## Octagram Kite Tiles

These diagrams show you how to fold the octagram kite tile from squares, silver rectangles and the 1:1+sqrt2/2 rectangle, which can be easily obtained from the leftover rectangle.

Silver rectangles have edges in the proportion 1:sqrt2. DIN paper sizes
 such as A4, A5 etc are good enough approximations of silver rectangles for practical paperfolding purposes.

Leftover rectangles have sides in the proportion of 1:sqrt2+1 and are easily obtained from silver rectangles by removing the largest possible square.

Using the methods given here, when the octagram kite tile is folded from the
 largest square that can be cut from a silver rectangle it will be the same size as one folded directly from a silver rectangle.

The area of the Octagram Kite tile is half the square of the length of one of its long edges. The method of folding from a $1: 1+$ sqrt2/2 rectangle is included because it provides an elegant way to demonstrate this by dissection and reassembly.

The octagram kite tile folded from a square is a traditional fold known as the kite base. I discovered that the area of the tile could be demonstrated by dissection and reassembly in 2010 and both the design of the silver rectangle version and the method of obtaining the $1: 1+$ sqrt2/2 rectangle from a leftover rectangle in 2016.

## Tiling patterns

1


1. Octagram kite tiles will tile the plane like this.

3

3. ... and four to form a four pointed star.

2

2. Eight will fit together to form an octagram

4

4. The four pointed star can be surrounded by further tiles to create a design like this ... but this design cannot be expanded further without leaving gaps between the tiles.

## Folding from squares


5. Fold in half sideways, then unfold.

7

7. Turn over sideways.

6. Fold both the right and left bottom sloping edges onto the vertical crease.
8

8. The octagram kite tile is finished.

## Folding from silver rectangles


9. Fold in half downwards, then unfold.

10. Fold all four corners inwards like this, using the horizontal crease to locate the

11

11. Fold both sloping right edges onto the horizontal crease.

12

12. Flatten all the folds and turn over sideways.

13. The octagram kite tile is finished.

## Folding from leftover rectangles

14

14. Fold in half corner to opposite corner like this but only make a tiny crease in the bottom edge.

16. Cut along the vertical crease to separate the two parts of the paper.

18

18. Fold in half downwards, then unfold.

20

20. Fold both sloping right hand edges onto the horizontal crease. The creases should meet the left corners of the top and bottom edges ...

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15. Fold the bottom right corner onto the point where the crease made in step 14 intersects the bottom edge, then unfold.

17

17. Discard the right hand piece.

19

19. Fold all four corners inwards like this, using the horizontal crease to locate the folds.

21

21. ... like this. Flatten all the folds firmly then turn over sideways.

22

31. The octagram star tile is finished.

## Notes

Equivalent sizing of tiles from square and silver rectangle


Obtaining the $1: 1+$ sqrt $2 / 2$ rectangle
C
1+sqrt2

C. A leftover rectangle has sides in the proportion 1:1+sqrt2

D


E

D. A crease made by folding corner to opposite corner then unfolding divides both the top and bottom edges in the proportions shown.
E. Fold 15 removes a length of sqrt2/2 from the long side of the leftover rectangle.

Demonstrating the area of the tile

G


H

H. To demonstrate this by dissection and reassembly first cut the paper into eight pieces along the main creases ...
G. The area of the octagram star tile is half the square of one of the longest sides, marked as length $x$ here.

I. ... then rearrange the pieces like this. Two of the large pieces need to be turned over to achieve this pattern.

## J . The result is a square of edge

 length $x$.