.</li> <li>12 shapes to make a stellated octahedron.</li> <li>30 shapes to make a stellated icosahedron.</li> </ul> </li> <li>You can also use 90 shapes to make a stellated truncated icosahedron – basically a spiky football with pentagonal and hexagonal faces. However this would take a <i>long</i> time.</li> </ul>	<p>In a lunchtime/single lesson one student can definitely make a cube by themselves. They will probably be able to make the octahedron, although they may want to work in pairs so they definitely will make one model and possibly make two (one each). Students need to choose whether they are making unit 1 or unit 2 and make all the same unit for their shape – don't mix and match. If students want to make the icosahedron they will need to work as a team.</p>
<p>Slide 14</p>	 <p><b>The sonobe unit</b></p> <ul style="list-style-type: none"> <li>There are two units that you can choose to use to make these shapes.</li> <li>They can be made with square origami paper or square post-its (post-its get fiddly as they are small, and work best with unit 1 rather than unit 2).</li> <li>Use one type of unit for the whole shape...</li> </ul>	<p>Students might enjoy looking at the ratio between the resulting faces and the original size.  Can they prove the relationship between the square created on the two different units?  Can they calculate the area of the end square in comparison to the area of the original piece of paper.</p>
<p>Slide 15</p>	 <p><b>Unit 1</b></p> <ul style="list-style-type: none"> <li>Fold your square in half, unfold, then fold in to the centre crease so your paper is in quarters</li> </ul> 	<p>If you have a visualiser, they are great tools for demonstrating origami.</p>
<p>Slide 16</p>	 <ul style="list-style-type: none"> <li>Unfold, then fold the bottom left corner up to the line <math>\frac{3}{4}</math> of the way up the paper</li> </ul> 	
<p>Slide 17</p>	 <ul style="list-style-type: none"> <li>Unfold, rotate the paper <math>180^\circ</math> then repeat</li> </ul> 	
<p>Slide 18</p>	 <ul style="list-style-type: none"> <li>Unfold, fold the bottom quarter up, then fold the corner in along the diagonal</li> </ul> 	

<p>Slide 19</p>	  <ul style="list-style-type: none"> <li>▪ Rotate and repeat ( do not unfold )</li> <li>▪ When folding in along the diagonal, tuck in under the horizontal flap</li> </ul> 	
<p>Slide 20</p>	  <ul style="list-style-type: none"> <li>▪ Flip your piece over, then fold in the triangles</li> </ul>  <ul style="list-style-type: none"> <li>▪ Flip back over and fold each side in to make a square</li> </ul> 	
<p>Slide 21</p>	  <ul style="list-style-type: none"> <li>▪ If you are making a unit that is for the stellated octahedron or icosahedron you need to add a crease down the diagonal as shown.</li> </ul> 	
<p>Slide 22</p>	  <p style="text-align: center;"><b>Unit 2</b></p> <ul style="list-style-type: none"> <li>▪ Start with folding your paper in to quarters the same way as with unit 1</li> </ul> 	
<p>Slide 23</p>	  <ul style="list-style-type: none"> <li>▪ Fold up the bottom left corner to the <b>first</b> line</li> </ul> 	
<p>Slide 24</p>	  <ul style="list-style-type: none"> <li>▪ Fold the bottom left corner again up to the <b>first</b> line</li> </ul> 	

<p>Slide 25</p>	  <ul style="list-style-type: none"> <li>Rotate your paper 180° and repeat</li> </ul> 	
<p>Slide 26</p>	  <ul style="list-style-type: none"> <li>Fold both sides in to the centre line and move your paper to the portrait position</li> </ul> 	
<p>Slide 27</p>	  <ul style="list-style-type: none"> <li>Fold down the top right corner so it meets with the left edge</li> </ul> 	
<p>Slide 28</p>	  <ul style="list-style-type: none"> <li>Rotate your paper 180° and repeat</li> </ul> 	
<p>Slide 29</p>	  <ul style="list-style-type: none"> <li>Tuck the large flaps under the small flaps so it looks like this.</li> </ul> 	
<p>Slide 30</p>	  <ul style="list-style-type: none"> <li>Flip the paper back over and fold the points in to make a square</li> </ul>  <ul style="list-style-type: none"> <li>If you are making the octahedron or icosahedron, fold along the diagonal to make an 'M' shape.</li> </ul>	

Slide  
31



### Creating the shape

- Once you have enough units made, you can start constructing the shapes
- The next presentation has instructions for creating a cube and a stellated octahedron