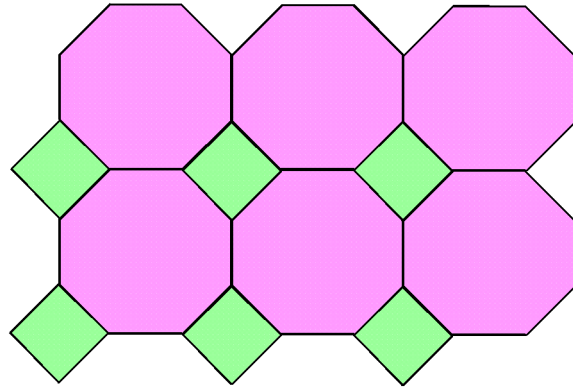


Folding Octagons

These diagrams explain five ways to create an octagon.

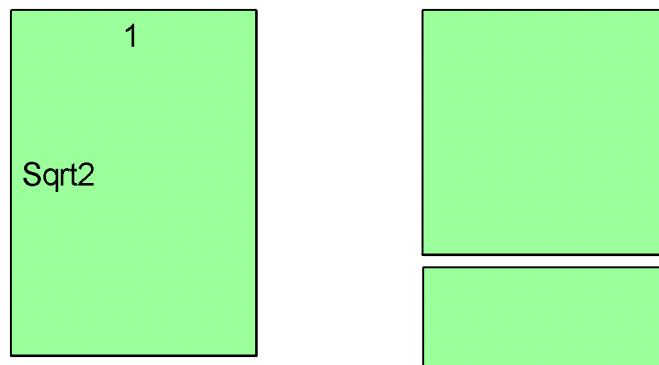
The first method shows you how to fold two octagons simultaneously from two squares of paper. The second method is essentially similar but only uses one square of paper at a time.



The third method also uses just a single square. I include it because it uses some interesting geometric constructions to fully locate the folds.

The fourth method shows you one way of folding an octagon directly from a $1:\sqrt{2}$ silver rectangle. DIN sized paper is a sufficiently good approximation of a silver rectangle to use for this purpose.

If you remove the largest possible square from a silver rectangle the part leftover will be a $1:1\sqrt{2}$ rectangle.



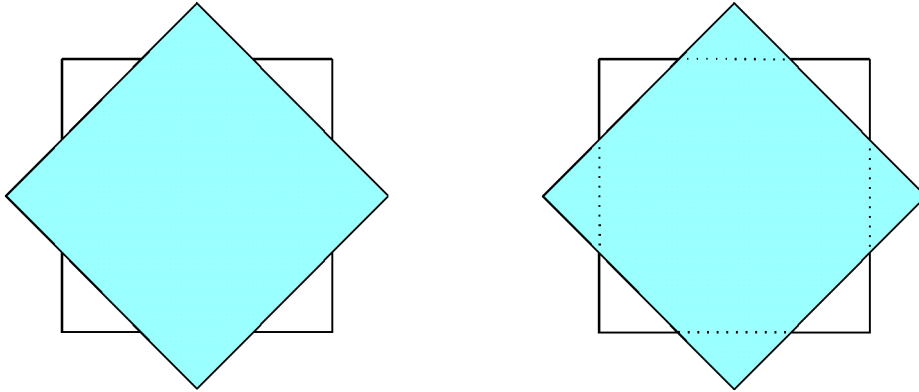
For obvious reasons I call this the leftover rectangle. Four leftover rectangles can be laid on top of each other to produce an octagon.

Octagons will only tile the plane in company with square filler tiles. A way of folding a correctly-sized tile is given at the end of these diagrams.

Method 1 - The Two Square, No Crease Method

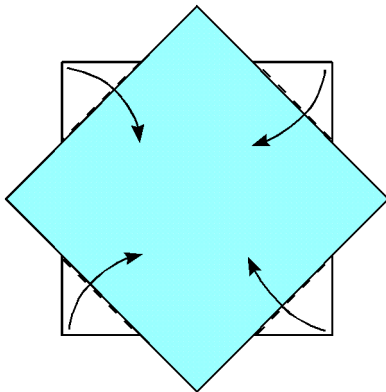
You will need two squares of the same size.

