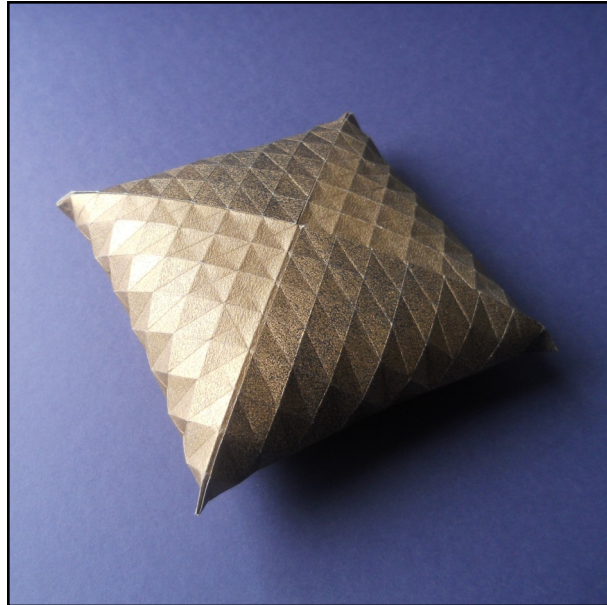


Cushions

Cushions are two part modular designs where each of the modules is created by dividing a rectangle into a grid of smaller rectangles using creases made in one direction and then dividing each of these smaller rectangles in half by a diagonal crease made in the other. They are ultimately derived from the Preliminary Ornament that is made by weaving two preliminary folds together.



Paulo Mulatinho created the first cushion using squares divided into 4x4 grids, a design which he called UFO. When I saw this I realised that the same kind of design could be made from squares divided into many other grids, then that the designs would also work if the same grid was applied to any other rectangle. Tung Ken Lam subsequently realised that cushions need not be regular, greatly extending the number of possible designs. Modular designs can be said to be regular when they are made from identical modules and irregular when they are not.

In general grids up to 8x8 work well. Above this complexity the modules tend to hold together less well unless the folding is very accurate indeed, and sometimes need to be glued together to achieve a clean finish.

When the sides of a rectangle, other than a square, are divided into differing numbers of cells there are, of course, always two possible grids (i.e 6x4 as well as 4x6).

The diagrams show you how to fold the Preliminary Ornament from both squares and oblongs (when I call it the Oblong Ornament) and how to develop these basic forms into cushions using a 4x4 grid.

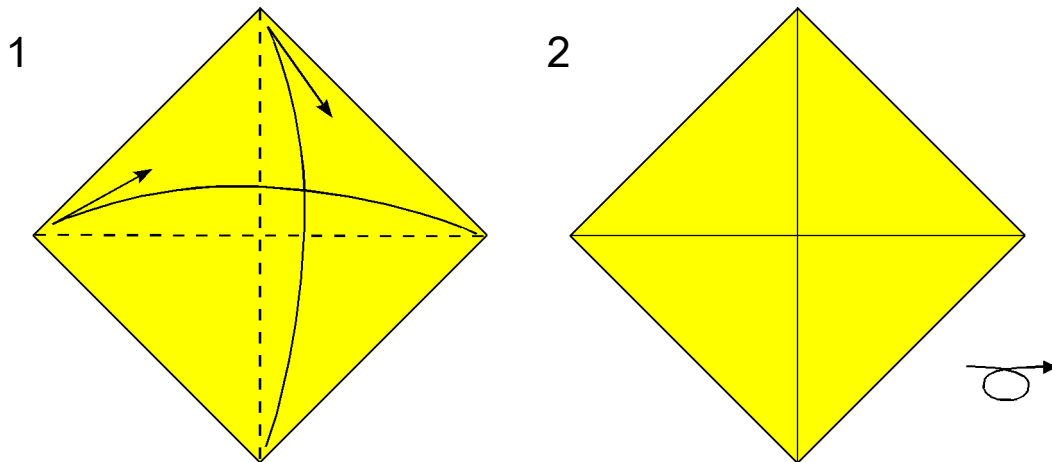
Crease patterns are then given for many other cushion designs, all of which are assembled in exactly the same way.

The Preliminary Ornament from squares was one of my own first discoveries in modular origami in 1987. The earliest publication of this design that I know of is in *The Origamian* Vol 7 Issue 4 of Winter 1967 where it is called Tree Ornament and attributed to Molly Kahn. It is, however, not at all unlikely that it goes back much further than that. As far as I know I was the first person to realise, in 1993, that the Preliminary Ornament design would also work from oblongs.

Paulo Mulatinho published his UFO design in his book *Origami Neue Ideen* in 1998. My realisation that the UFO design could be generalised to more complex grids and to oblongs came shortly after I first learned the design from Paulo at a BOS convention, probably in 2004. Tung Ken Lam pointed out that cushions could be made from irregular pairs of modules during a discussion we had in 2005.

Folding the Preliminary Ornament

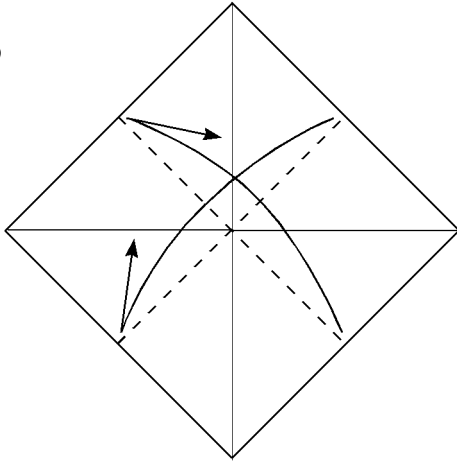
You will need two squares of paper. If you are using irogami begin with your paper arranged coloured side up.



1. Fold in half diagonally, then unfold, in both directions.

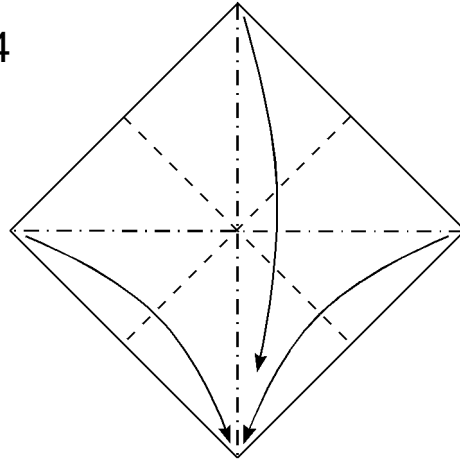
2. Turn over sideways.

3



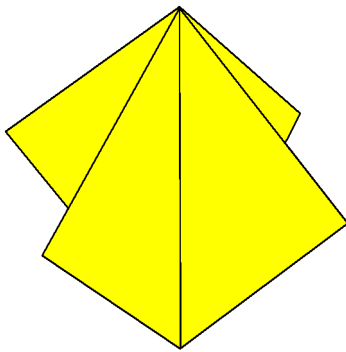
3. Fold in half edge to edge, then unfold, in both directions.

4



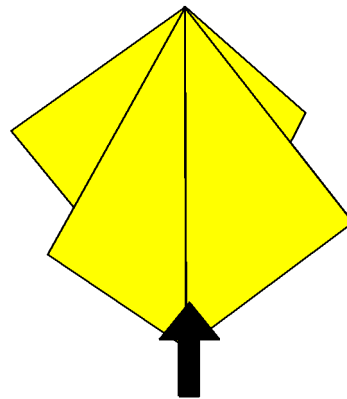
4. Collapse into a Preliminary Fold.

5



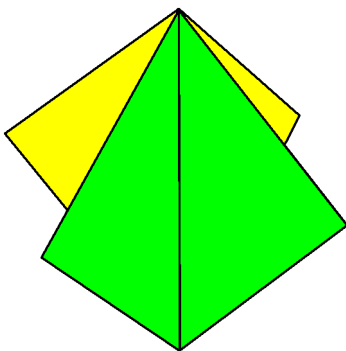
5. Make two.

6



6. Slide together so that alternate flaps go inside and outside the other module.

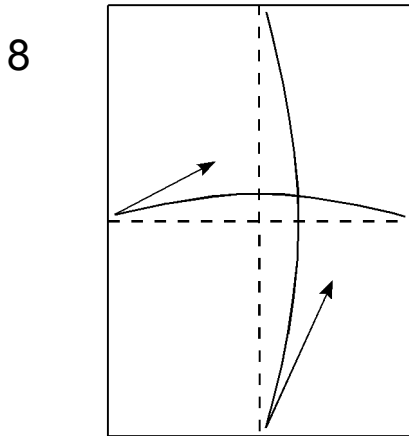
7



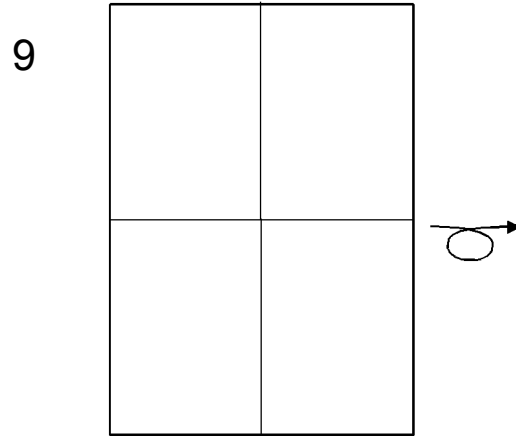
7. The finished ornament should look like this.

