

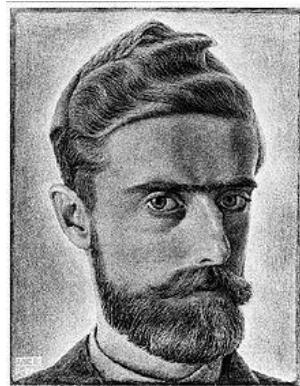
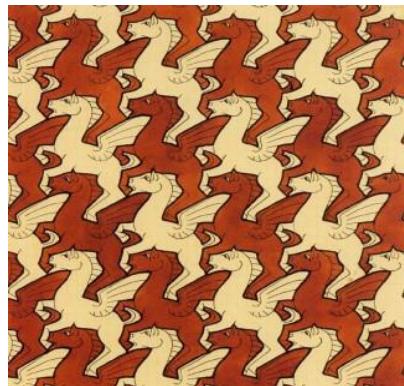
Around the World in 80 tiles

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Create your own Escher-like Tessellation

The Dutch artist Maurits Cornelius Escher (1898 – 1972) is renowned for his tessellations.



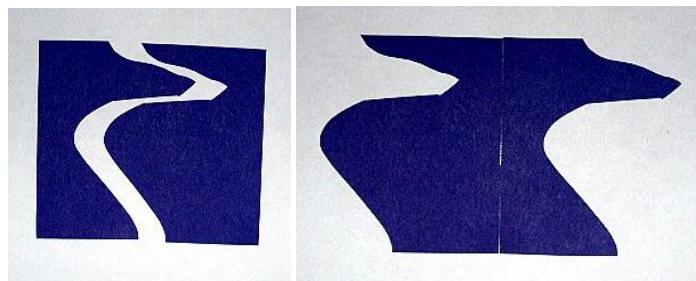
These repeating designs were produced predominantly through the use of the geometric transformations of translation and rotation.

Use the activity overleaf or the extra activity sheets to make your own Escher-like tessellation.

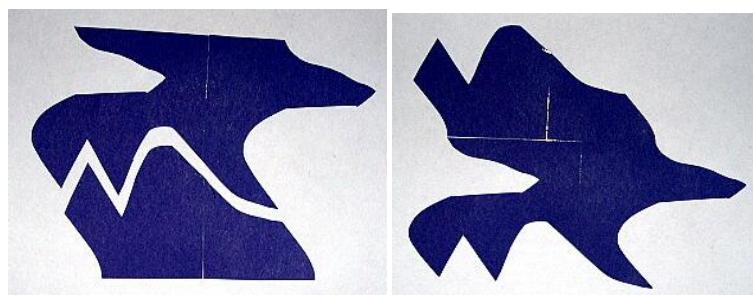
Create your own tessellation from scratch using card and scissors.

Step 1 Cut out accurately a square or rectangle from thin card.

Step 2 Draw a line from the top edge to the bottom edge. It can be as wiggly as you like. Cut along the line and move the left hand piece to the right hand side. Position the pieces together precisely and stick together with sticky tape.

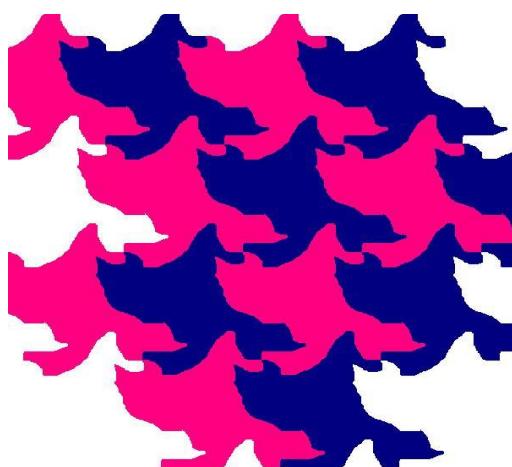


Step 3 Now draw a wiggly line from left to right. Cut along this line and move the top piece to the bottom, again lining up the pieces of card **very** precisely.

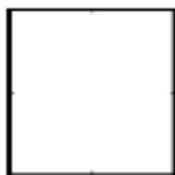


Step 4 Use this final shape as a template, drawing around it very carefully, each time lining up the shape precisely before drawing the next outline. You should be able to cover a sheet of paper without leaving any gaps!

This technique can also be used to create colourful tessellations using [Microsoft Paint](#) -there are full instructions here with clear diagrams.



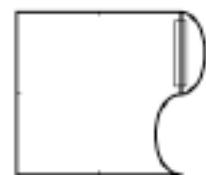
Cut and Rotate



Mark accurately the mid-point of each side of a card square.

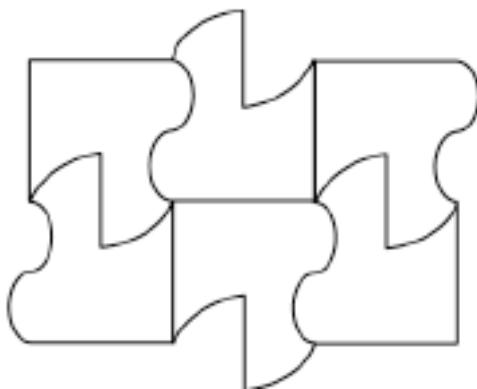


Cut out a piece from half of one side and rotate it about the mid-point.



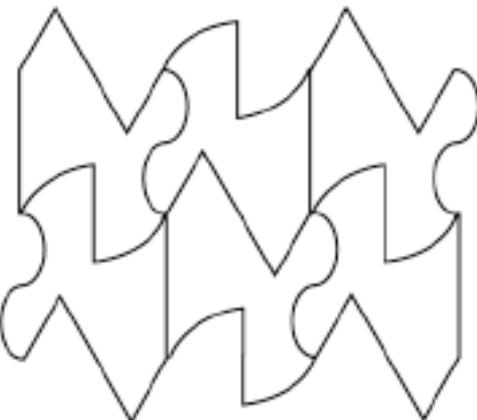
Tape this piece to the uncut half.