1



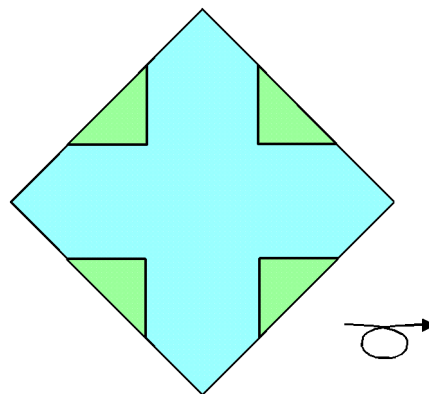
1. Lay one square on top of another like this so that all the single layer areas are the same size and shape. It may help to hold the paper up to the light so that the shape of the single layer areas can be seen more easily. With practice you will be able to do this accurately by eye alone. As an alternative, steps 7 to 10 show you how to position the two squares by lining up creases folded into the paper. If you get children to do this by eye alone their octagons will tend to end up wonky rather than regular. On the other hand they will all, probably, still be octagons.

2

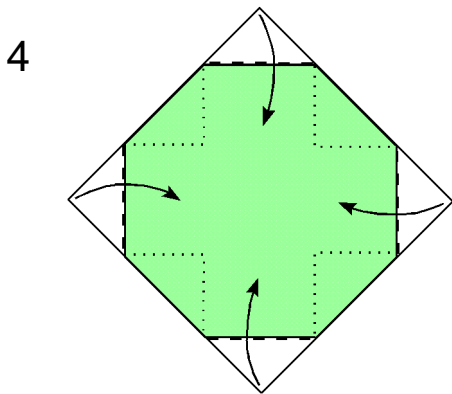


2. Fold all the corners of the square at the back to the front in turn, making sure that the squares do not slip out of alignment as you do so.

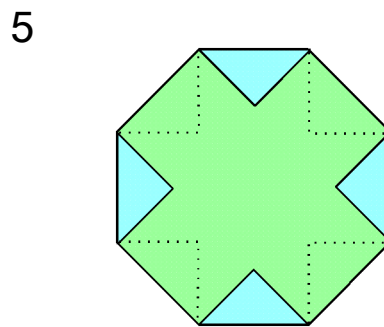
3



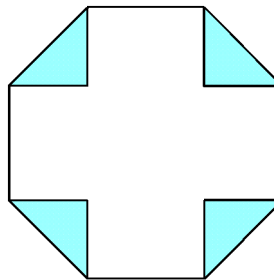
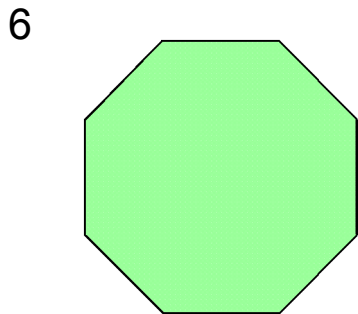
3. Turn over sideways.



4. Repeat step 2 on the corners of the other square, which is now at the back.

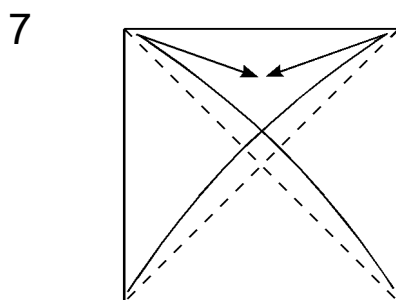


5. Take the two sheets apart, then fold the corners inwards again.

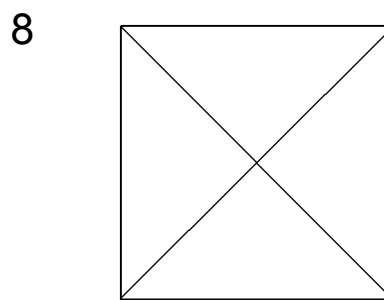


6. You should now have two identical octagons (one of which will need to be turned over). Neither of the octagons will have a crease across the face

If you find it difficult to arrange the position of the two squares by eye alone you can use creases to help position them more accurately.

