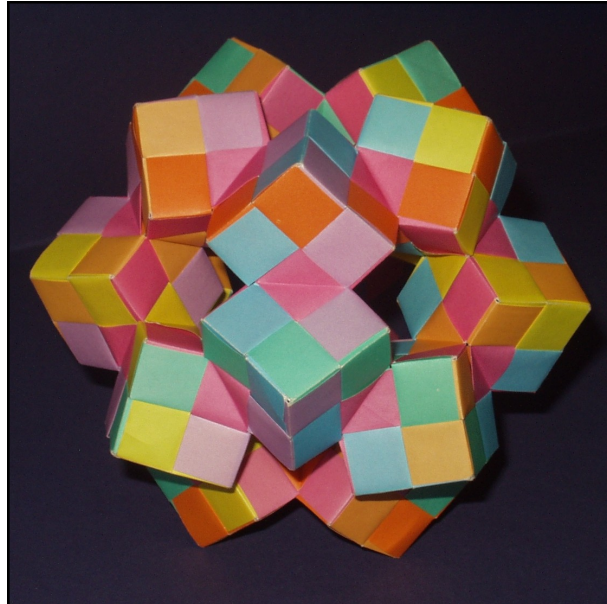# Simplex Modules

I discovered Simplex modules in 1989. They are very simple to fold, hence the name, and very versatile to use. They will make any shape whose faces are either squares, diagonally truncated squares, or silver triangles. Their most useful quality, and the one that distinguishes them from other useful modules such as the Sonobe and Letterbox modules, which will make the same range of shapes, is that designs made from Simplex modules are seriously robust. They are therefore ideal for making designs which are intended to be handled a lot, such as the Soma Cube puzzle, or for cubes and polyhedra made from a large number of modules.

The picture shows a Simplex module version of my Ball of Cubes design, which is made by integrating twenty 24-part Simplex Cubes. I made this piece in 2001 and it has been much handled by adults and particularly by young children, often being handed round classrooms, since then. It is still in perfect condition. The colour scheme, incidentally, does not quite work all the way round.

Designs made from Simplex modules are even distribution designs, each part of the finished design being nine layers of paper deep. This sounds quite inefficient of paper until you consider that designs made from Sonobe modules are eight layers of paper deep at every point, without the benefit of being anywhere near as robust. On the other hand, designs made from Sonobe modules are in general much easier to put together, especially where the number of modules is low.
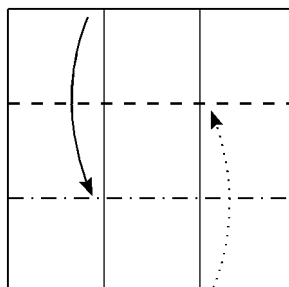
Folding the modules

Simplex modules are folded from squares.

1
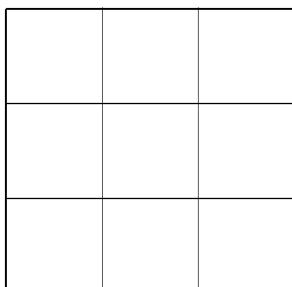
1. Begin by dividing your square into a 3x3 grid of smaller squares. A pdf download which shows you how to do this is available from the Utilities section of the Origami Heaven downloads page.
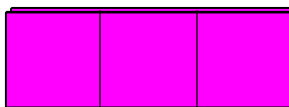
2

2. Arrange you square white side up. Fold the top edge downwards in front and the bottom edge upwards behind. Both folds are made using the existing creases.
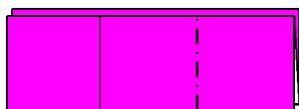
3
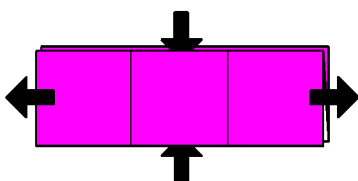
3. That's it. The basic Simplex module is finished. The Simplex module has two tabs and two pockets, indicated with arrows here.
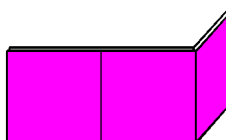
4