Do not reflect it!

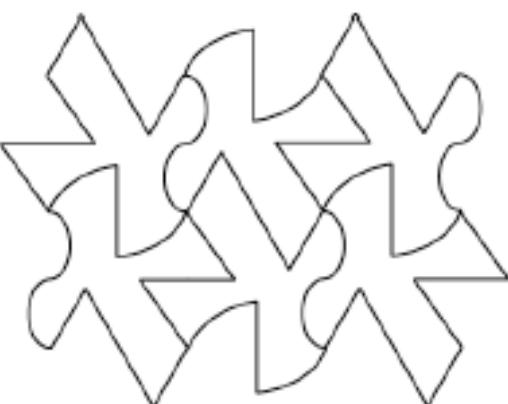


Show that this shape will tessellate.

Repeat the 'cut and rotate' process for another side.



Repeat the 'cut and rotate' process for a third side. Show that this shape will tessellate.



Repeat the 'cut and rotate' process for the fourth side. Show that this shape will tessellate. Decorate if required.

Cut and Slide



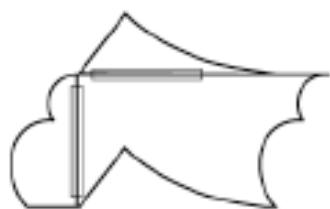
Cut a rectangular piece of card from one edge to a corner as shown above.



Translate (slide) the cut piece to the opposite side.



Tape the two pieces together.



Repeat the 'cut and slide' process with the other two sides.



What does the shape remind you of?



Decide which way up you want your tessellation. Decorate it if you wish.



Challenge:

Start with a regular hexagon.

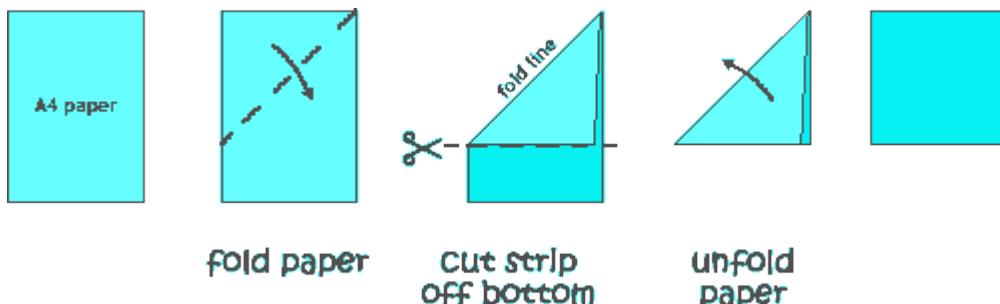
Try to make a shape that will tessellate by cutting off and adding to sides.

Be a paper mathemagician!

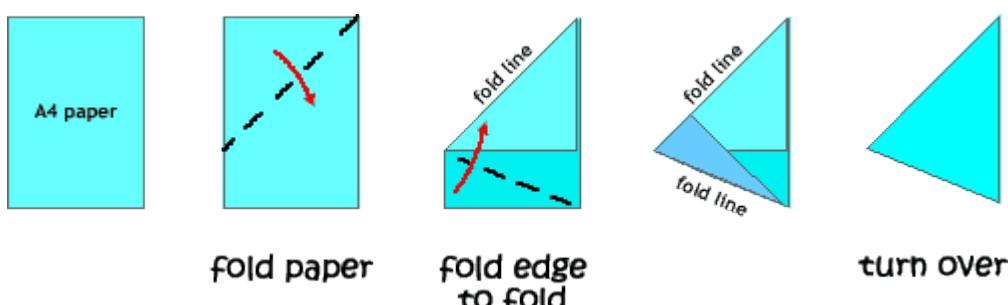
Folding Polygons (1)

Always start with a piece of A sized paper - this could be any A size (it doesn't have to be A4), depending on how large a shape you want.

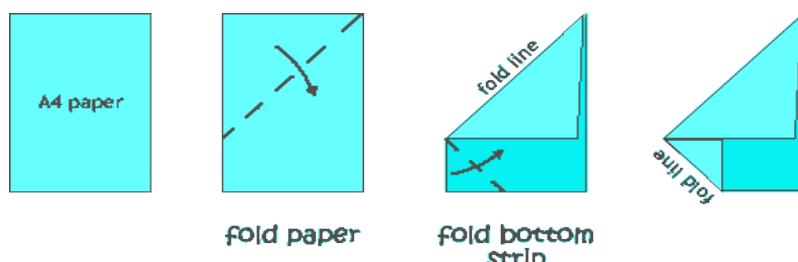
Square



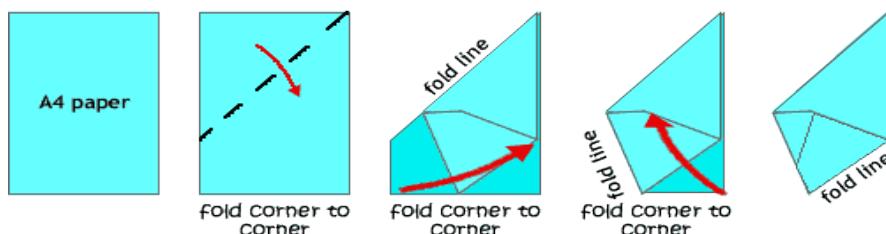
Isosceles triangle



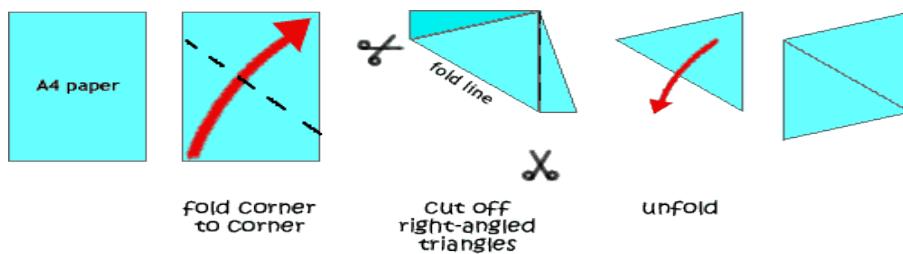
Kite (1)



