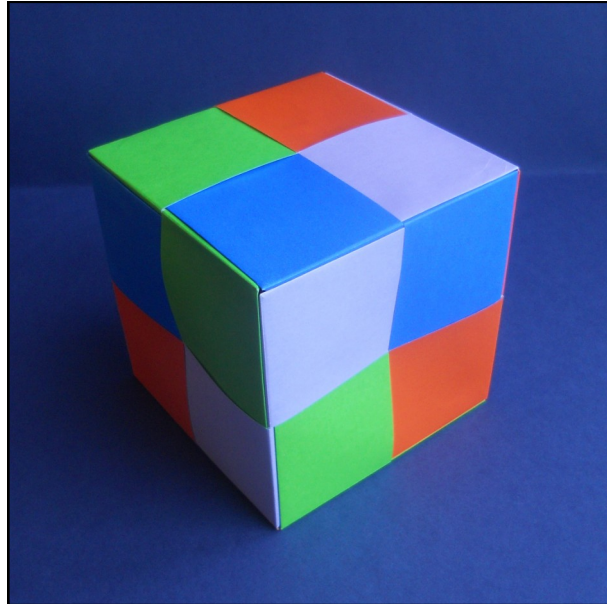


Alpha and Beta 12-part Cubes from Sonobe and Corner-pocket Sonobe modules

Alpha 12-part cubes can be made from 'flaps out' versions of the Sonobe and Corner-pocket Sonobe modules. (It is not possible to make a stable alpha 12-part cube from Darwin modules because they lack these flaps.)



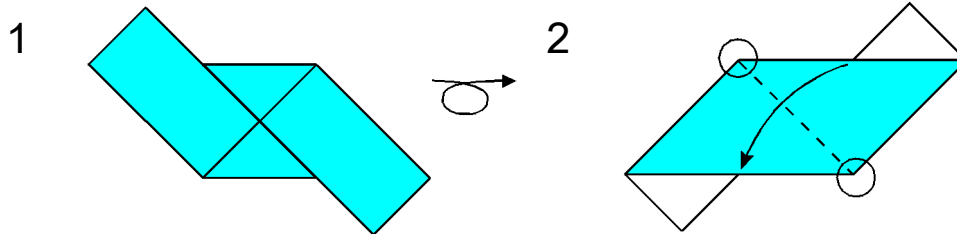
Beta 12-part Cubes can also be made from Sonobe and Corner-pocket Sonobe modules. Where the beta module cubes are analogous, i.e. the colours are in the same positions relative to each other as they were in the alpha module cubes, the resulting pattern on the surface of the cube will be a mirror image of the alpha module design.

I have not drawn the Corner-pocket Sonobe cubes as the beta versions are difficult to construct and cubes of the same appearance can in any case be made in a much more elegant way from Semi-Sonobe modules.

The alpha 12-part Sonobe cube was discovered by Mitsonobu Sonobe sometime in the late 1960s. In 1989 I discovered that Sonobe modules could also be configured as beta modules. In looking for antecedents I found that Tomoko Fuse had published the 12-part beta Sonobe cube earlier in the 1980's. A basic beta Sonobe module can also be found in *Origami for the Connoisseur* by Kunihiko Kasahara and Toshie Takahama, which was first published in Japanese in 1985 and in English in 1987.

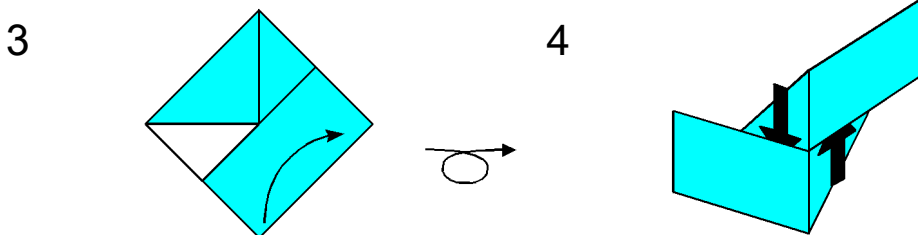
Alpha 12-part Cubes from Sonobe modules

Stable alpha 12-part cubes can only be made from the 'flaps out' version of the Sonobe module.