4. We will call this the A version of the module. There are three other basic ways to configure a Simplex module using the other creases of the 3x3 grid.
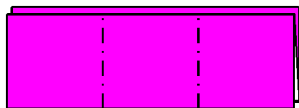
5

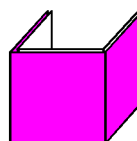5. Folding the right hand third backwards at right angles using the existing crease produces the B module ...
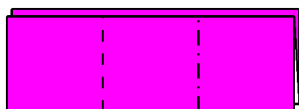
6

6. ... like this.

7

7. Folding both the left and right hand thirds backwards at right angles using the existing creases produces the C module ...
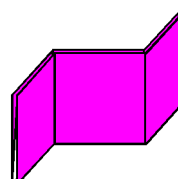
8

8. ... like this.

9

9. Folding the left hand third forward and the right hand third backwards at right angles using the existing creases produces the D module ...
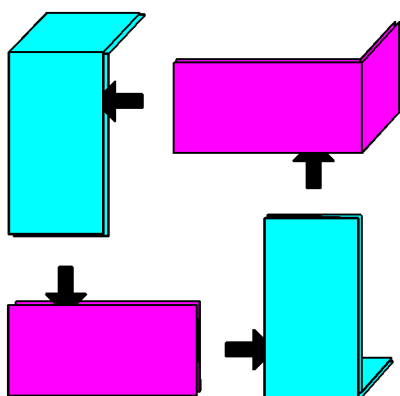
10

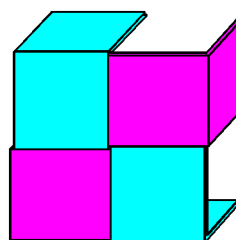10. ... like this.

The 24-part Simplex Cube

You will need twenty four B modules. These diagrams show you how to make a cube using eight modules in each of three contrasting but complementary colours. Many other colourings are possible. Each module contributes one coloured square to the design.

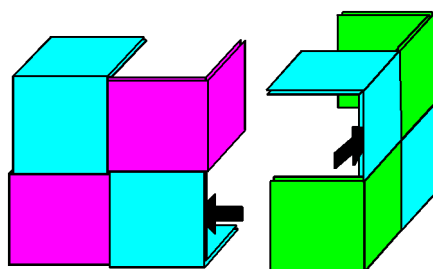**11**

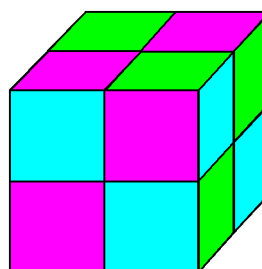11. Four modules go together like this to form ...

12

12. ... one face of the cube.

13

14

13. Faces can be linked together like this, although you will probably find it easier to add the modules one by one, keeping to the pattern of colours shown.
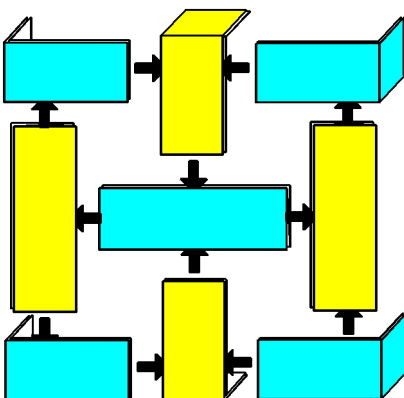
14. This is what the finished cube should look like. Many other colourings are possible.
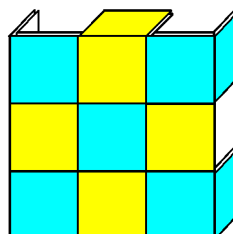
The 54-part Simplex Cube

You will need eighteen A modules and thirty six B modules. These diagrams show you how to make a cube using eighteen modules, in each of three contrasting but complementary colours.
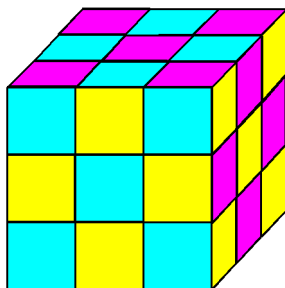
15

16

15. This is how the first nine modules go together to form ...

16. ... one face of the cube.