Folding the Oblong Ornament

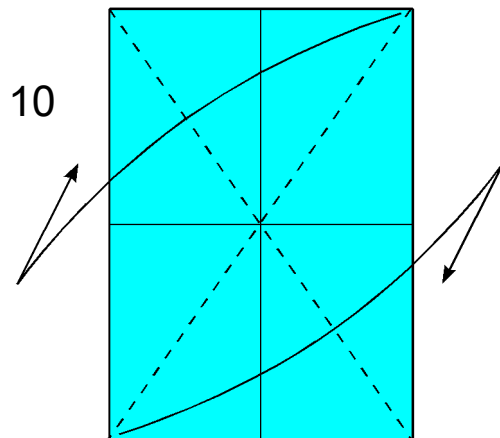
You will need two identical oblongs of paper. These diagrams show you how to fold the ornament using silver rectangles but the design will also work if you use oblongs of any other proportion. If you are using irogami begin with your paper arranged coloured side up.



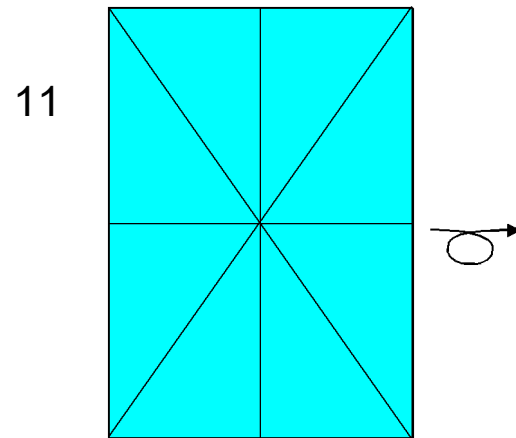
8. Fold in half edge to edge, then unfold, in both directions.



9. Turn over sideways.

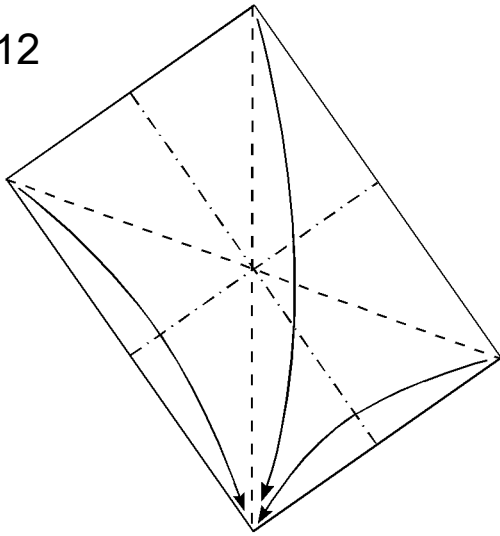


10. Fold in half diagonally, then unfold, in both directions. Take care to ensure that these creases pass exactly through the corners.



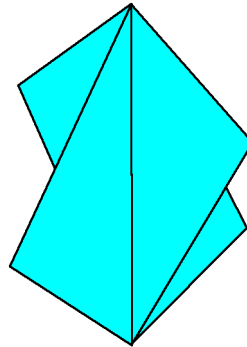
11. Turn over sideways and arrange to look like picture 12.

12



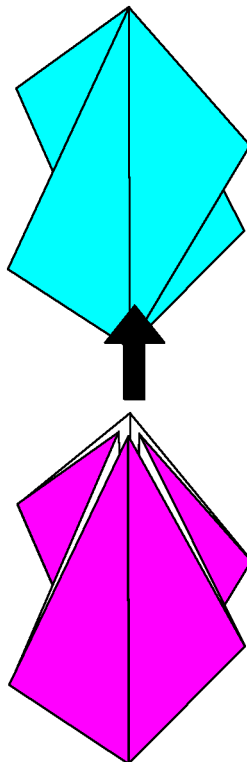
12. Collapse into the form shown in picture 13.

13



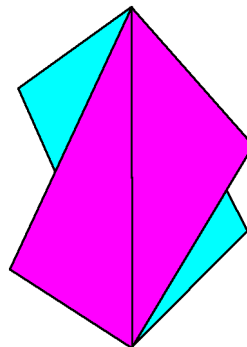
13. Make two.

14



14. Slide together so that alternate flaps go inside and outside the other module.

15

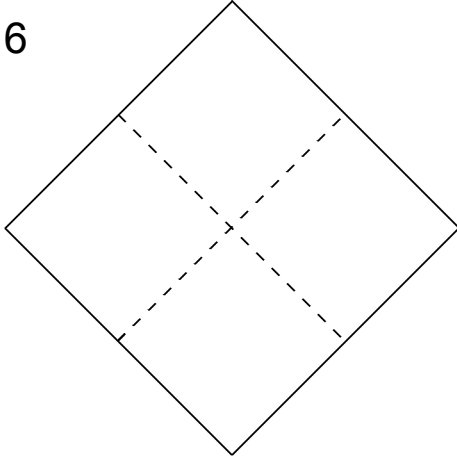


15. The Oblong Ornament is finished.

Folding the 4x4 Cushion (the UFO)from squares

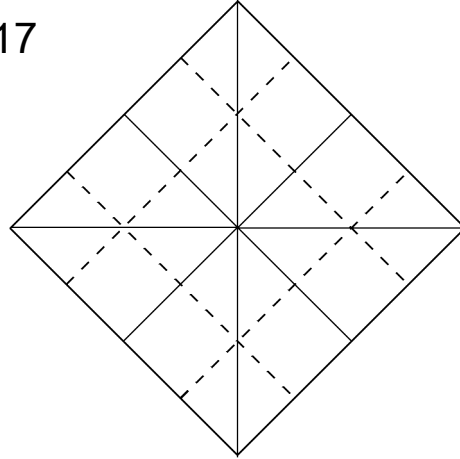
You will need two squares of paper. If you are using irogami begin with your paper arranged coloured side up.

16



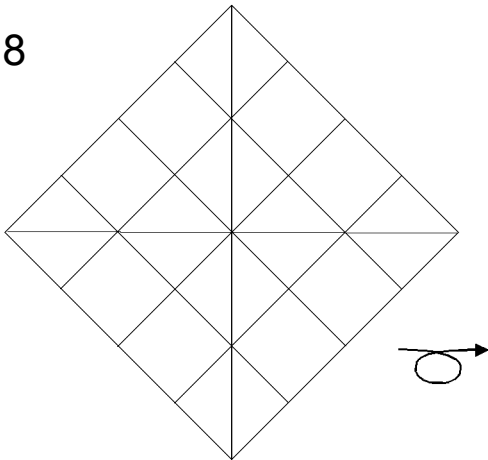
16. Fold in half edge to edge, then unfold, in both directions.

17



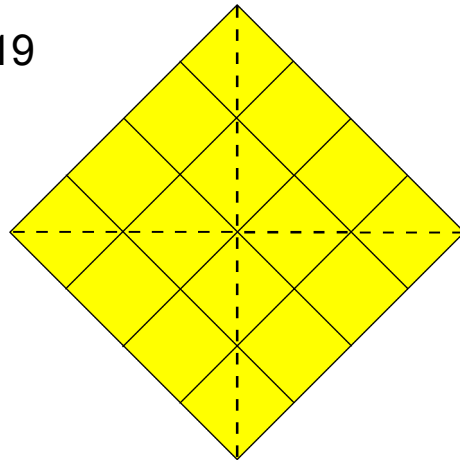
17. Fold all four edges into the centre, then unfold, in turn.

18



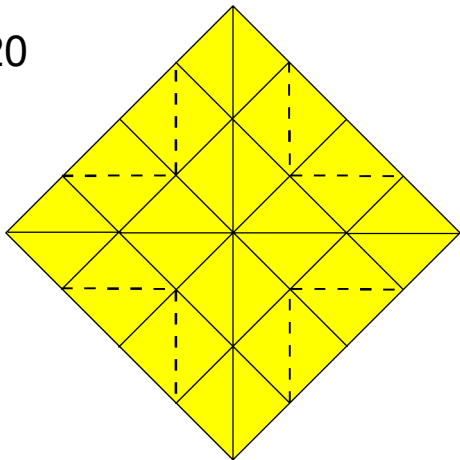
18. Turn over sideways.