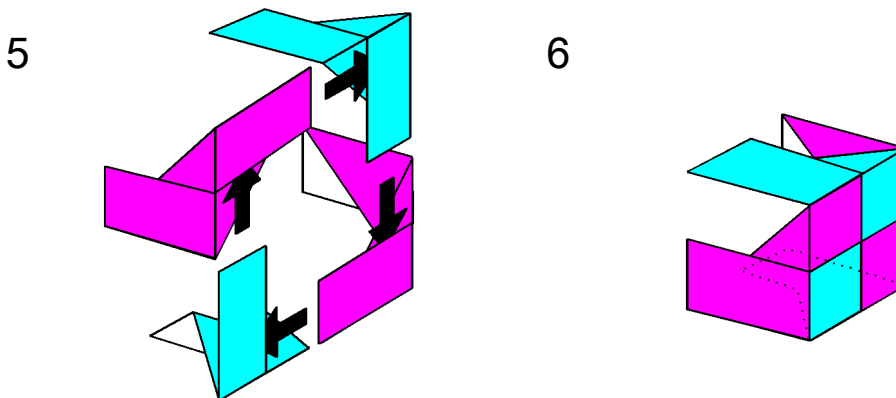
1. You will need twelve basic modules for each cube. Begin by turning your first module over sideways.

2. Fold in half diagonally from corner to corner, being careful to make sure the corners remain sharp.



3. Unfold at right angles then turn over sideways.

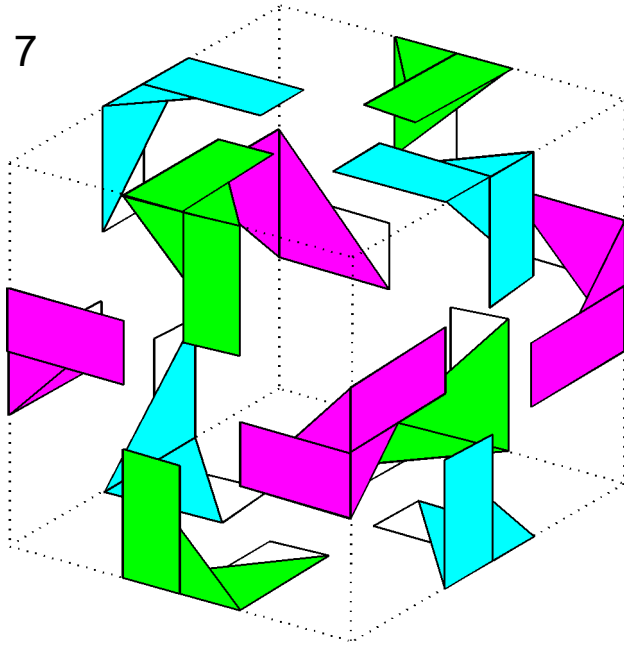
4. The finished module should look like this. You will need twelve to make a cube.



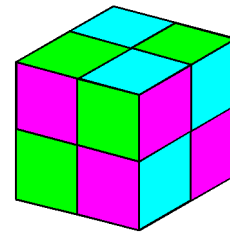
5. Four modules go together like this to form one face of the cube.

6. One face of the cube is finished. Continue adding modules in the same way to complete the cube.

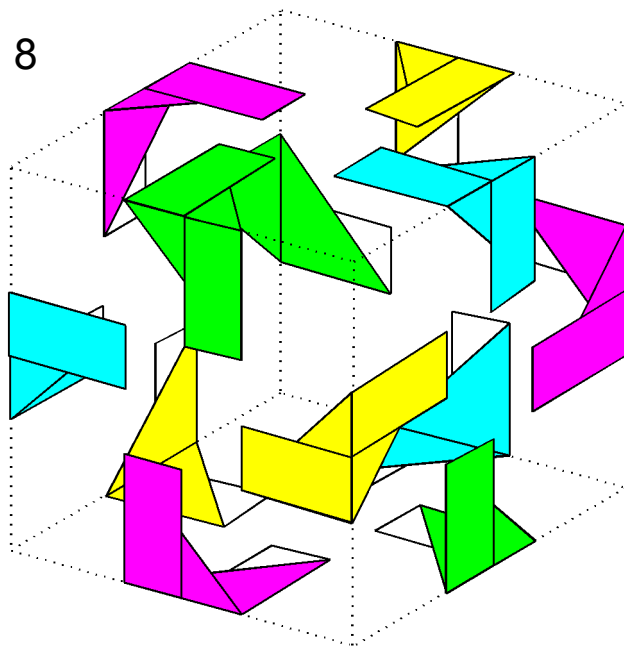
7



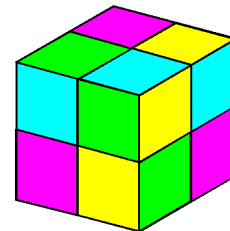
7. This is the modular pattern for a 12-part cube made using three colours where only two colours appear on each face. In this pattern each colour forms a zigzag band around the cube.