17

17. The finished cube should look like this. Many other colourings are possible.
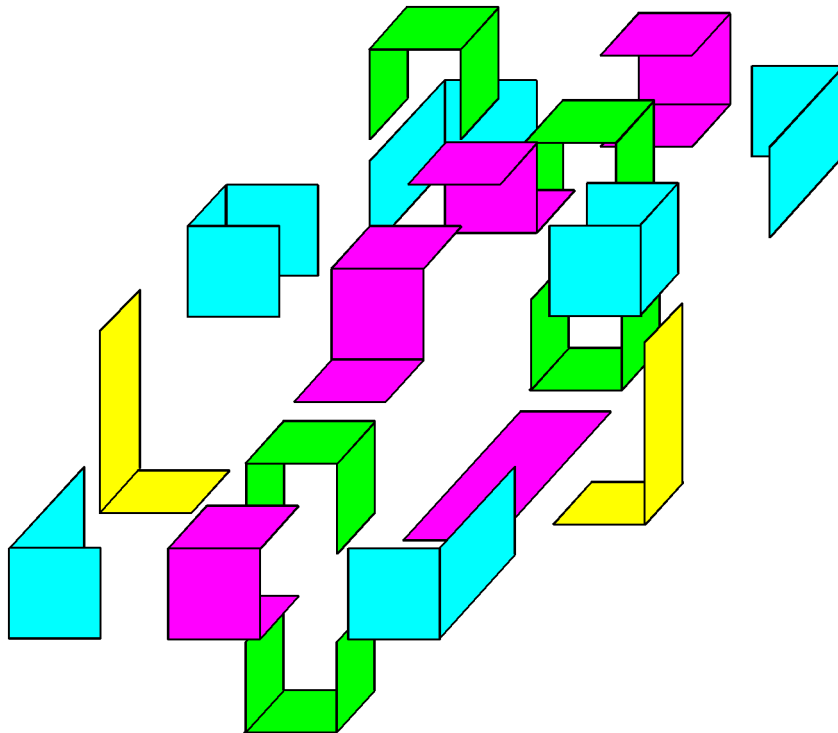
Compound Cube designs

Simplex modules are particularly useful for making seriously robust compound cube designs such as the pieces for a Soma Cube puzzle. The exploded diagram below shows you how one of the pieces of this puzzle can be made by combining A ,B,C and D modules.

18
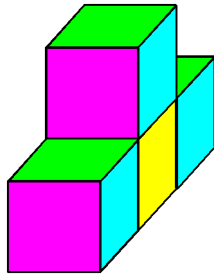
18. This is the puzzle piece in question.

19

19. And this is how to make it using one A module, six B modules, nine C modules and two D modules.

Simplex modules with diagonal creases

Simplex modules can also be configured using diagonal creases. Ignoring for now the assignment of these creases as mountains or valleys, there are six different ways to do this (and many more if you combine diagonal creases with upright ones).
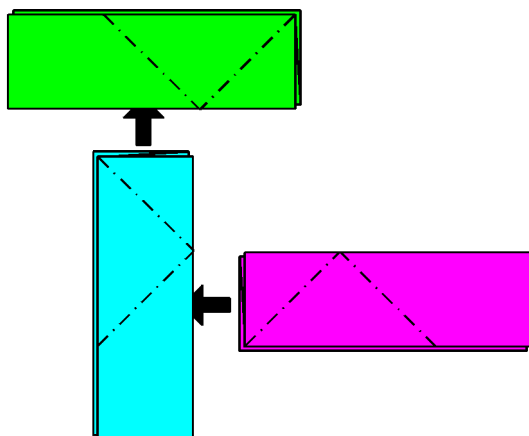
E