19



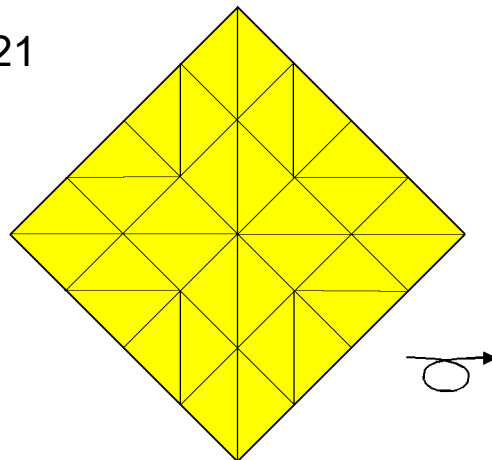
19. Fold in half diagonally, then unfold, in both directions.

20



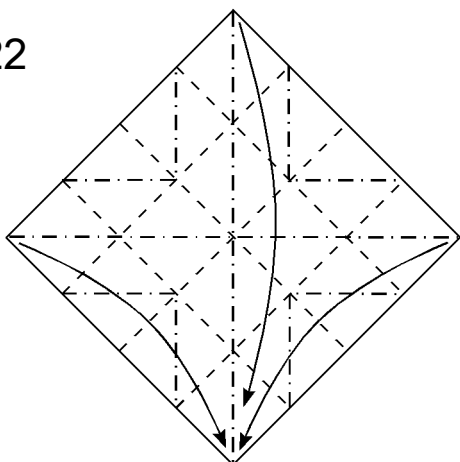
20. Add eight small diagonal creases in the way shown here.

21



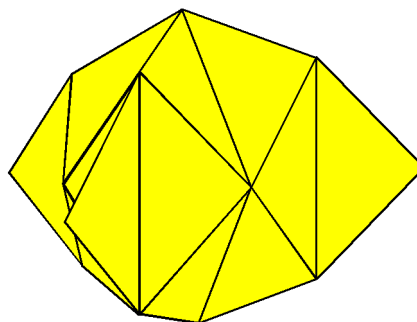
21. Turn over sideways.

22



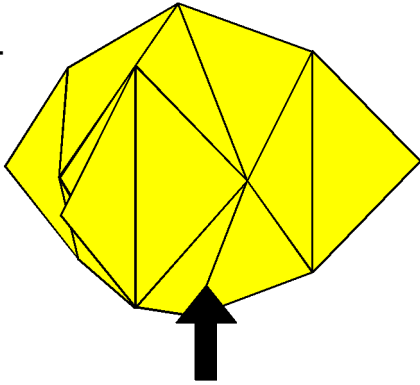
22. Collapse into the form shown in picture 22.

23

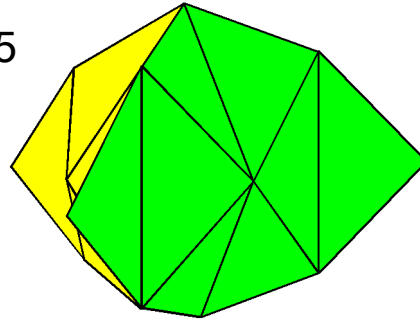


23. Make two.

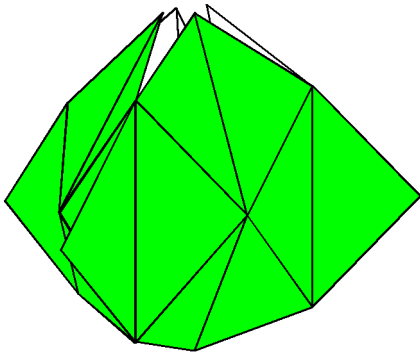
24



25



25. The 4x4 Cushion from squares, otherwise known as UFO, is finished.

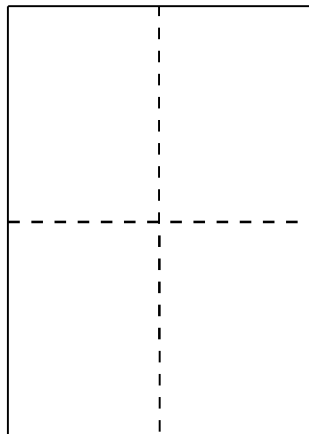


24. Slide together so that alternate flaps go inside and outside the other module.

Folding the 4x4 Cushion from oblongs

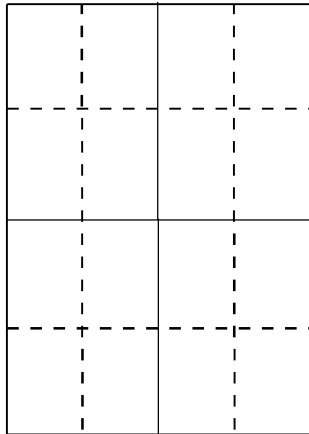
You will need two identical oblongs of paper. These diagrams show you how to fold the ornament using silver rectangles but the design will also work if you use oblongs of any other proportion. If you are using irogami begin with your paper arranged coloured side up.

26



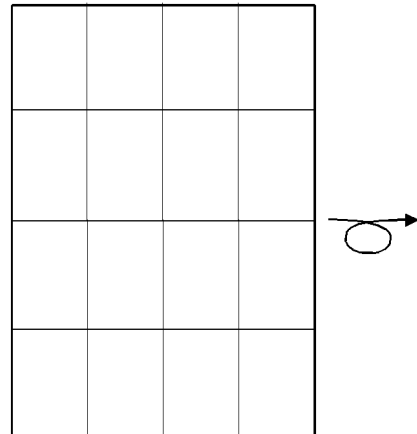
26. Fold in half edge to edge, then unfold, in both directions.

27



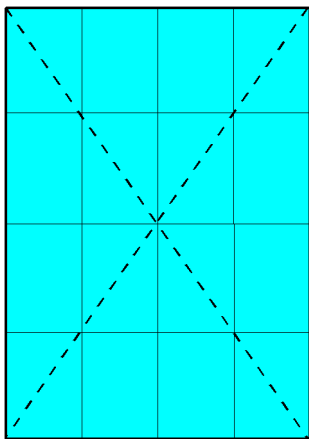
27. Fold all four edges into the centre in turn, then unfold.

28



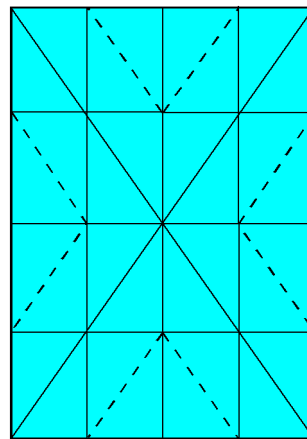
28. Turn over sideways.

29

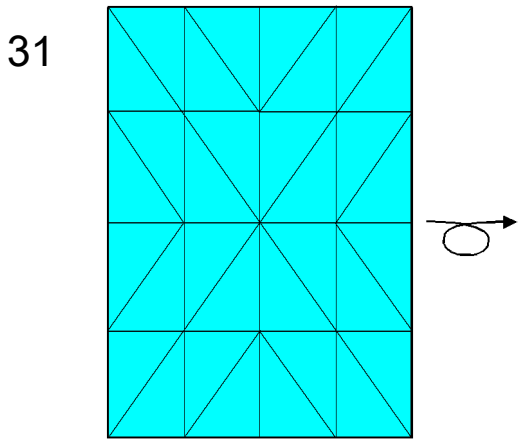


29. Fold in half diagonally, then unfold, in both directions. Take care to ensure that these creases pass exactly through the corners.

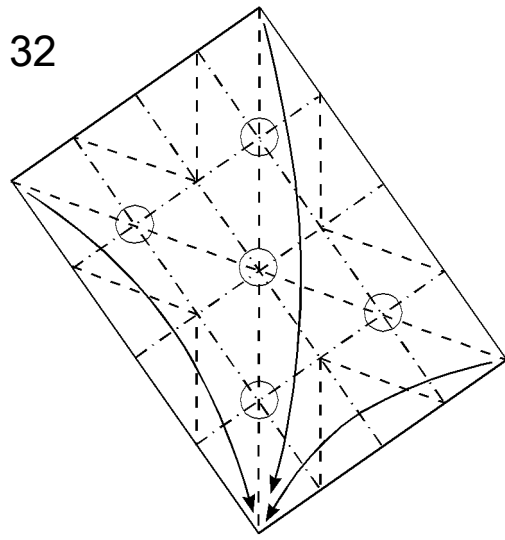
30



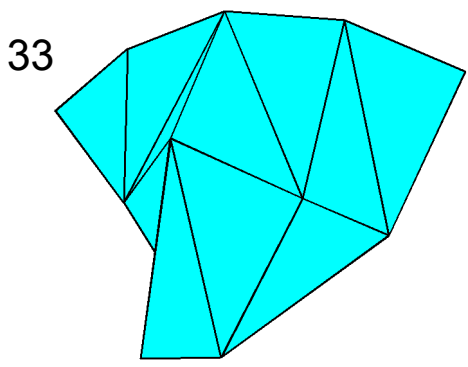
30. Add eight small diagonal creases in the way shown here.