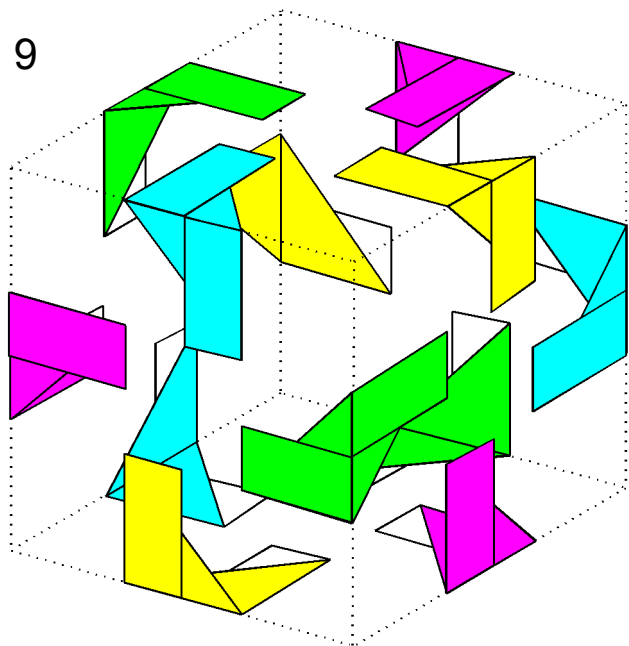
8



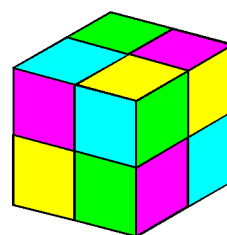
8. This is the modular pattern for a cube made using four colours where each colour appears on each face and forms a diagonal zigzag band around the cube.



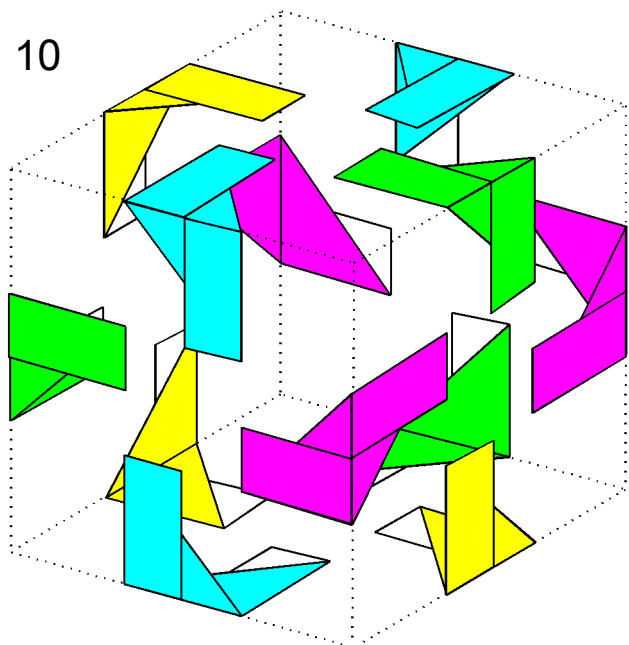
9



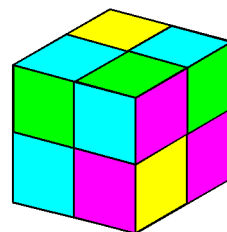
9. This is the modular pattern for a cube made using four colours where each colour appears on each face, three of the colours form incomplete zigzag bands around the cube and the other forms a complete diagonal zigzag band which interrupts them.