F

G

H

I

J
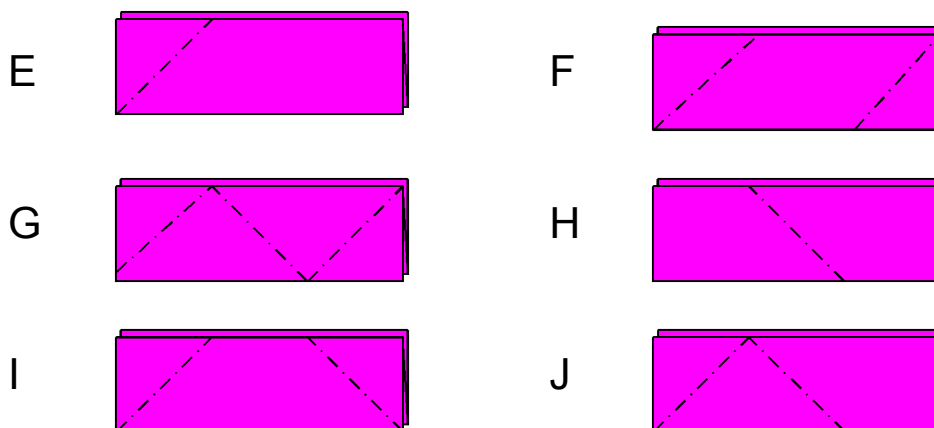
The H module is the one used to link twenty 24-part Simplex Cubes together to make the Ball of Cubes pictured on page 1.
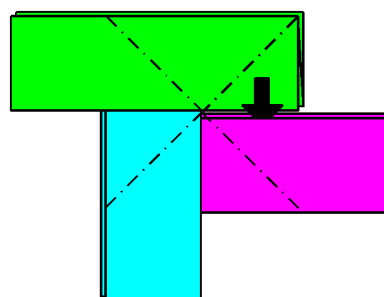
The 48-part Simplex cube

This cube is made by combining twenty four J and twenty four E modules. The corners are quite challenging to put together so it is a good idea to make them first.
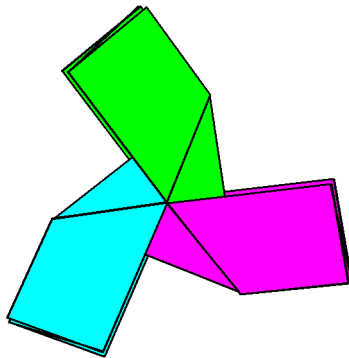
20

21

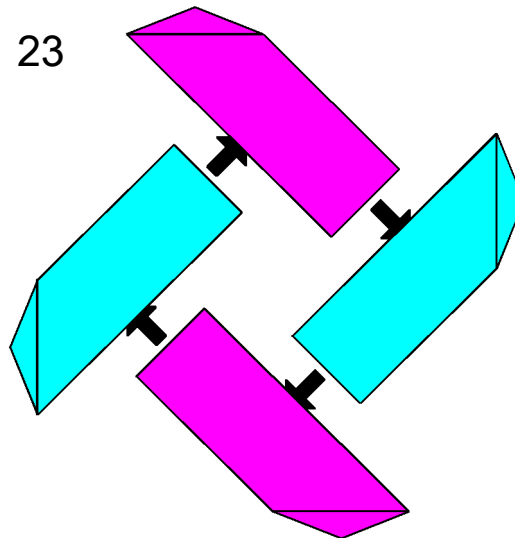20. Each corner is made by putting three J modules together like this.

21. Continue by inserting the green module inside the pink module. The assembly becomes three dimensional as you do this.

