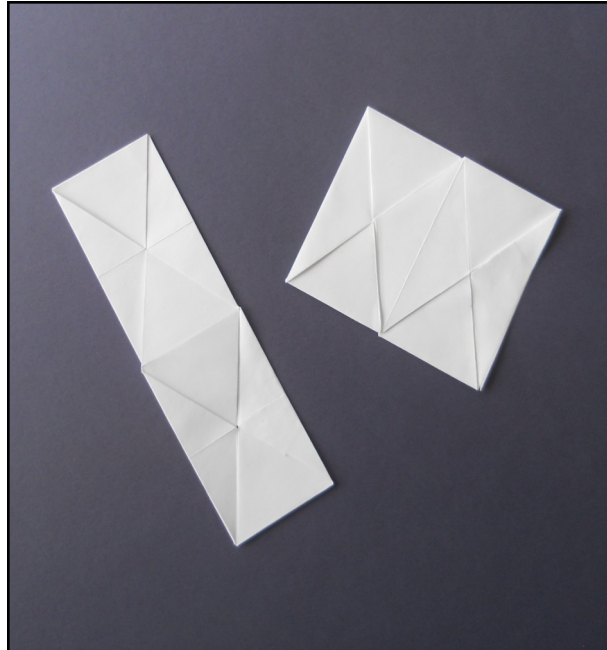# End to End

End to End is a simple manipulative puzzle that I created in 2007. The object of the puzzle is to change a short, wide mat, the one on the right in the photo, into a long, thin mat, the one on the left, without adding any extra creases to the paper. The solution is extremely simple to achieve, but, I hope, somewhat more difficult to discover.

When I sent a draft of the diagrams for End to End to Bob Neale he told me that he had discovered the same device for himself a decade earlier. Thus while this particular puzzle presentation is mine the underlying device is his. Bob ' s own puzzle presentation of the device is called Trading Places and is also published on this site.

Once you know how the solution to End to End works you will find it is possible to carry out the manipulation behind your back, thus turning a puzzle into a simple magical effect.

These diagrams show you how to make End to End out of an ordinary sheet of A4 or US letter sized photocopy paper.
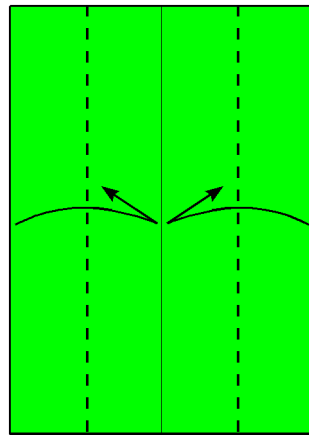
Please try to resist the temptation to look up the solution until you have attempted to solve the puzzle for yourself.
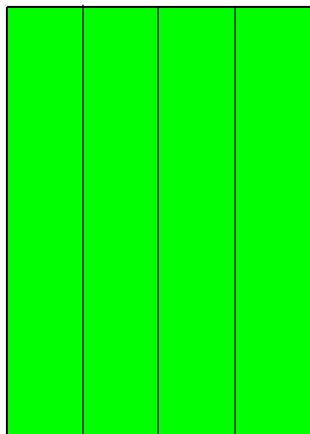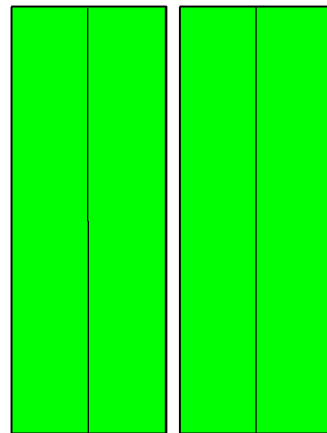
1
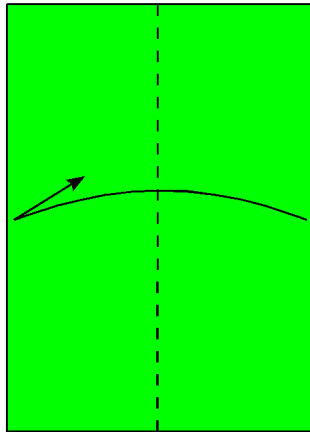
1. Fold in half sideways, then unfold.