Kite (2)



Rhombus (1)

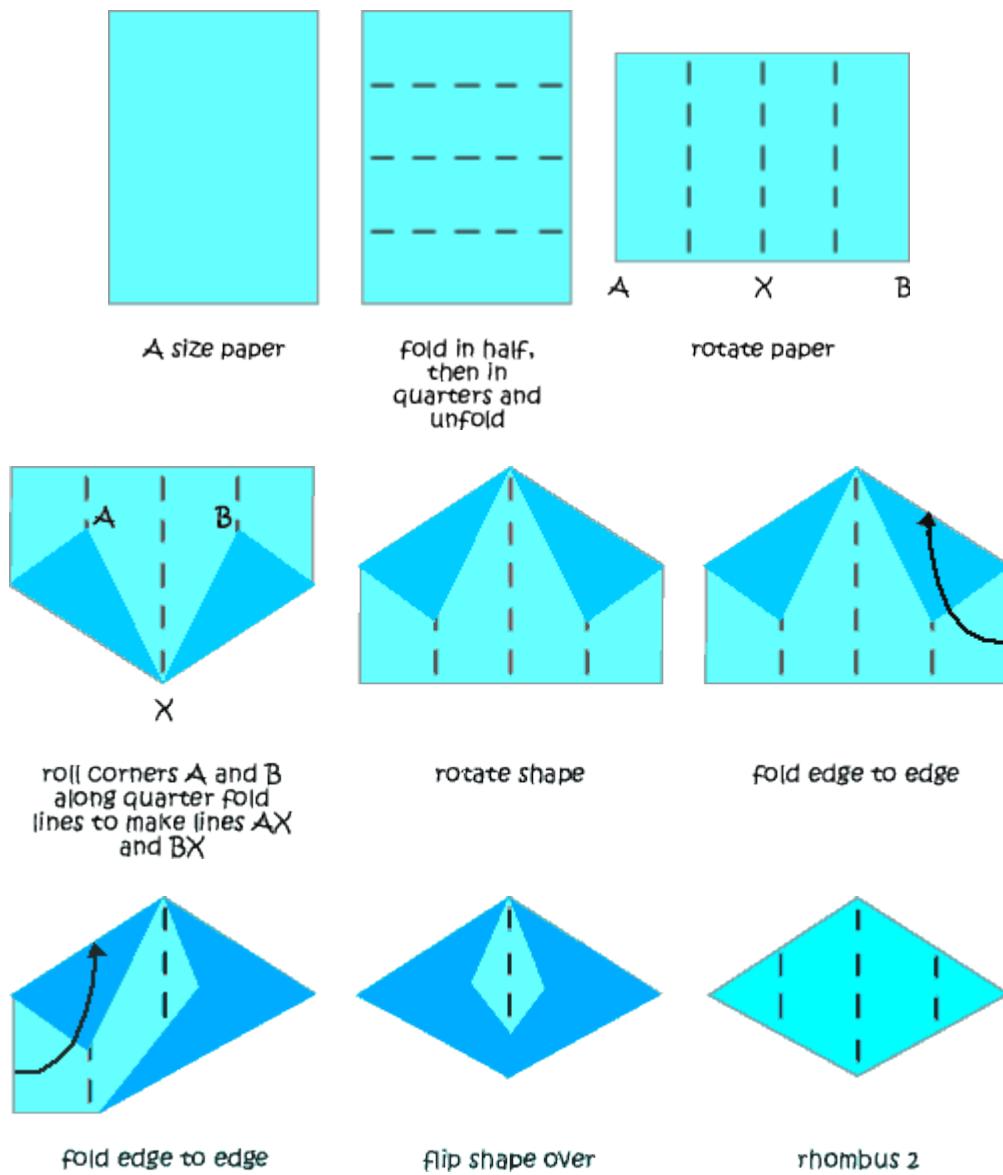


Be a paper mathemagician!

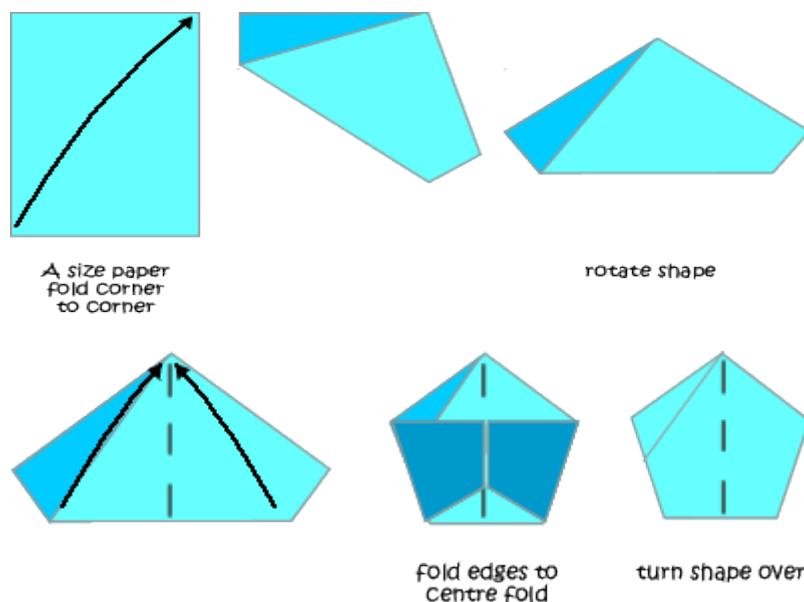
Folding Polygons (2)

Always start with a piece of A size paper. The actual size you use will determine how big the polygons are.