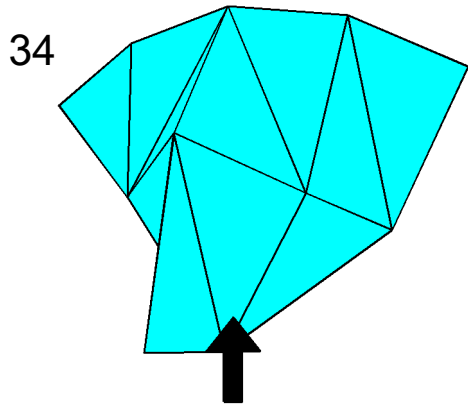
31. Turn over sideways and arrange to look like picture 32.



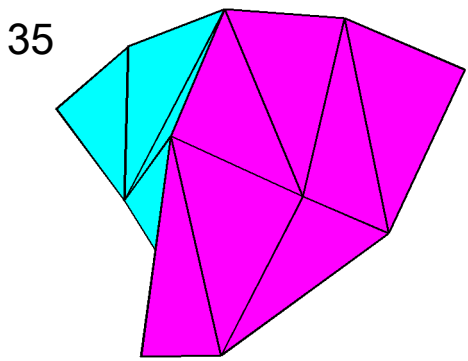
32. Collapse into the form shown in picture 33.



33. Make two.



34. Slide together so that alternate flaps go inside and outside the other module.



35. The 4x4 Cushion from oblongs is finished.

Crease patterns for cushions

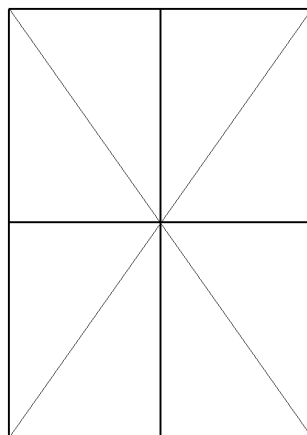
In all these crease patterns valley folds are shown as thick lines and mountain folds as thin ones. All the crease patterns are shown as if they are being folded from silver rectangles but they will also work from any other rectangle, including the square. Where only one pattern is given the design is regular i.e. both sheets are folded in the same way. Where two patterns are given the design is irregular. The first sheet should be folded using one crease pattern and the second sheet using the other.

This sequence of patterns can be extended to grids of 10, 12 or more rectangular cells but the modules become less easy to assemble into attractive designs as their complexity increases. Because of this I have only given one example of a crease pattern derived from a 12x12 grid.

Those crease patterns which are not themselves regular grids are derived by removing creases, in pairs, from the regular grids. This is a particularly convenient way to derive crease patterns for cushions but it is not the only way of doing it.

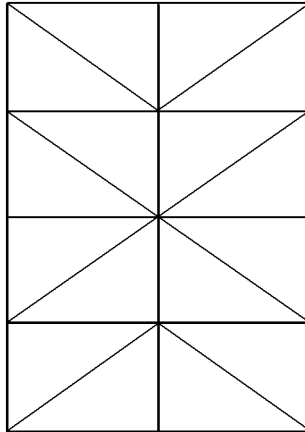
The crease patterns are labelled to show which creases have been removed, first horizontally, then vertically, in both cases beginning from the top left corner. Thus a 6x6 grid from which the 2nd and 4th creases have been omitted in both directions would be labelled 6 (missing 2 and 4) x 6 (missing 2 and 4) .

A
2 x 2
(The Oblong
Ornament)



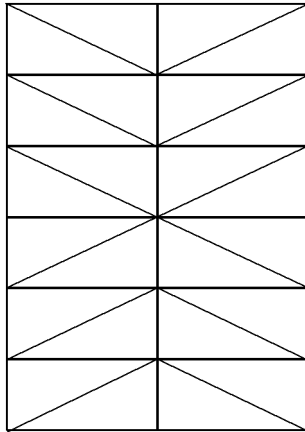
B

2 x 4



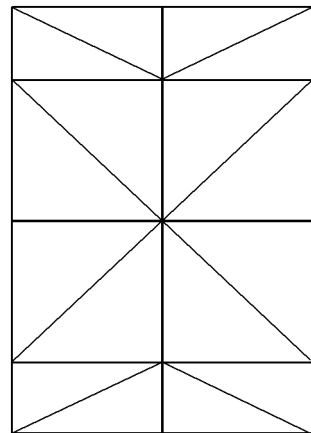
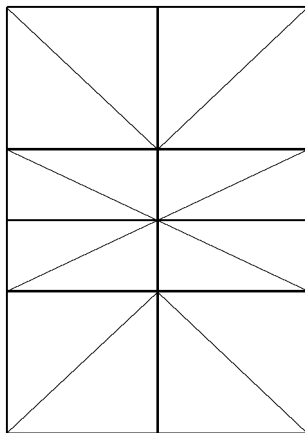
C

2 x 6



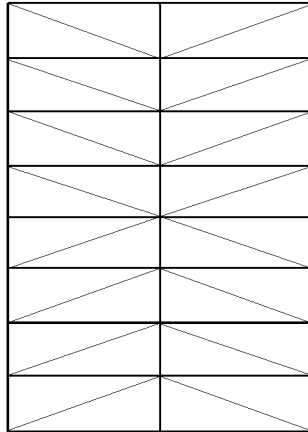
D

2
x
6 (missing 1 and 5)
+
2
x
6 (missing 2 and 4)



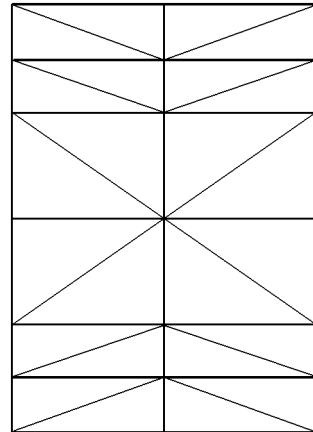
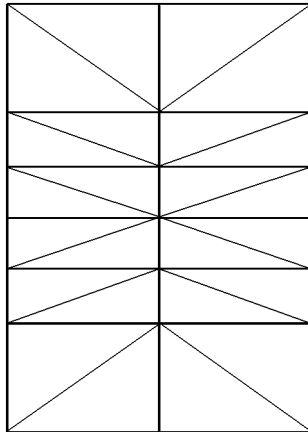
E

2 x 8



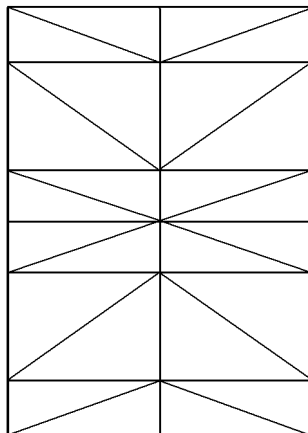
F

2
x
8 (missing 1 and 7)
+
2
x
8 (missing 3 and 5)



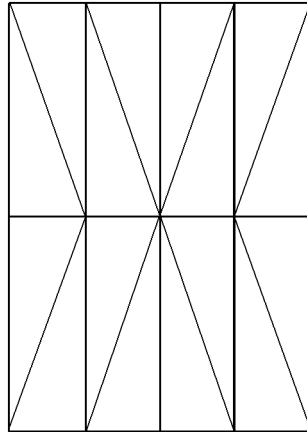
G

2
x
8 (missing 2 and 6)