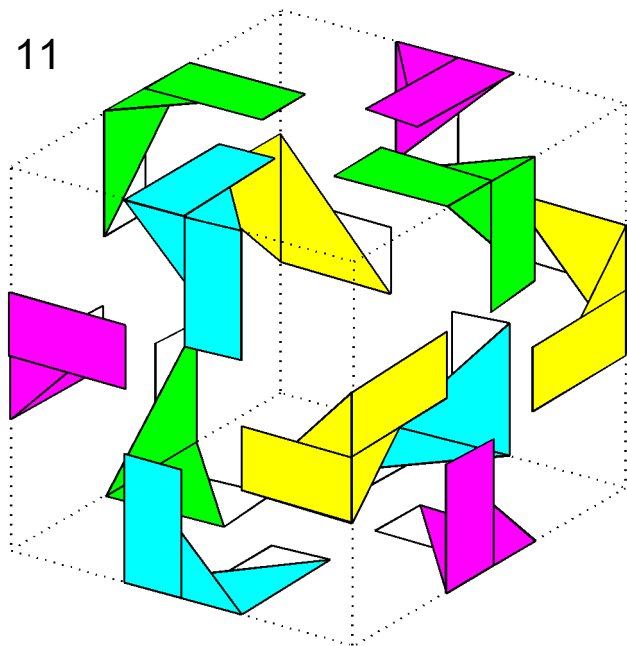
10



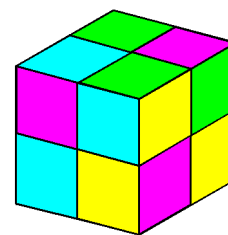
10. This is the modular pattern for a cube made using four colours where each colour appears on each face but none of the colours forms any kind of band around the cube.



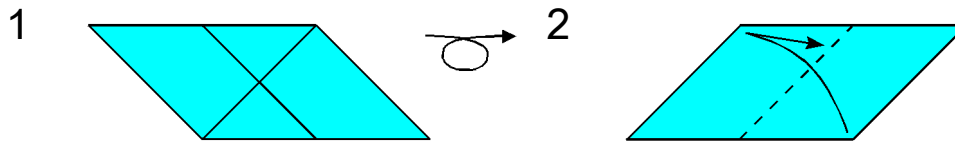
11



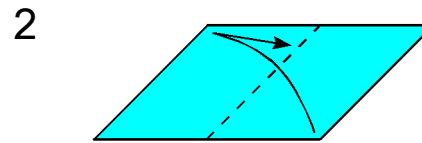
11. And finally this is the modular pattern for a cube made using four colours where only three appear on each face. Three colours form incomplete zigzag bands around the cube. The other colour interrupts them but does not form a band.



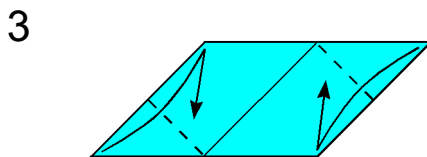
Beta 12-part Cubes from Sonobe and Darwin modules



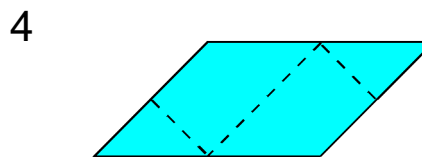
1. You will need twelve basic modules for each cube. Begin by turning your first module over sideways.



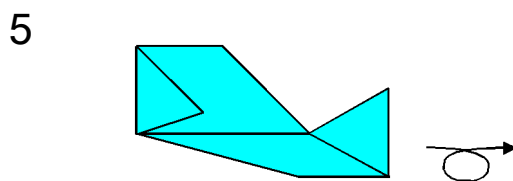
2. Fold in half diagonally from corner to corner as shown.



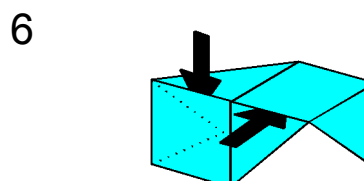
3. Fold the bottom left and to right corners inwards like this, then unfold.



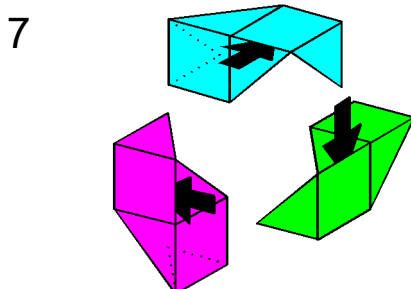
4. Use these creases to configure the module into the form shown in picture 5.