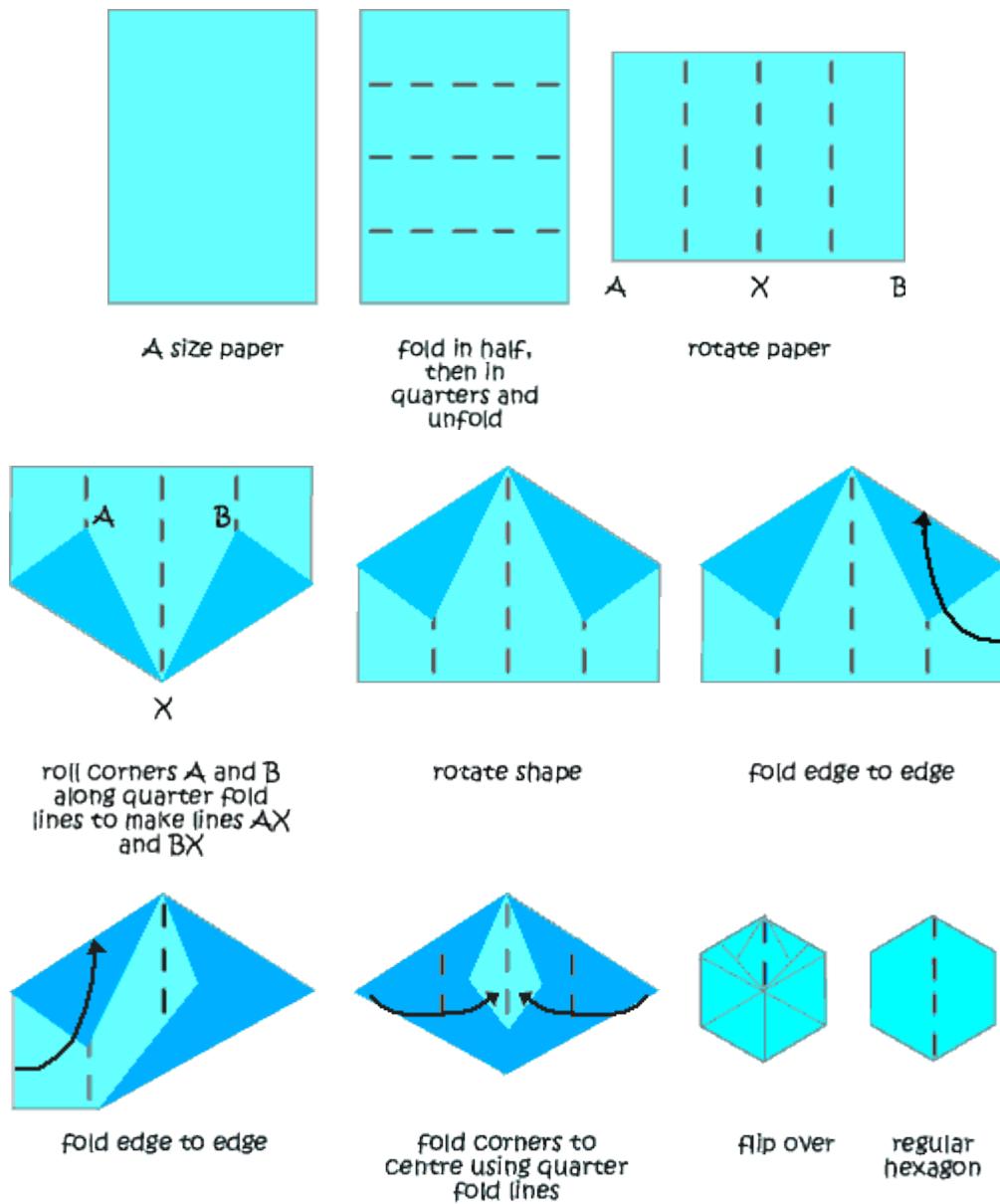
Rhombus (2)



Regular pentagon (a good approximation!)