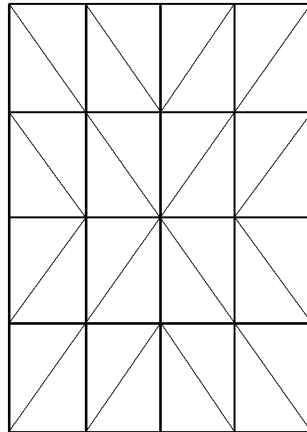
H

4 x 2



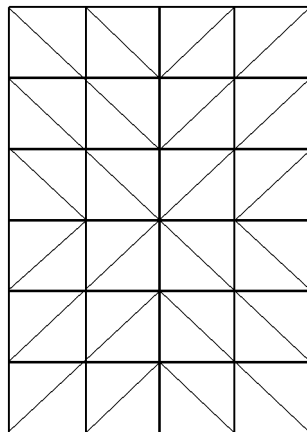
I

4 x 4

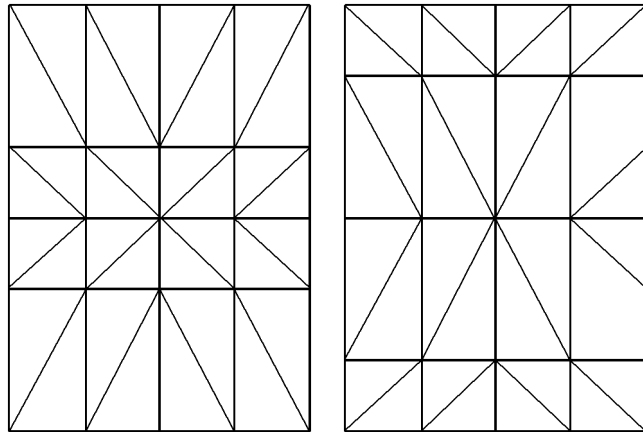


J

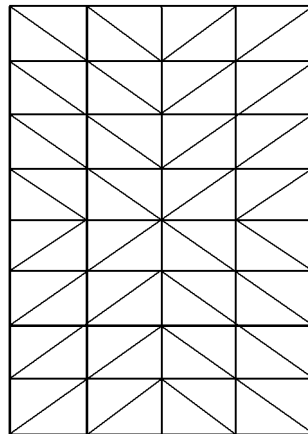
4 x 6



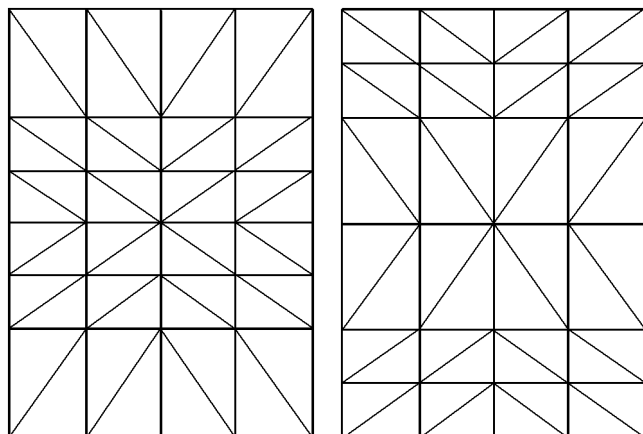
K
 4
 x
 6 (missing 1 and 5)
 +
 4
 x
 6 (missing 2 and 4)



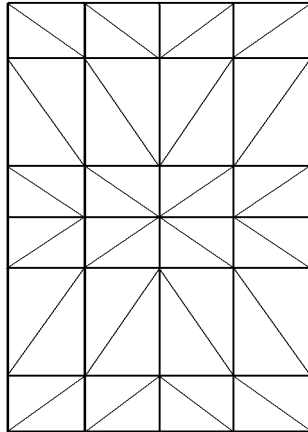
L
 4 x 8



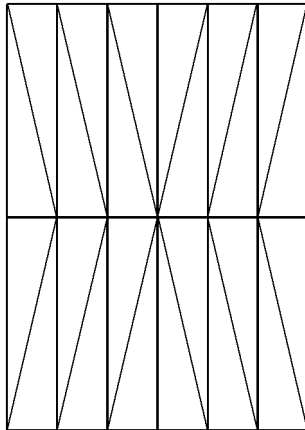
M
 4
 x
 8 (missing 1 and 7)
 +
 4
 x
 8 (missing 3 and 5)



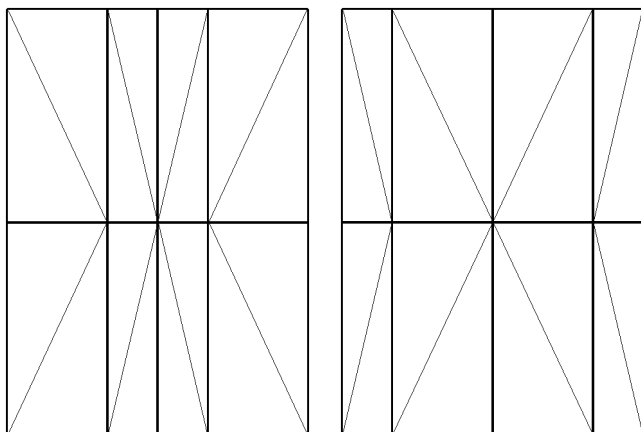
N
 4
 X
 8 (missing 2 and 6)



O
 6 x 2

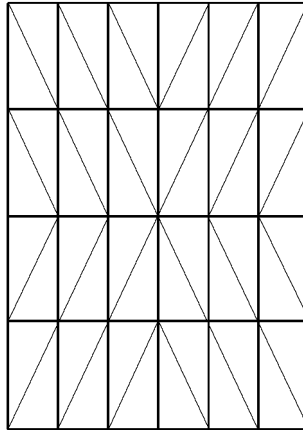


P
 6 (missing 1 and 5)
 X
 2
 +
 6 (missing 2 and 4)
 X
 2



Q

6 x 4



R

6 (missing 1 and 5)

x

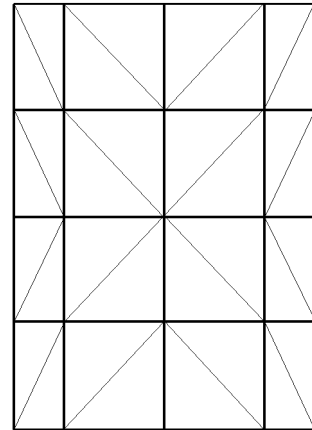
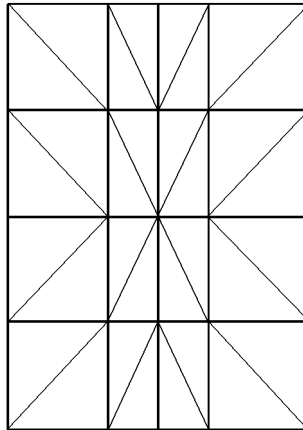
4

+

6 (missing 2 and 4)

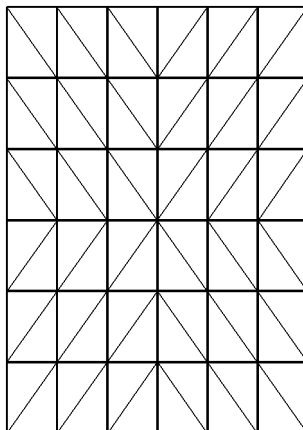
x

4



S

6 x 6



T

6 (missing 1 and 5)

x

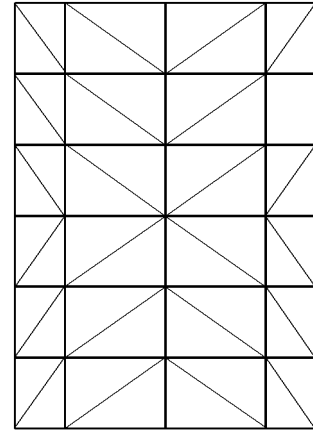
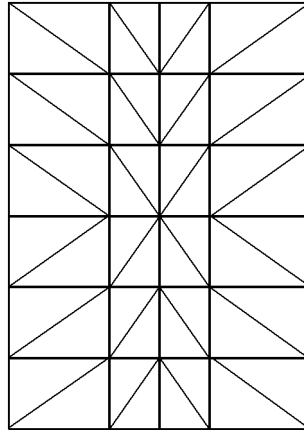
6

+

6 (missing 2 and 4)

x

6



U

6

x

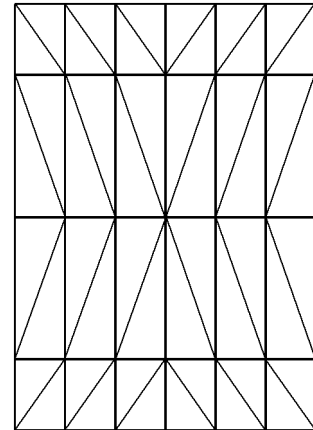
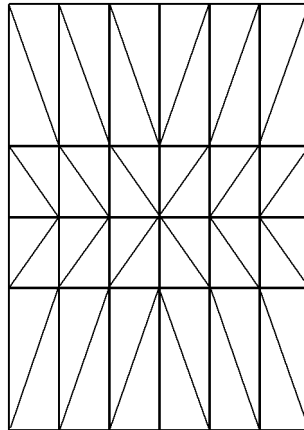
6 (missing 1 and 5)

+

6

x

6 (missing 2 and 4)