2

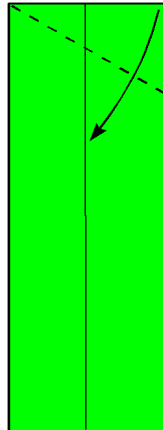2. Fold both outside edges to the centre, then unfold.

3

3. Cut along the central vertical crease to separate the paper into two halves.
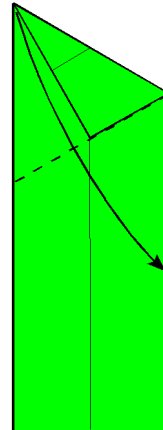
4

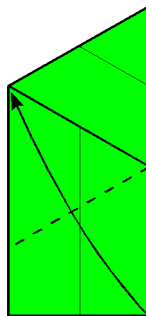4. You can make End to End from either or both pieces.

5

5. Fold the top right corner onto the vertical centre crease making sure the crease passes through the top left corner which becomes sharp.

6

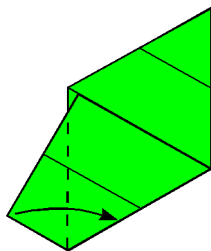**6.** Fold the top sloping edge onto the right edge.
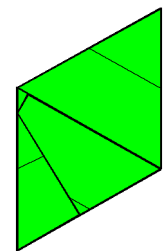
7

7. Fold the bottom edge upwards so that the lower part of the right edge butts up against the sloping bottom edge of the front layers.
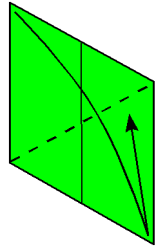
8

8. Fold the left hand corner inwards so that the crease forms along the line of the edge immediately below it.
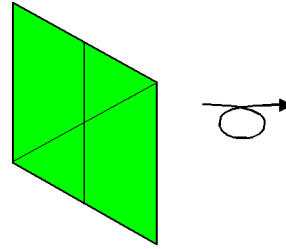
9

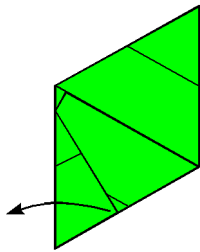**9.** Turn over sideways.

10

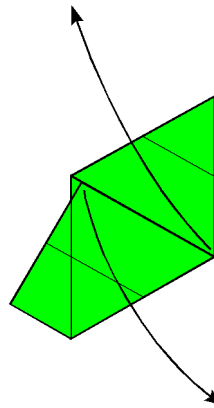10. Fold in half downwards, then unfold.
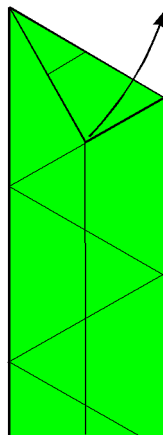
11

11. Turn over sideways.

12

12. Open out the fold made in step 8.
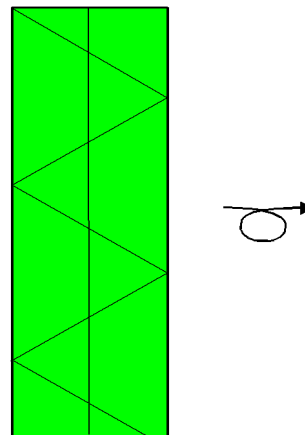
13

13. Open out the folds made in steps 6 and 7.

14

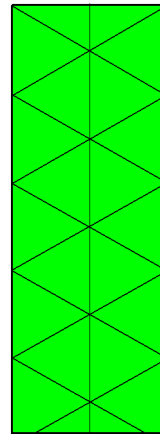14. Open out the fold made in step 5.

15

15. Turn over sideways.

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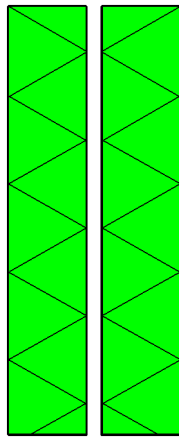
16
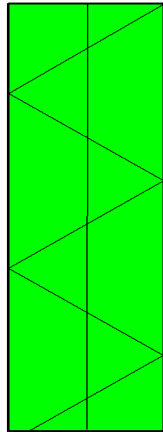
16. Repeat steps 5 through 14.

17

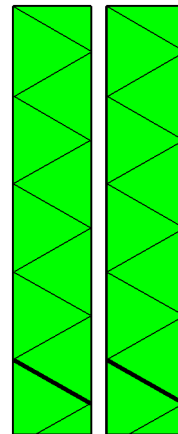17. When you have finished the crease pattern should look like this.