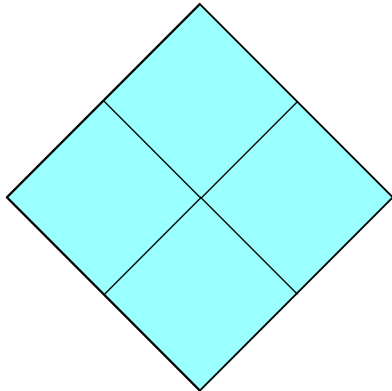


7. Lay the first square white side up. Fold in half diagonally, then unfold, in both directions.



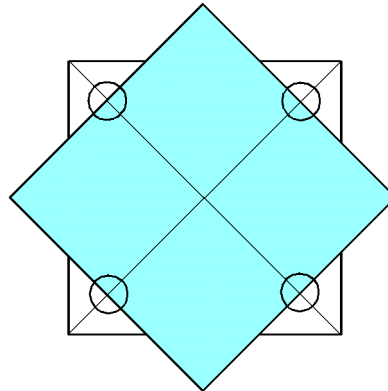
8. The result should look like this.

9



9. Lay the second square coloured side up. Fold the second square in half edge to edge, then unfold, in both directions.

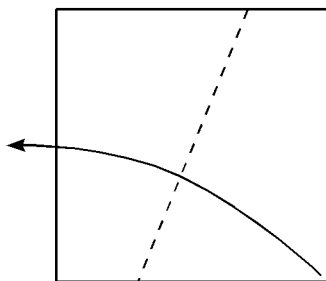
10



6. Lay one square on top of the other so that the creases are aligned at the points marked with circles like this. Complete the octagon by following steps 2 through 6. The resulting octagon will have several creases across its face.

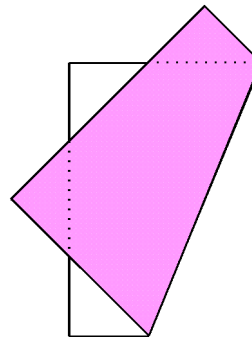
Method 2 - The One Square, One Crease Method

11



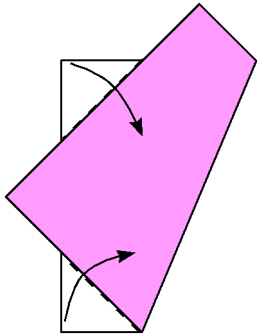
11. Arrange your square white side up, then fold it in half like this. Make your crease softly at first and only flatten it completely when you are sure it is in the correct position. Picture 12 shows what the result should look like and gives you advice on how to achieve an accurate result.

12



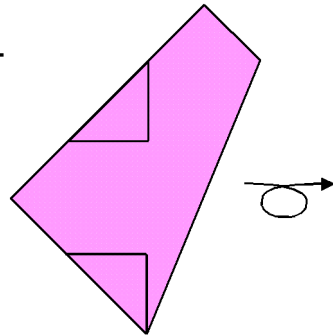
12. Once the crease is flattened, all the single layer areas should be the same size and shape. It may help to hold the paper up to the light so that the shape of the single layer areas can be seen more easily. With practice you will be able to make this fold accurately. As an alternative, steps 19 to 22 show you how to locate this fold by lining up creases folded into the paper.

13



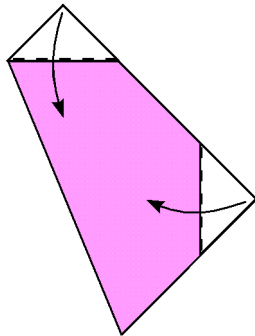
13. Fold both the corners of the back layer inwards over the edges of the front layer.