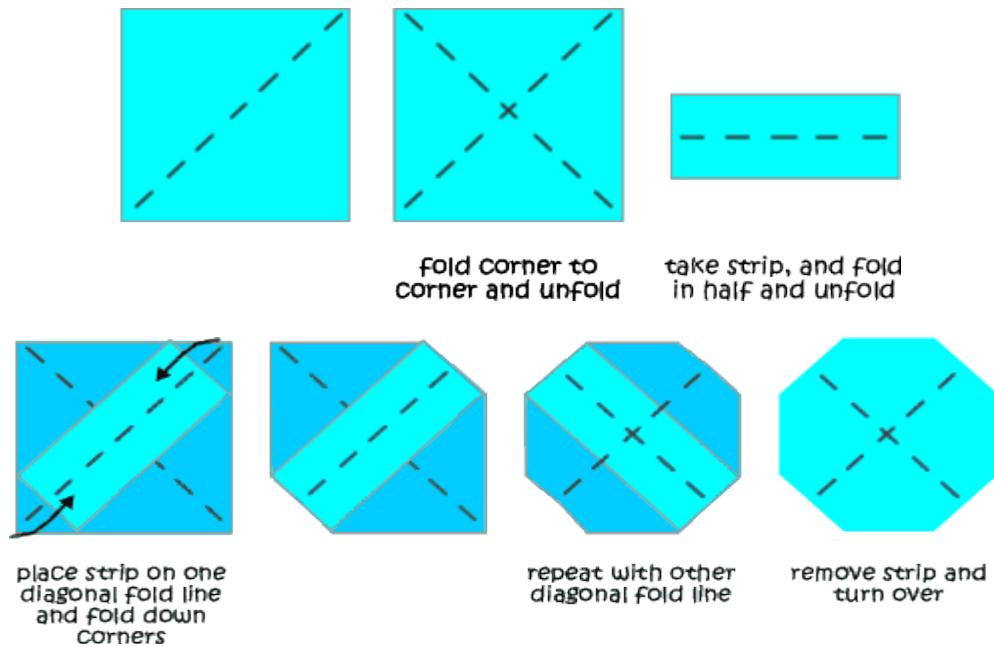


Regular hexagon

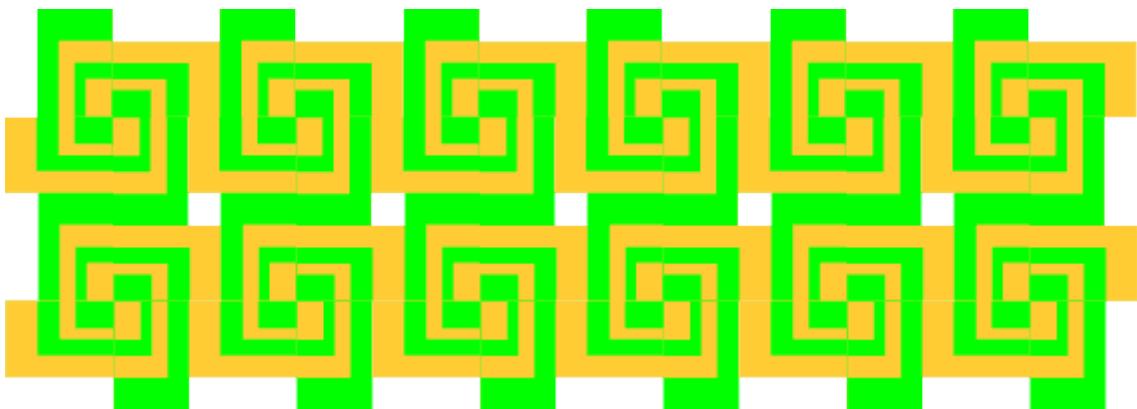


Regular octagon

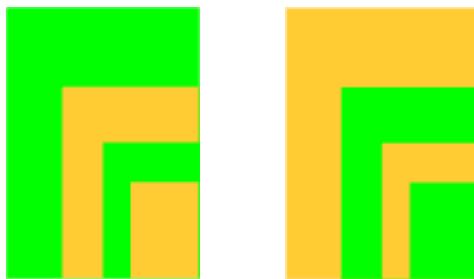
Start with a square folded from A size paper and keep the strip cut off.



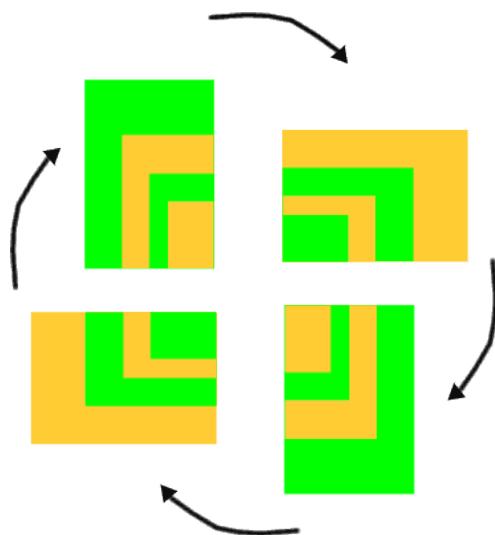
Be a paper mathemagician! Greek Key pattern



You can make a Greek Key pattern using A4, A5, A6 and A7 sheets of paper in two different, contrasting colours. Starting with the A4 sheet in each case, make sets of rectangular patterns like these:



Fit two of each of these patterns together, turning each through 90 degrees to the previous one like this:



Make other units like this, and fit them together to make a Greek Key frieze like the one at the top of this page.

Challenge

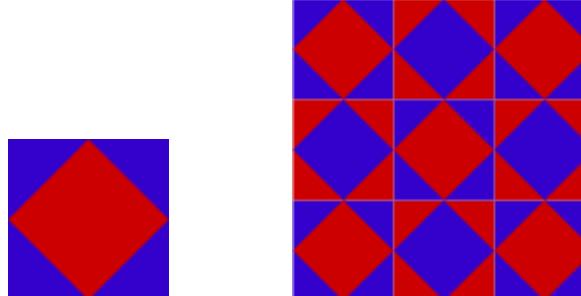
Make other patterns using these basic units as a starting point.

Be a paper mathemagician! Patchwork patterns

Once you can make some of the basic shapes and polygons, you can investigate patterns made up of different colour and size shapes.

Square patchwork

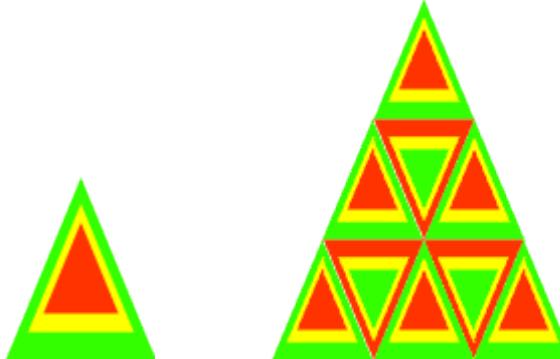
- Make squares in two different colours, one using A4 paper and the other using A5, then put them together to form a unit like this:



What do you notice about these squares? Use them to make a pattern like the one above. Can you make other patterns using units like these?