V

6 (missing 1 and 5)

x

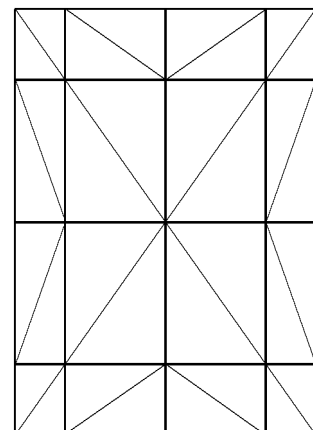
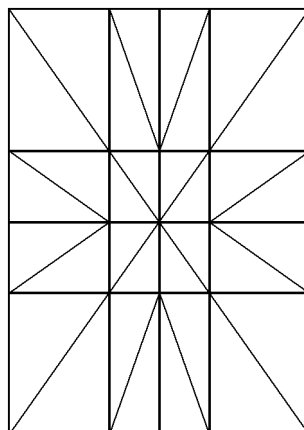
6 (missing 1 and 5)

+

6 (missing 2 and 4)

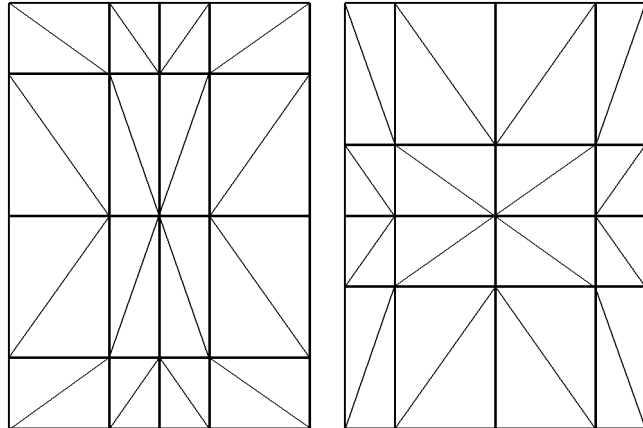
x

6 (missing 2 and 4)



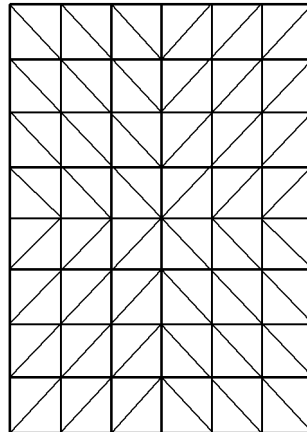
W

6 (missing 1 and 5)
x
6 (missing 2 and 4)
+
6 (missing 2 and 4)
x
6 (missing 1 and 5)



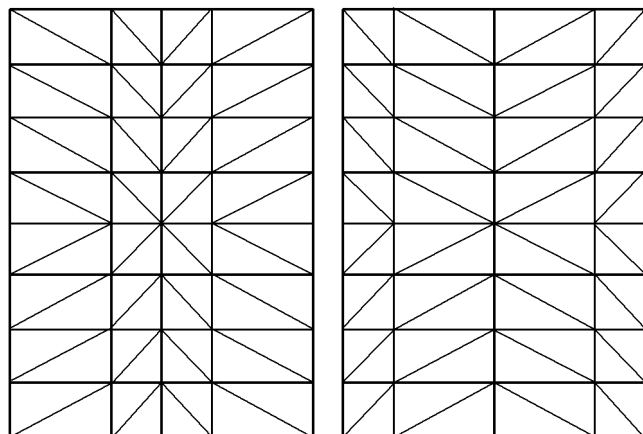
X

6 x 8



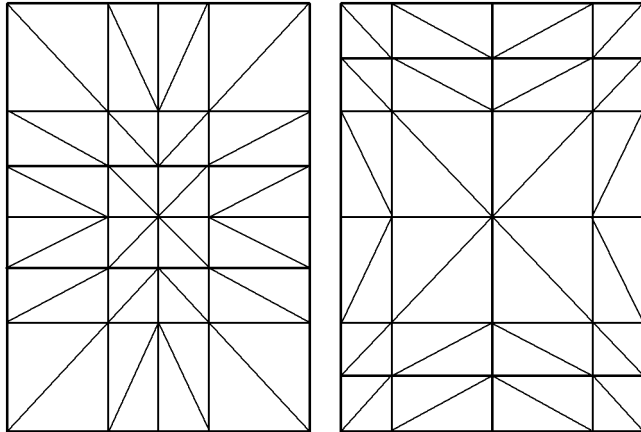
Y

6 (missing 1 and 5)
x
8
+
6 (missing 2 and 4)
x
8



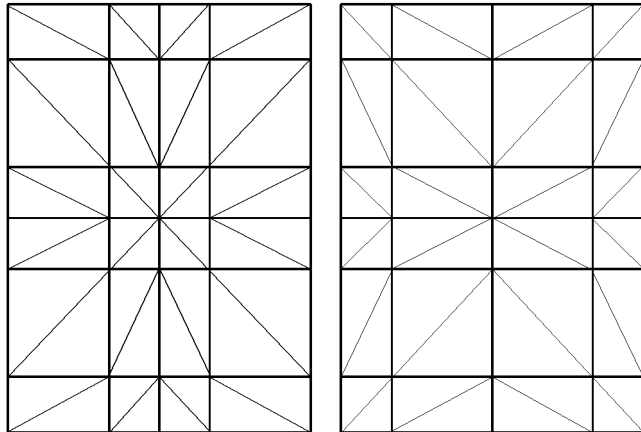
Z

6 (missing 1 and 5)
x
8 (missing 1 and 7)
+
6 (missing 2 and 4)
x
8 (missing 3 and 5)



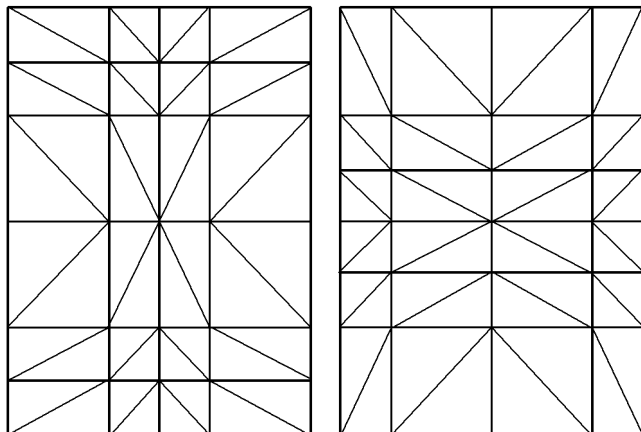
AA

6 (missing 1 and 5)
x
8 (missing 2 and 6)
+
6 (missing 2 and 4)
x
8 (missing 2 and 6)



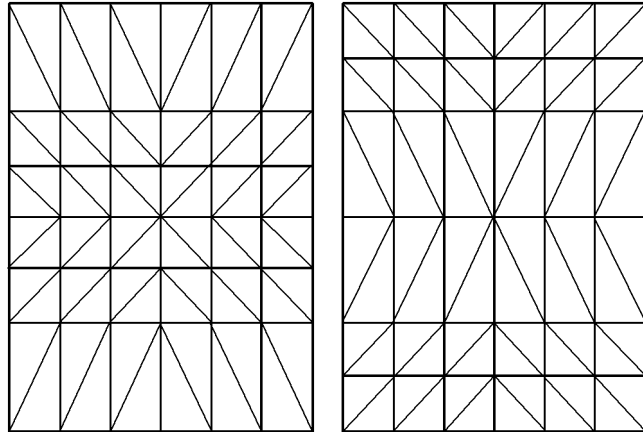
BB

6 (missing 1 and 5)
x
8 (missing 3 and 5)
+
6 (missing 2 and 4)
x
8 (missing 1 and 7)



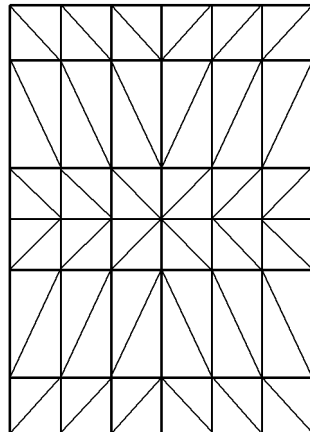
CC

6
x
8 (missing 1 and 7)
+
6
x
8 (missing 3 and 5)



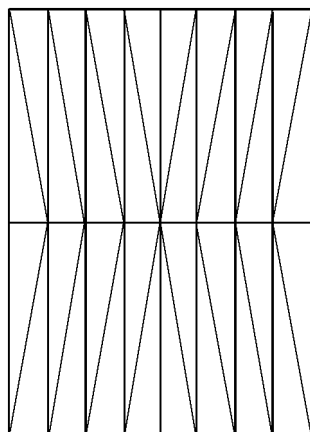
DD

6
x
8 (missing 2 and 6)