18

18. Cut along the vertical centre crease to separate the two halves of the paper, then turn the right hand piece over sideways..
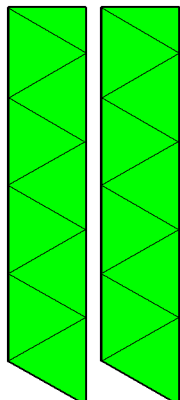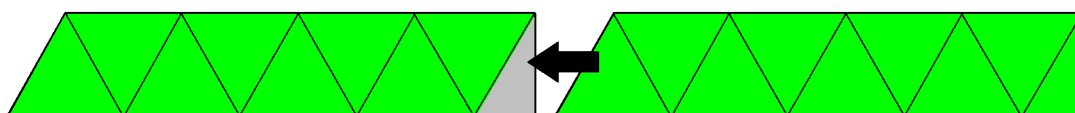
19

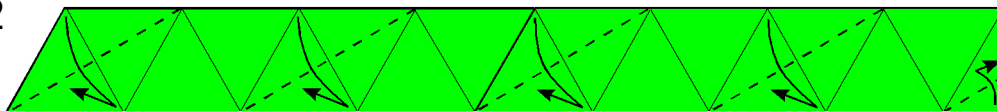19. Cut along the creases marked by thick black lines.

20

20. Reverse the direction of all the creases and make sure they fold easily in both directions, backwards as well as forwards.
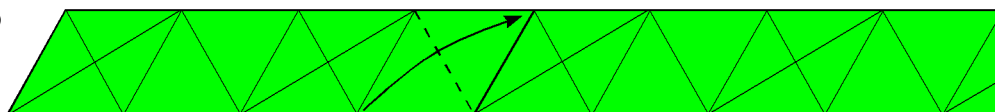
21

21. Apply glue to the flap shaded grey and join the two pieces into a long single strip in the way shown here. Allow the glue to dry.
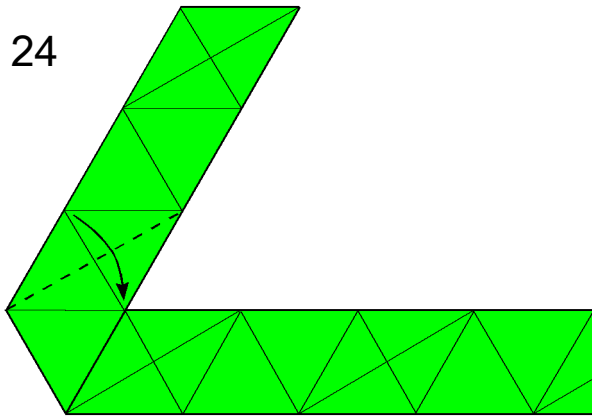
22

22. Make five new diagonal creases as shown. Reverse the direction of all the new creases and make sure they fold easily in both directions.
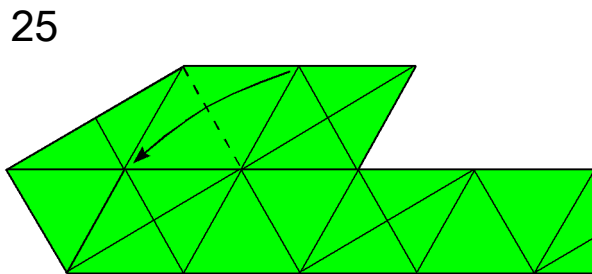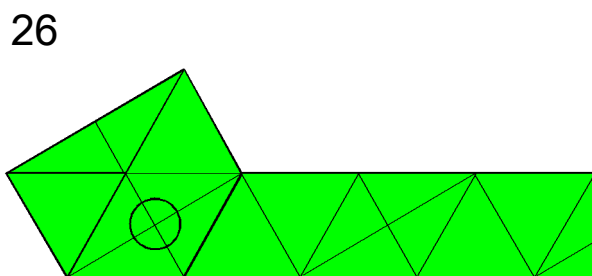
23

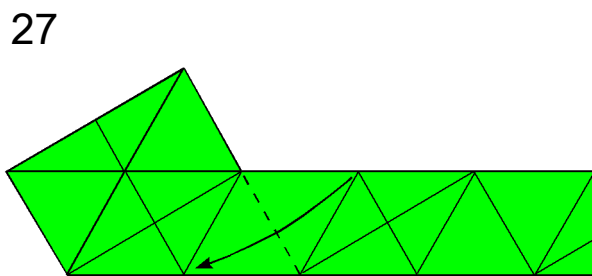23. Fold the left part of the strip diagonally upwards to the right as shown.