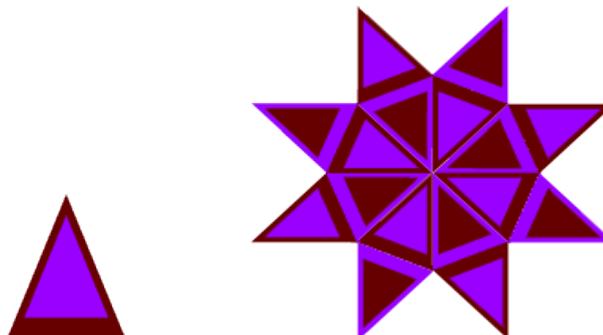
Triangular patchworks

- Make isosceles triangles using different coloured A4, A5 and A6 paper, and centre them on top of each other like this:



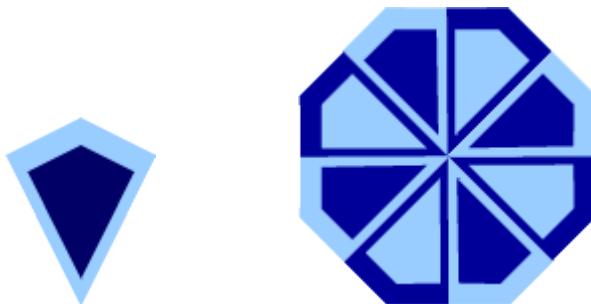
Then use these units to build up a large triangle patchwork like this on the right above. Can you find other ways to make a patchwork of isosceles triangles?

If you use two isosceles triangles rather than three, you can make a star pattern like this one:



Octagonal patchworks

- Can you make this octagonal patchwork out of [kites](#)?



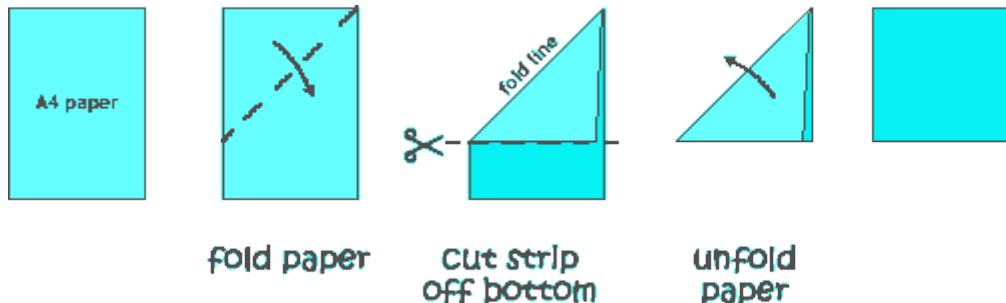
- At the bottom of the page are three octagonal patchworks to make out of [isosceles triangles](#) using triangular tiles made by combining them as in the diagram below. Have a go at making these patchworks.



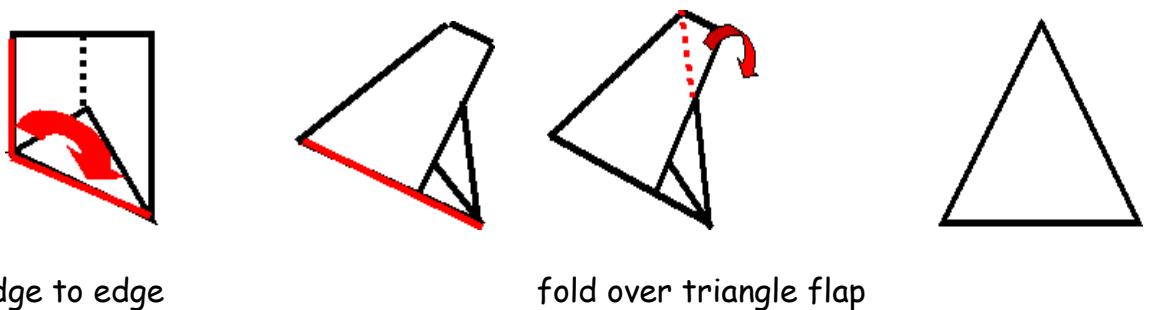
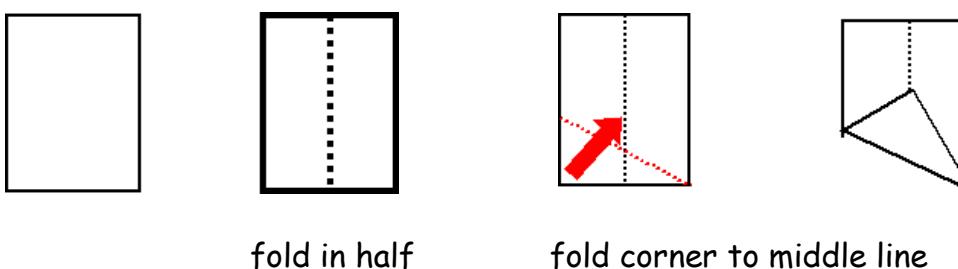
Folding Polygons for Islamic Patterns

Always start with a piece of A sized paper - this could be any A size (it doesn't have to be A4), depending on how large a shape you want.