14



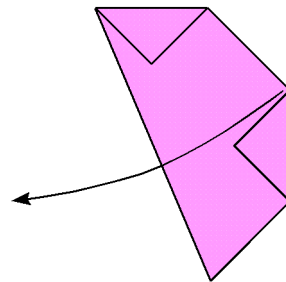
14. Turn over sideways.

15



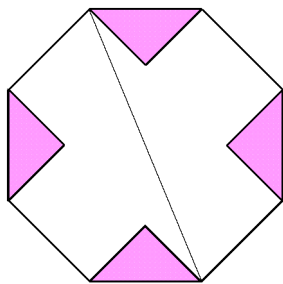
15. Fold both the corners of the new back layer inwards over the edges of the front layer.

16



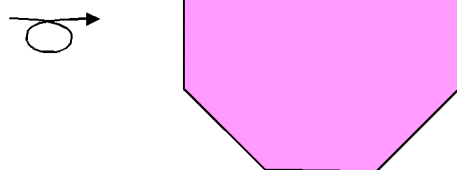
16. Open out then refold the corners inwards.

17



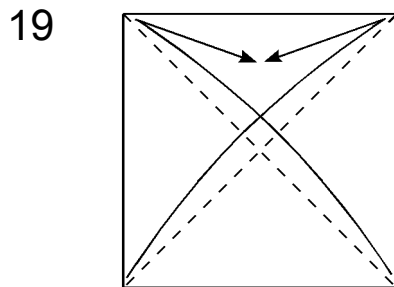
17. Turn over sideways.

18

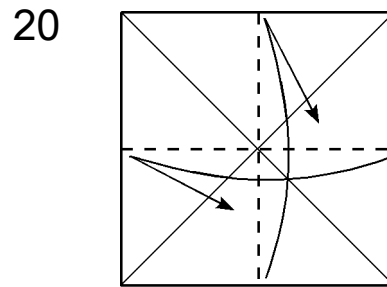


18. Your octagon is finished.

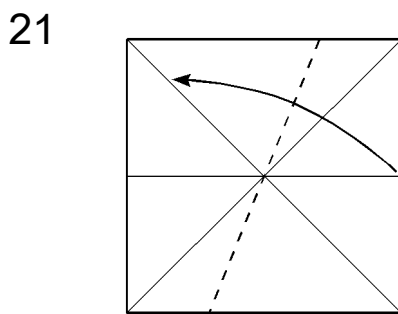
If you find it difficult to arrange the position of the two squares sufficiently accurately by eye alone you can use creases to help position them



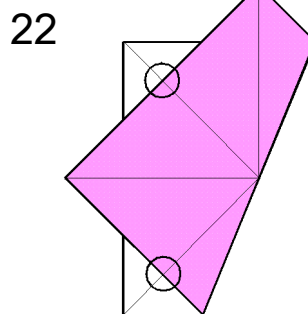
19. Fold your square in half diagonally, then unfold, in both directions.



20. Fold your square in half edge to edge, then unfold, in both directions.

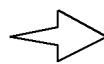
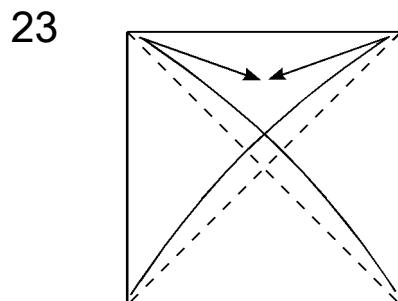


21. Fold your square in half like this so that the result looks like picture 22.



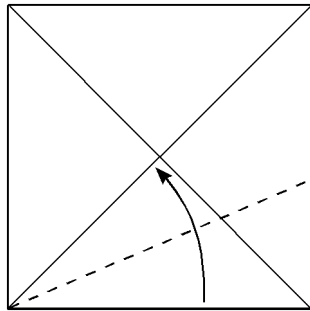
22. Flatten the fold so that the creases marked with circles are in alignment. Continue with steps 13 through 17.