EE

8 x 2



FF

8 (missing 1 and 7)

x

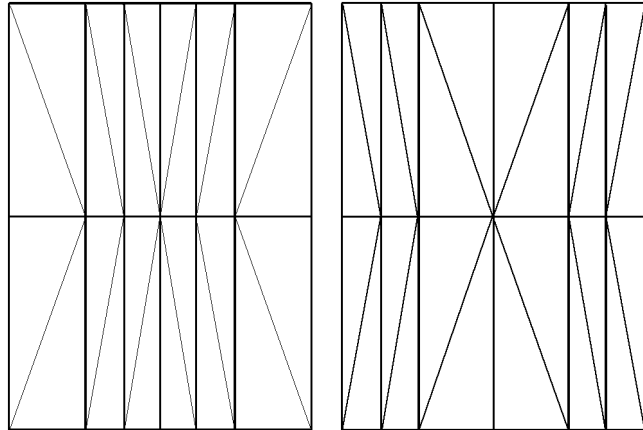
2

+

8 (missing 3 and 5)

x

2



GG

8 (missing 2 and 6)

x

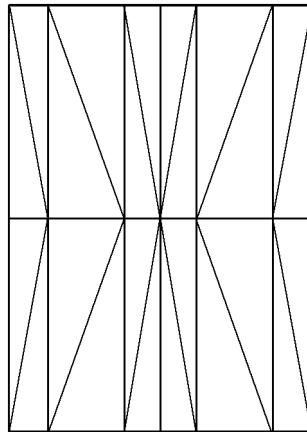
2

+

8 (missing 2 and 6)

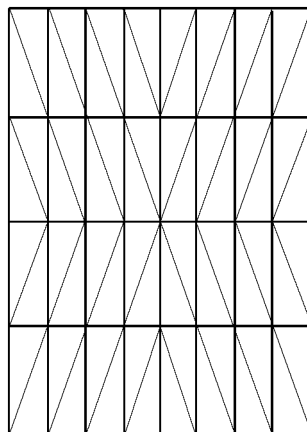
x

2



HH

8 x 4



II

8 (missing 1 and 7)

x

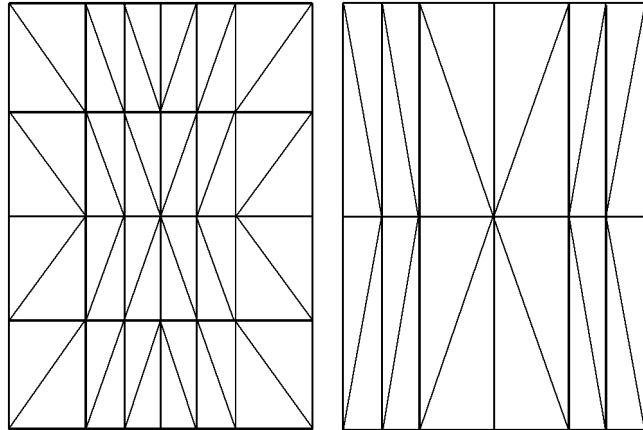
4

+

8 (missing 3 and 5

x

4



JJ

8 (missing 2 and 6)

x

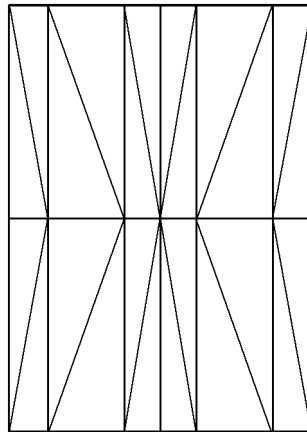
4

+

8 (missing 2 and 6)

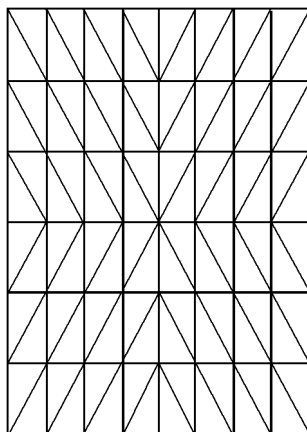
x

4



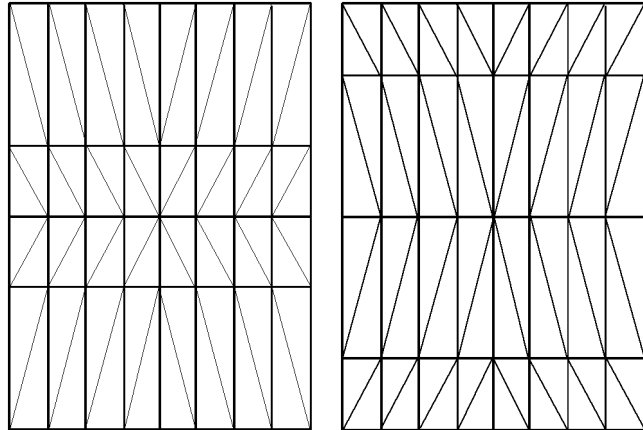
KK

8 x 6



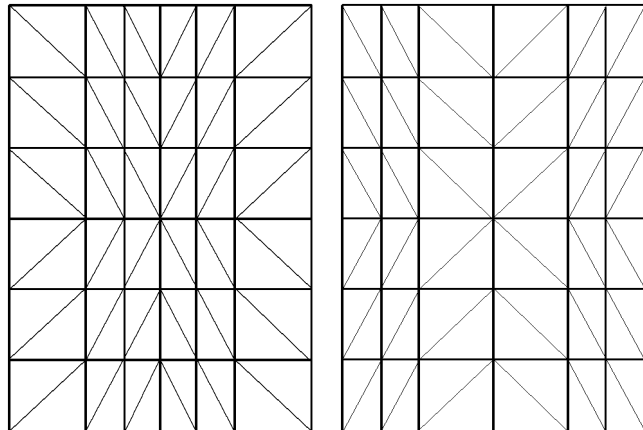
LL

$$\begin{array}{r} 8 \\ \times \\ 6 \text{ (missing 1 and 5)} \\ + \\ 8 \\ \times \\ 6 \text{ (missing 2 and 4)} \end{array}$$



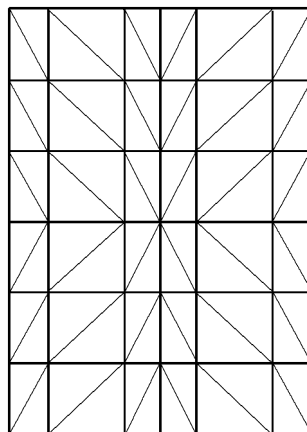
MM

$$\begin{array}{r} 8 \text{ (missing 1 and 7)} \\ \times \\ 6 \\ + \\ 8 \text{ (missing 3 and 5)} \\ \times \\ 6 \end{array}$$



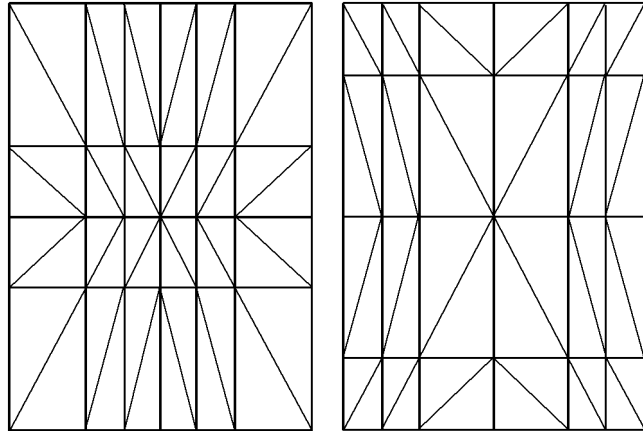
NN

$$\begin{array}{r} 8 \text{ (missing 2 and 6)} \\ \times \\ 6 \\ + \\ 8 \text{ (missing 2 and 6)} \\ \times \\ 6 \end{array}$$



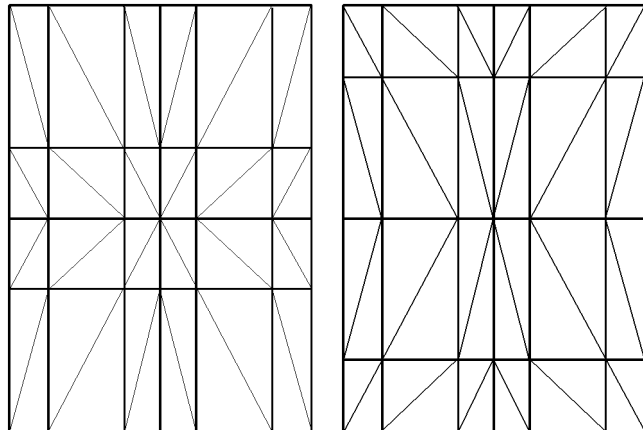
OO

8 (missing 1 and 7)
x
6 (missing 1 and 5)
+
8 (missing 3 and 5)
x
6 (missing 2 and 4)