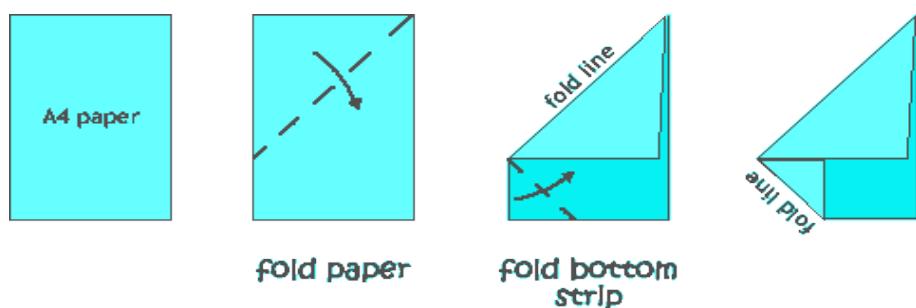
Square



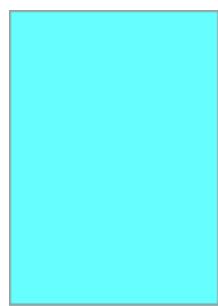
Equilateral triangle



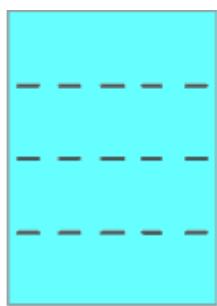
Kite (1)



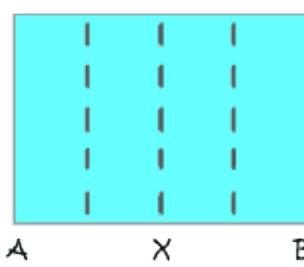
Regular hexagon



A size paper

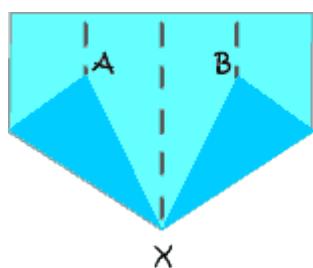


fold in half,
then in
quarters and
unfold

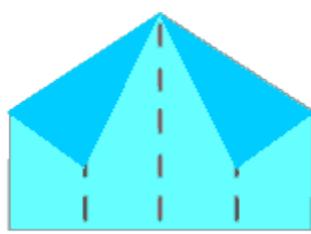


A X B

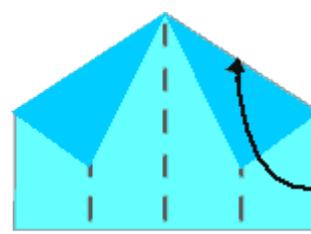
rotate paper



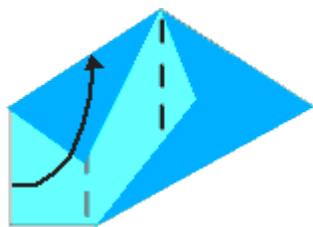
roll corners A and B
along quarter fold
lines to make lines AX
and BX