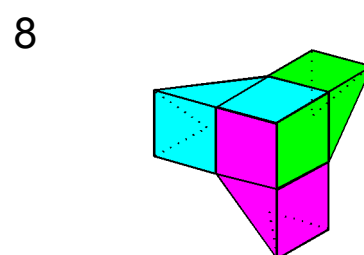
5. Turn the modules over.



6. Make all 12. The positions of the pockets are indicated by the arrows.

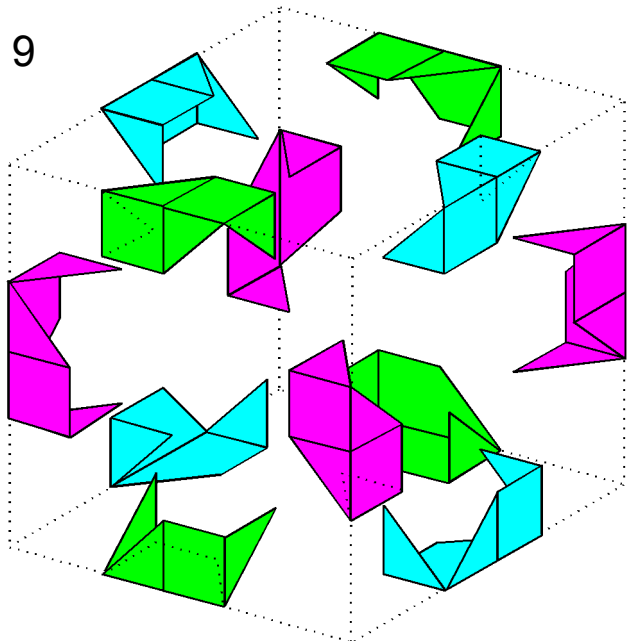


7. Three modules go together to form a corner of the beta module cube ...

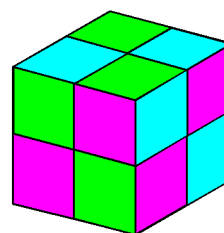


8. ... like this. Continue to add modules in the same way to create further corners until the cube is complete.

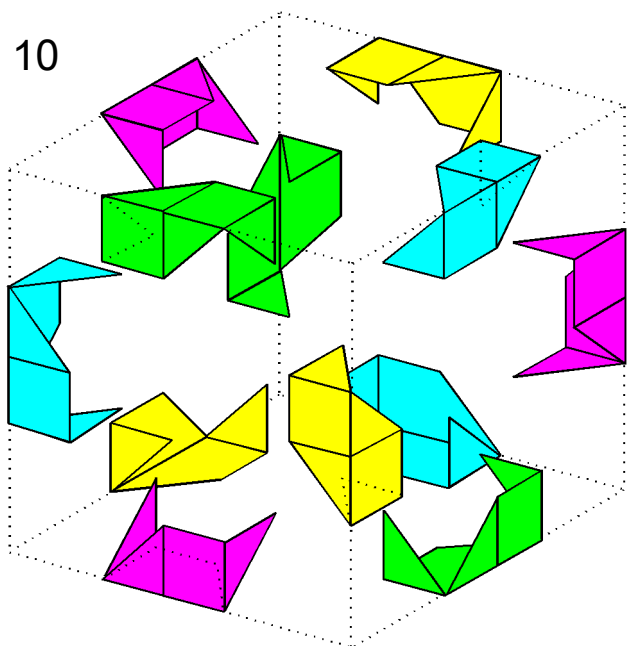
9



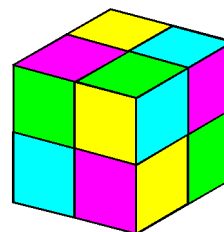
9. This is the modular pattern for a cube made using three colours where only two colours appear on each face. In this pattern each colour forms a zigzag band around the cube.