Method 3 - The One Square, Fully Located Method



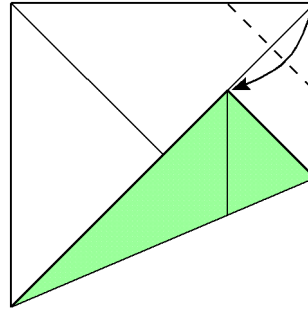
23. Begin with your square arranged white side up. Fold in half diagonally, then unfold, in both directions.

24



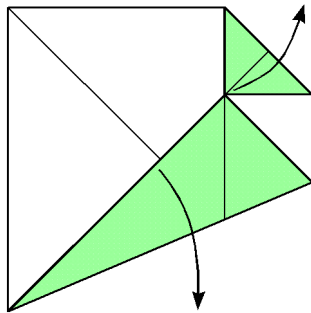
24. Fold the bottom edge onto the diagonal crease, like this.

25



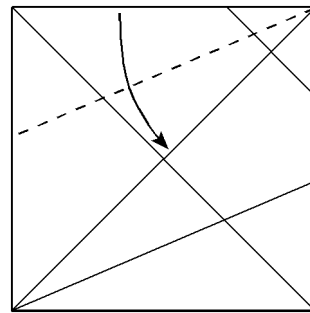
25. Fold the top right corner inwards so that it just touches the top corner of the front layer.

26



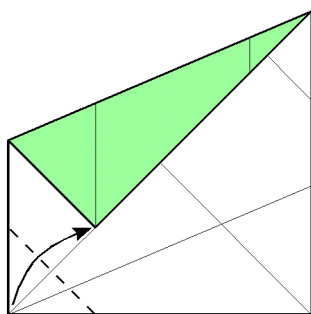
26. Undo the folds you made in steps 24 and 25.

27



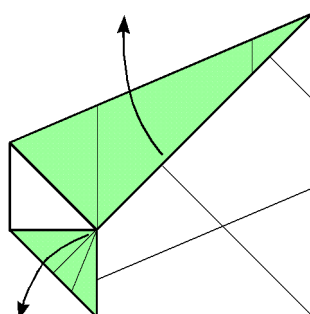
27. Fold the top edge onto the diagonal crease, like this.

28



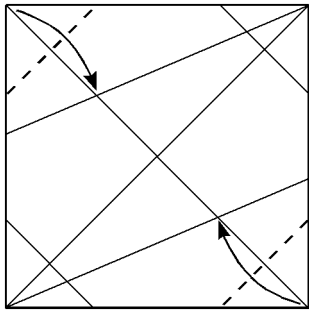
28. Fold the bottom left corner inwards so that it just touches the bottom corner of the front layer.

29



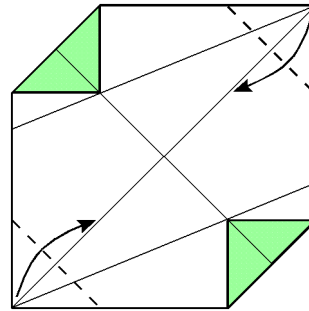
29. Open out the folds made in steps 27 and 28.

30



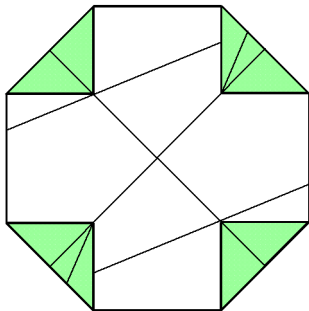
30. Fold the top left and bottom right corners inwards to the points where the creases made in steps 24 and 27 cross the diagonal.

31



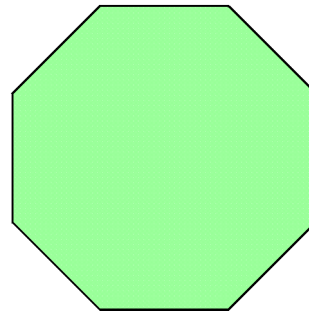
31. Remake the folds made in steps 25 and 28.