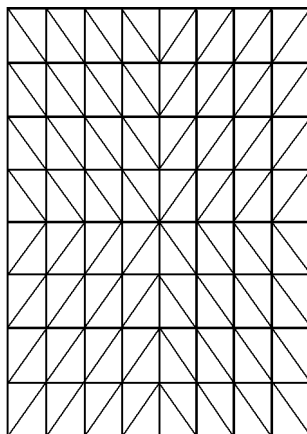
PP

8 (missing 2 and 6)
x
6 (missing 1 and 5)
+
8 (missing 3 and 5)
x
6 (missing 2 and 4)



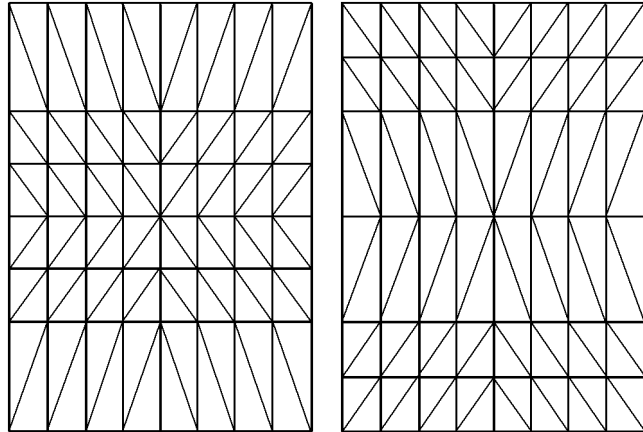
QQ

8 x 8



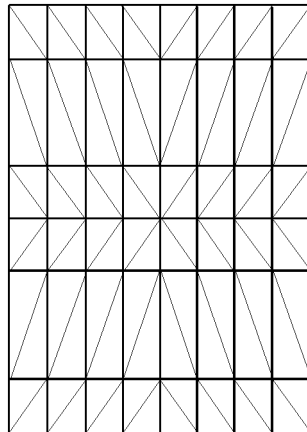
RR

$$\begin{array}{r} 8 \\ \times \\ 8 \text{ (missing 1 and 7)} \\ + \\ 8 \\ \times \\ 8 \text{ (missing 3 and 5)} \end{array}$$



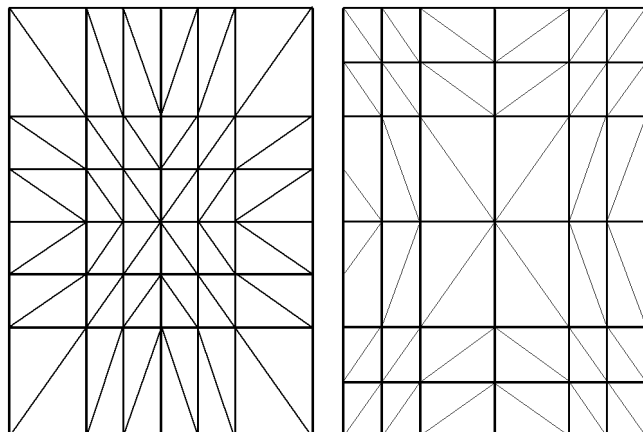
SS

$$\begin{array}{r} 8 \\ \times \\ 8 \text{ (missing 2 and 6)} \\ + \\ 8 \\ \times \\ 8 \text{ (missing 2 and 6)} \end{array}$$



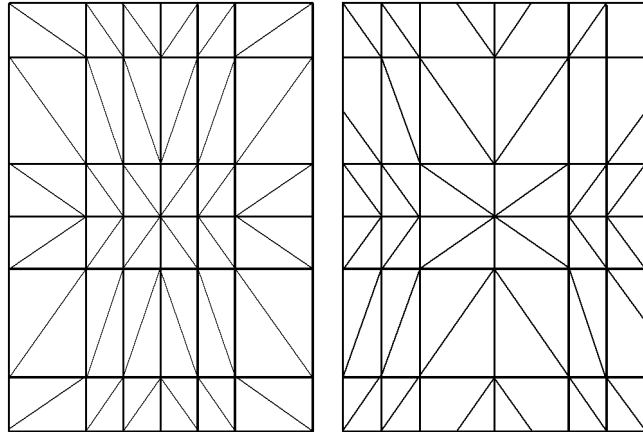
TT

$$\begin{array}{r} 8 \text{ (missing 1 and 7)} \\ \times \\ 8 \text{ (missing 1 and 7)} \\ + \\ 8 \text{ (missing 3 and 5)} \\ \times \\ 8 \text{ (missing 3 and 5)} \end{array}$$



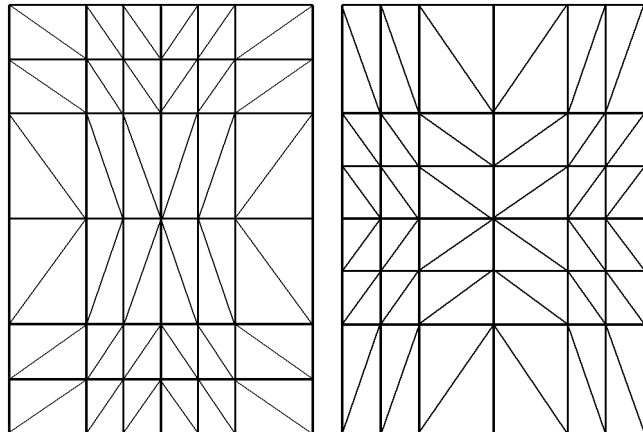
UU

8 (missing 1 and 7)
 x
 8 (missing 2 and 6)
 +
 8 (missing 3 and 5)
 x
 8 (missing 2 and 6)



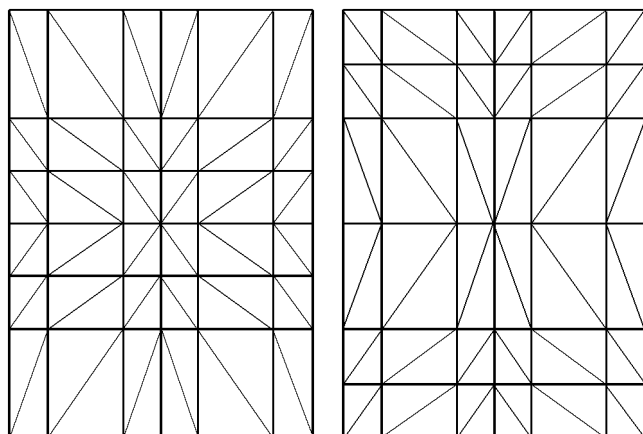
VV

8 (missing 1 and 7)
 x
 8 (missing 3 and 5)
 +
 8 (missing 3 and 5)
 x
 8 (missing 1 and 7)



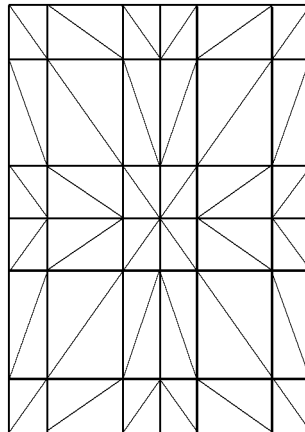
WW

8 (missing 2 and 6)
 x
 8 (missing 1 and 7)
 +
 8 (missing 2 and 6)
 x
 8 (missing 3 and 5)



XX

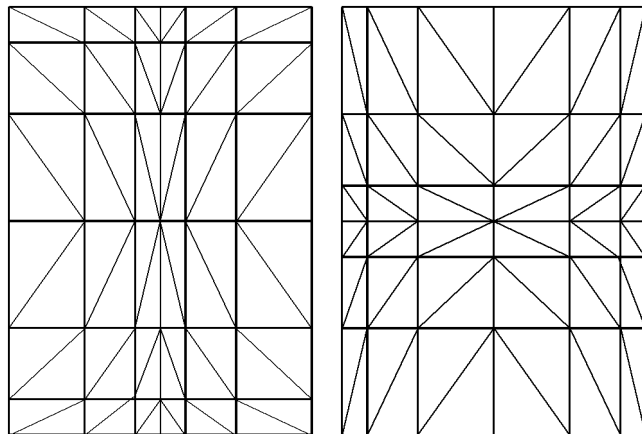
8 (missing 2 and 6)
x
8 (missing 2 and 6)
+
8 (missing 2 and 6)
x
8 (missing 2 and 6)



And finally, here is just one example of a crease pattern for a cushion derived from a 12 x 12 grid:

YY

12 (missing
1,2,4,8,10 and 11)
x
12 (missing 2,4,5,7,8
and 10)
+
12 (missing 2,4,5,7,8
and 10)
x
12 (missing
1,2,4,8,10 and 11)



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