rotate shape



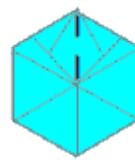
fold edge to edge



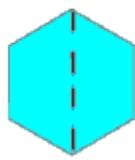
fold edge to edge



fold corners to
centre using quarter
fold lines

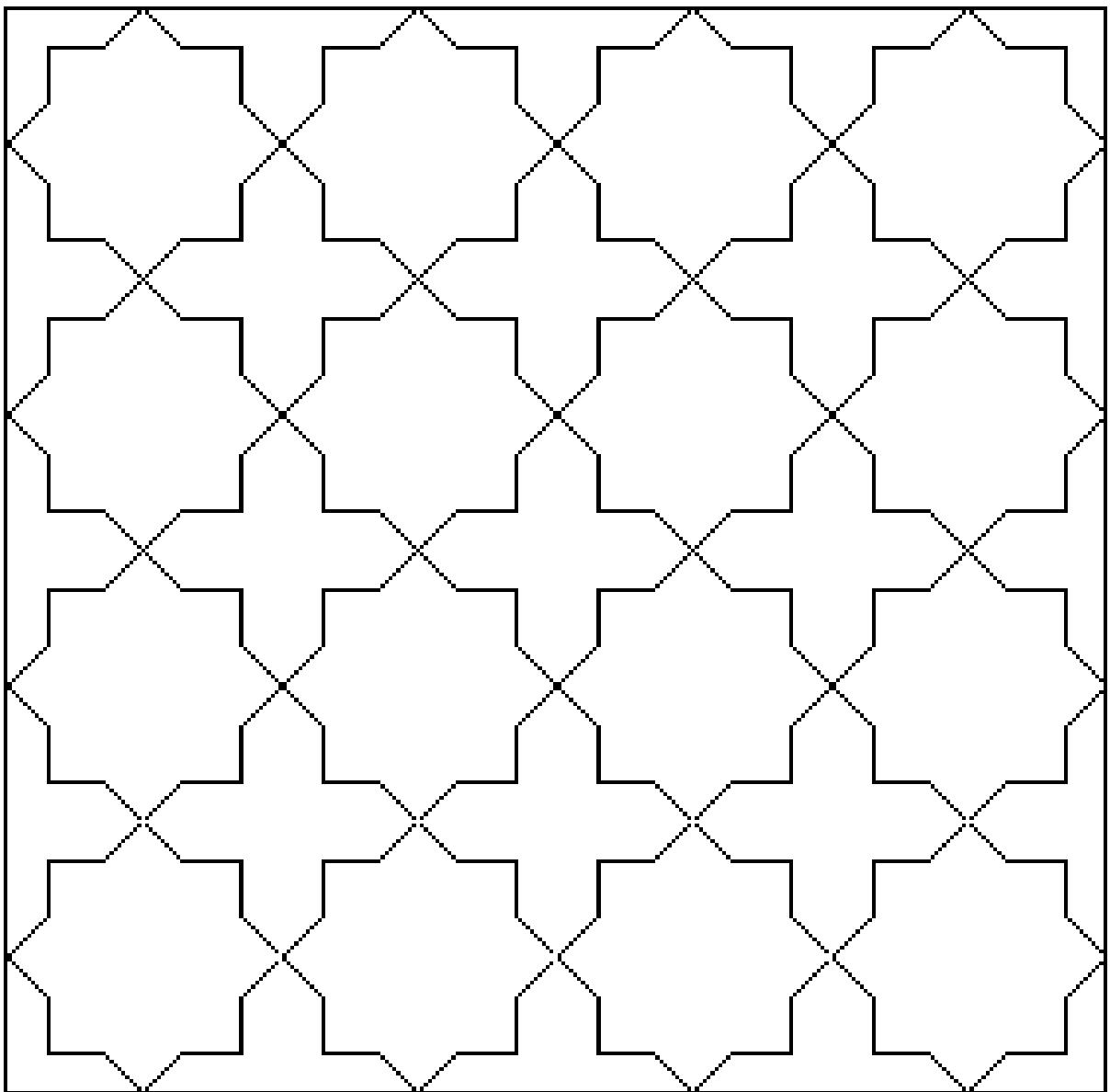


flip over



regular
hexagon

Islamic Tiling Patterns 1.....using folded 'A' size squares

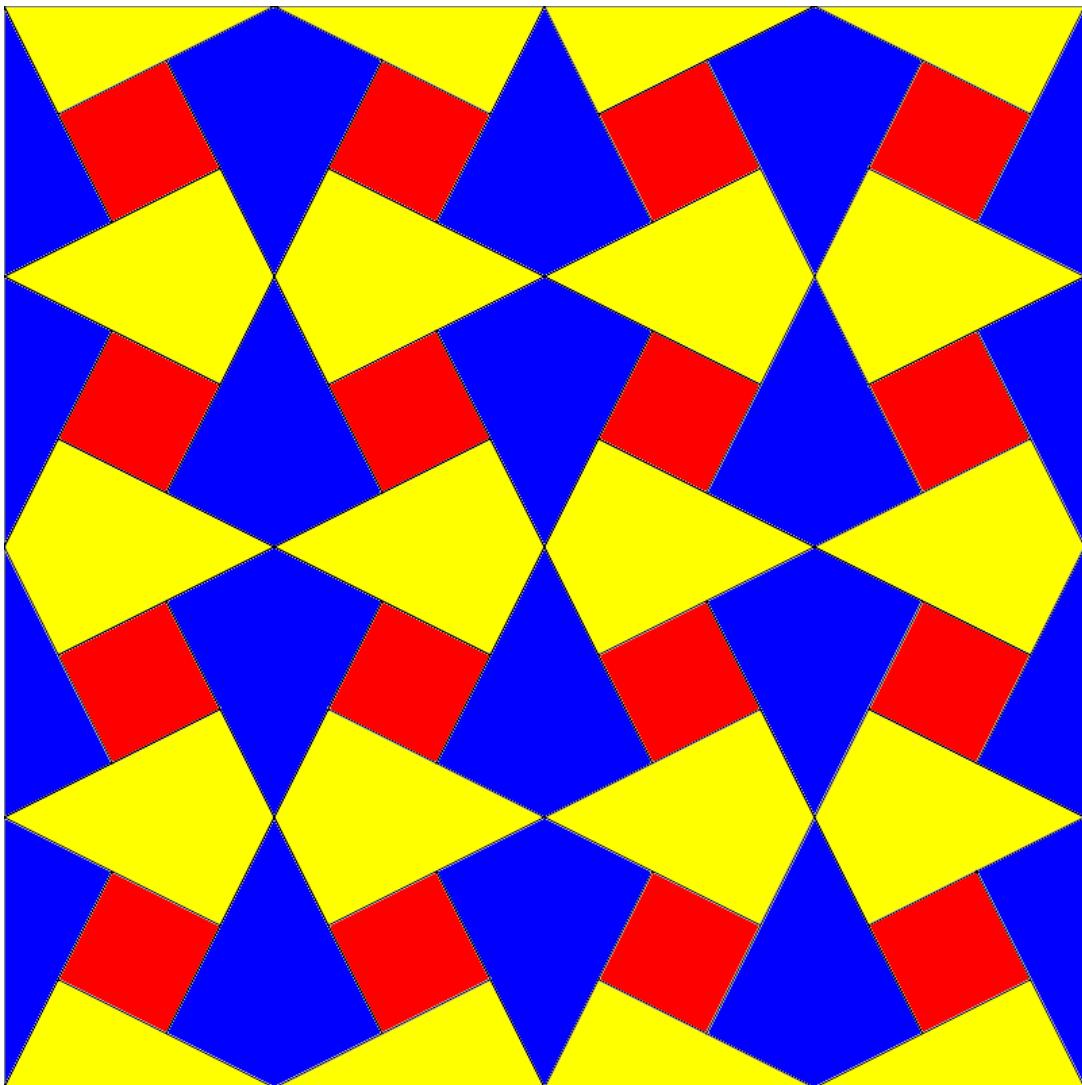


Instructions for making the pattern above:

- Make sets of 8-pointed star tiles using 2 folded squares (of the same size and colour) for each one.
- Place the 8-pointed star tiles onto a large sheet of paper or card horizontally and vertically as in the pattern above.
- When satisfied with your positioning, glue the tiles onto the sheet of paper or card.
- The gaps will leave the 'cross' type tile.

Islamic Tiling Patterns 2.....using folded 'A' size kites

This is a common Islamic pattern. It is derived from a visual proof of Pythagoras' Theorem by Abu'l Wefa.



Instructions for making the pattern above:

- Make 2 sets of folded kite tiles using two different colours of A size paper.
- Place kite tiles onto a large sheet of paper or card as in the pattern above. Possibly start by placing 4 kites (2 of each colour) around a point and then place other kites to make your pattern grow.
- When satisfied with your positioning, glue the tiles onto the sheet of paper or card.
- The gaps will be square.