32



32. Make sure all the layers lie flat then turn over sideways.

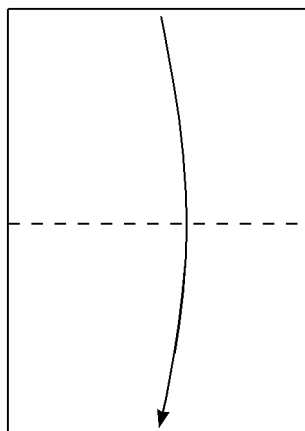
33



33. Your octagon is finished.

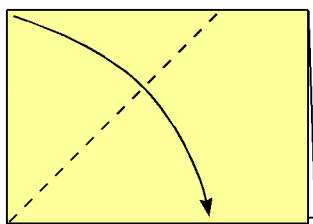
Method 4 - Directly from a Silver Rectangle

34



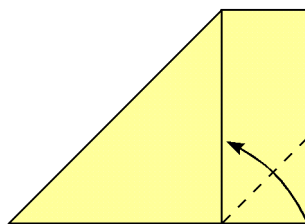
34. Arrange your paper white side up. Fold in half downwards.

35



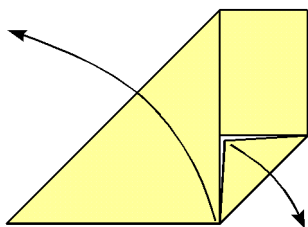
35. Fold the left edge onto the bottom edge.

36



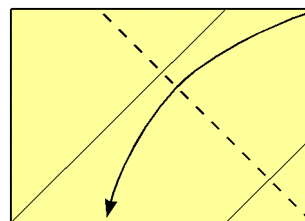
36. Fold the bottom right hand corner inwards so that the bottom edge butts up against the vertical edge of the other front layers. Make this fold in both layers.

37



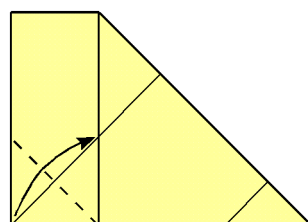
37. Open out the folds made in steps 35 and 36.

38



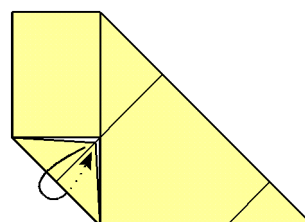
38. Fold the right edge onto the bottom edge.

39

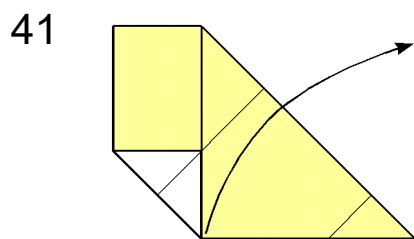


39. Fold the bottom left hand corner inwards so that the bottom edge butts up against the vertical edge of the other front layers. Make this fold in both layers.

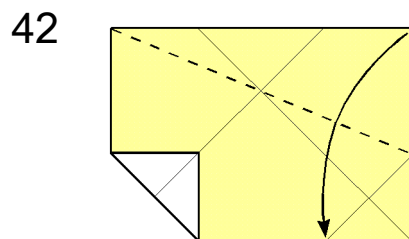
40



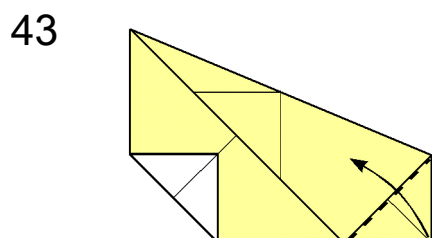
40. There are two small flaps at the bottom left corner. Rotate just the front flap backwards out of sight.



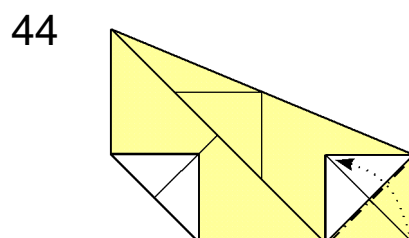
41. Open out the fold made in step 38.