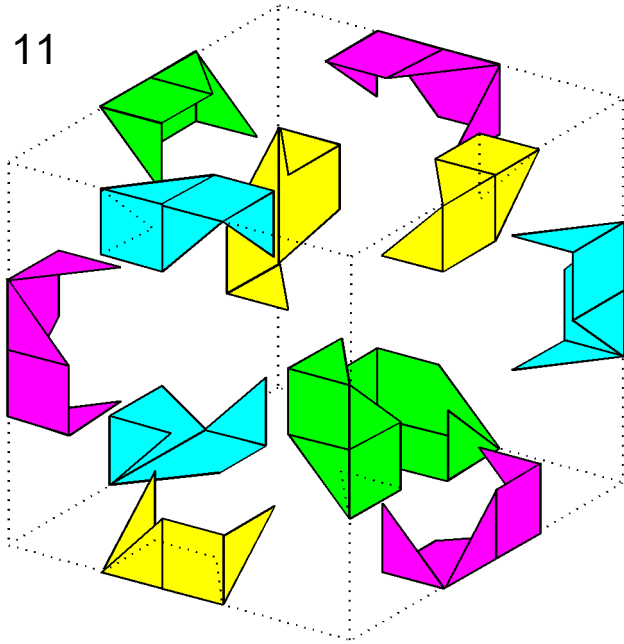
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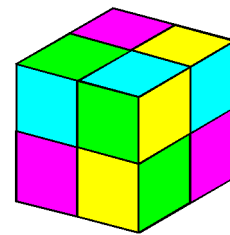
10. This is the modular pattern for a cube made using four colours where each colour forms a diagonal zigzag band around the cube.



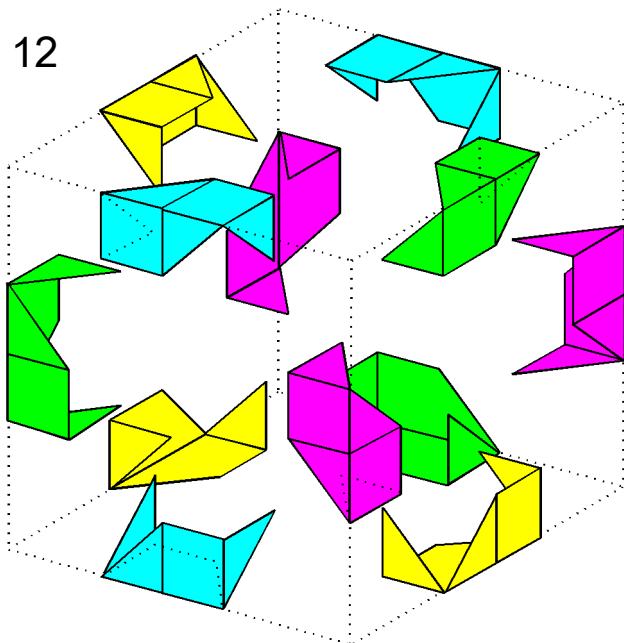
11



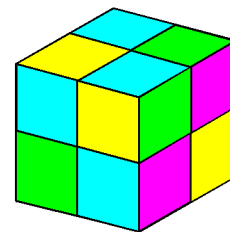
11. This is the modular pattern for a cube made using four colours where only three appear on each face. Three of the colours form incomplete zigzag bands around the cube. The other forms a complete diagonal zigzag band which interrupts them.



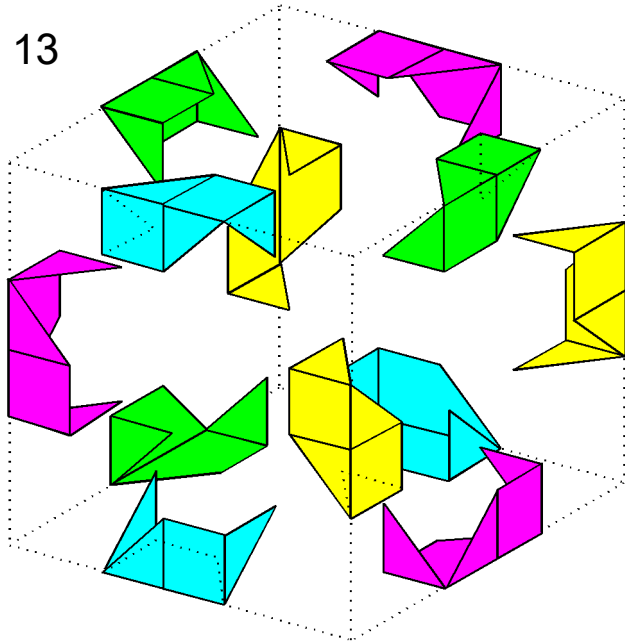
12



12. This is the modular pattern for a cube made using four colours where each colour appears on each face but none of the colours forms any kind of band around the cube.



13



13. And finally this is the modular pattern for a cube made using four colours where only three appear on each face. Three colours form incomplete zigzag bands around the cube. The other colour interrupts them but does not form a band.