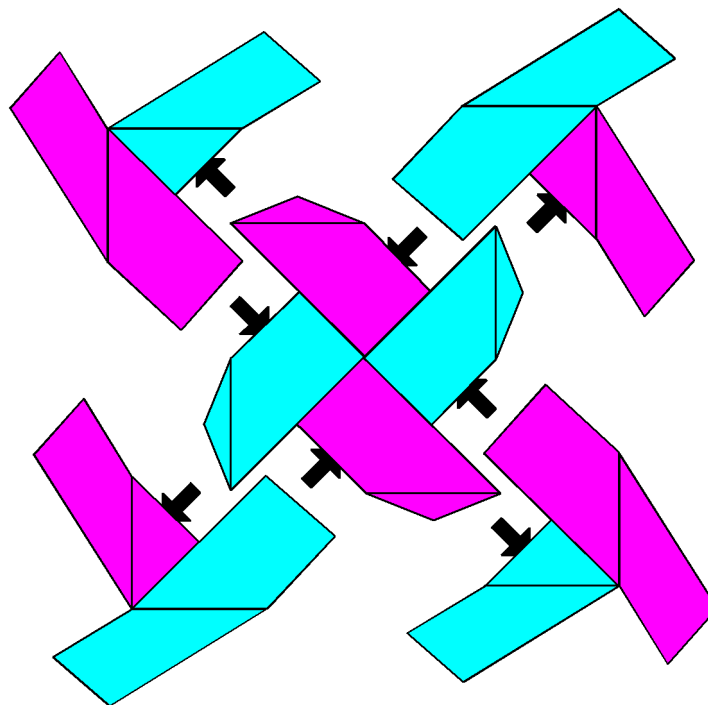David Mitchell / Simplex Modules

22

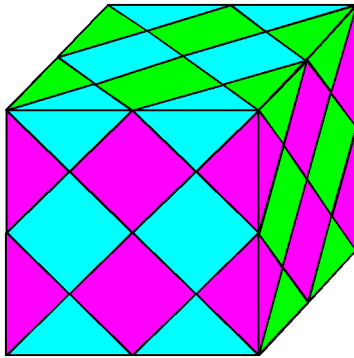22. This is what the finished corner should look like.

23

23. The centre of each face is made from four E modules.

24

24. Eight J modules complete the face. It is wise to construct this cube by assembling the J modules into corner units first, then adding the other modules individually as required.
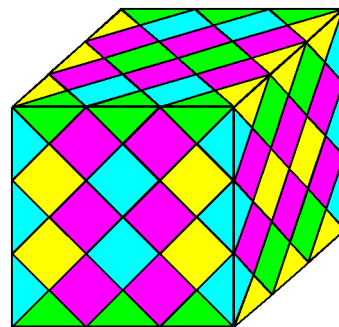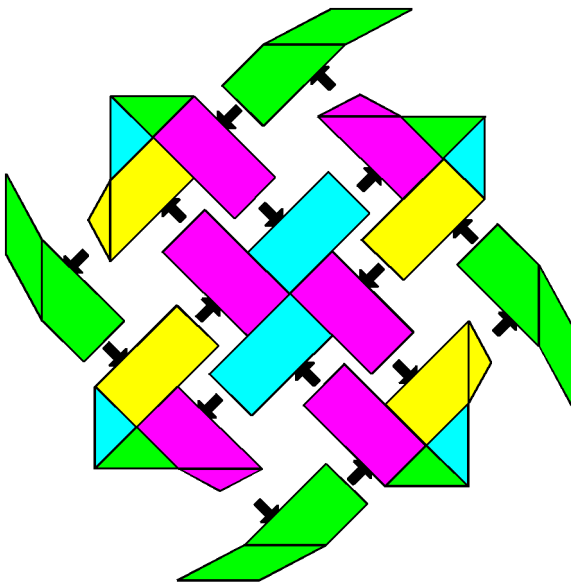
25

23. The finished cube should look like
this. Many other colourings are possible.

More complex cubes

In theory Simplex modules should hold together sufficiently well to allow the assembly of
still more complex cubes like the one shown below. I have not, however, yet found time
to try out this possibility in practice.