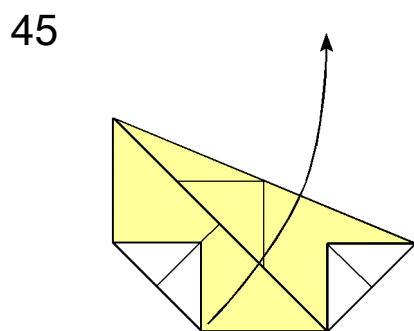
42. Fold the top right corner onto the bottom edge like this, making sure the crease starts from the top left corner, which remains sharp.



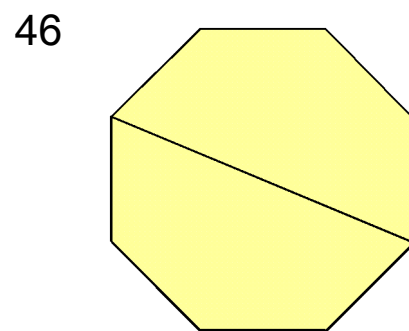
43. There are two small flaps at the bottom right corner. Fold the front flap inwards using the existing crease.



44. Fold the second flap backwards out of sight using the existing crease.



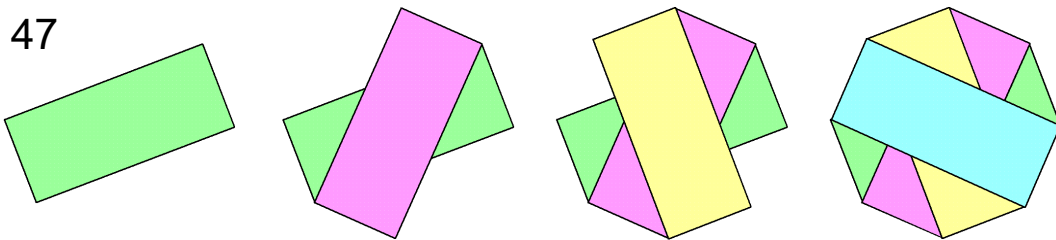
45. Make sure all the layers lie flat then open out the front layers upwards and to the right.



46. The octagon is finished.

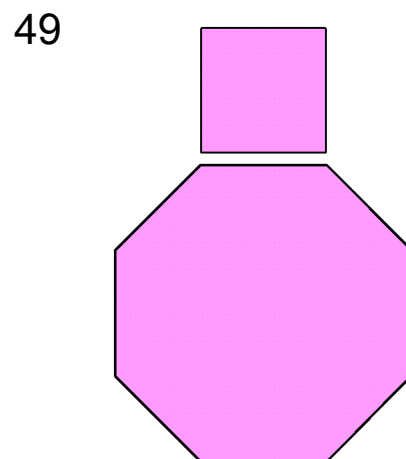
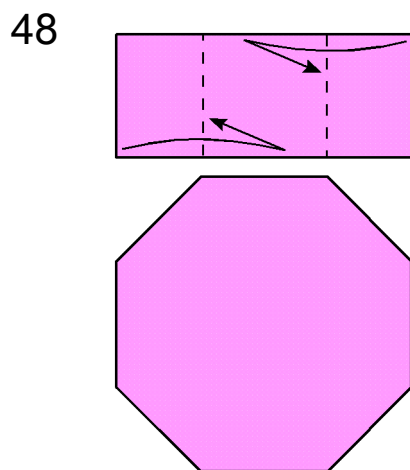
Method 5 - By arranging leftover rectangles

If you have been making your squares by cutting down DIN rectangles in the way shown on page 1 you will by now have a good supply of leftover rectangles. Four of these can be arranged to form an octagon.



Making a square filler tile

If you make an octagons from the largest size of square that can be cut from a DIN size rectangle, a square filler tile can be made from the leftover rectangle that you cut off when making the square.



48. Roughly align the leftover rectangle and the octagon like this. Fold in both ends of the leftover rectangle using the ends of the top edge of the octagon to locate the folds.

49. The filler tile is finished.

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