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24

24. Fold the top part of the strip diagonally downwards as shown.

25

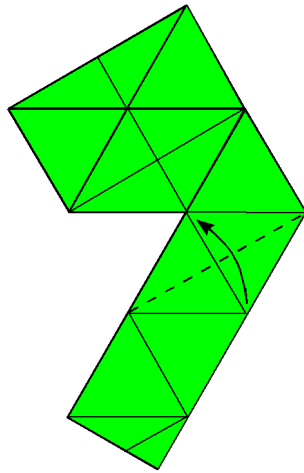25. Fold the top part of the strip diagonally to the right as shown.

26

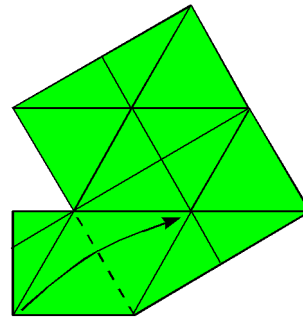26. Tuck he flap marked with a circle out of sight underneath the other layers

27

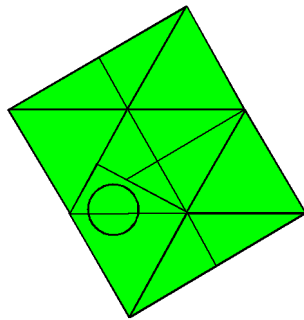27. Fold the right part of the strip diagonally to the left as shown.

28

28. Fold the bottom part of the strip diagonally upwards as shown.
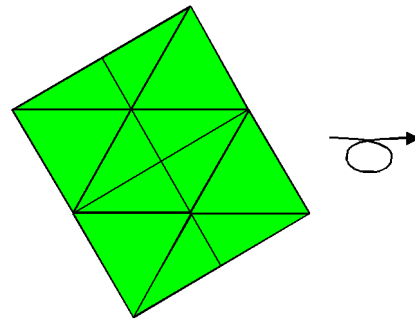
29

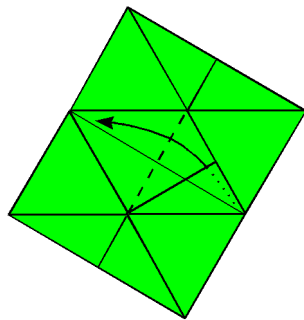**29.** Fold the bottom left part of the strip diagonally to the right as shown.

30

30. Tuck the small triangular flap marked with a circle out of sight underneath the other layers.
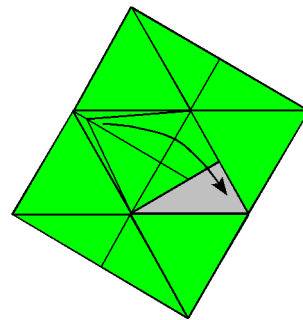
31

31. Turn over sideways.

32

32. Fold the loose triangular flap diagonally across to the right as shown.

33

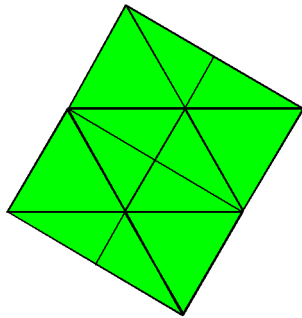**33.** Apply glue to the flap shaded grey then fold the loose flap down on top of it to join the strip into a continuous band.

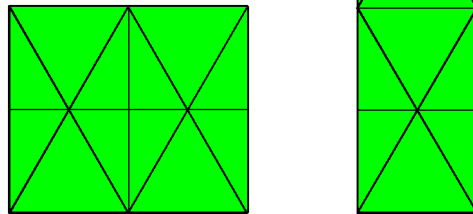David Mitchell / Robert E Neale / End to End

34

34. End to End is complete. Allow the glue to dry.

35

35. You will see that at present End to End consists of two rectangles arranged side by side. The challenge is to manipulate the puzzle so that the two rectangles are arranged End to End, in the way shown on the right, instead. You do not need to add any extra creases to the paper to achieve this transformation.