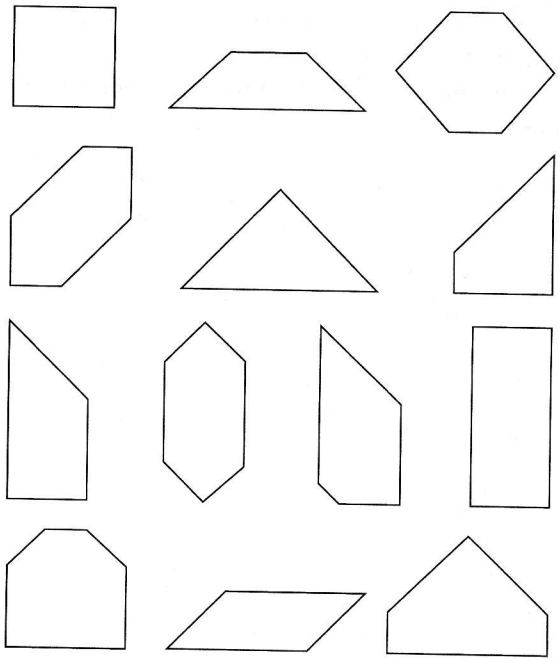
IDEA 49

TANGRAMS 2

The following idea is written as a short article, by Jean Sauvy in the ATM journal *Mathematics Teaching* 114 and is about creating all the possible convex polygons (which means every internal angle is less than 180°) .

Every one of the shapes below can be made each time from seven tangram pieces.

There are 13 such polygons and these are shown below.



PROBLEM 1

Can students make them all?

PROBLEM 2

As they are made students can be asked to work out the perimeter of each one and then order them in terms of smallest to largest perimeter.

PROBLEM 3

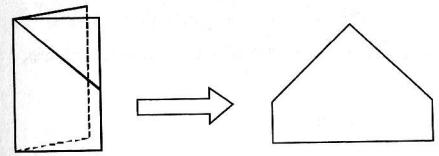
Students can be asked to draw a scattergraph of length of longest diagonal against perimeter.

IDEA 50

TAKE A SQUARE PIECE OF PAPER

This idea could be used in the first instance to develop students' understanding of line symmetry and is based upon a visualization/mind imagery approach.

- Fold a square piece of paper in half through its vertical line of symmetry to form a rectangle.
- Cut off an isosceles right-angled triangle from the mid-point of the longest side of the folded piece of paper to one of the corners.



There are two possible ways of doing this; when the shapes are unfolded, one forms a pentagon with internal angles 90°, 135°, 90°, 135° and 90° (as shown above) and the other forms a pentagon with internal angles 90°, 45°, 270°, 45° and 90°.

As a visualization task students could be asked to make a sketch of the shapes they think will be formed by cutting off different corners before the outcome is revealed. This task can be developed in different directions and this will depend upon the main concepts we want students to work on. Some are:

- Producing tiling patterns from the different shapes formed.
- Calculating the angle sum of the shapes formed. Helping students make sense of the size of internal angles in concave polygons is an important concept here.

Carrying out a different number of folds before a corner is sliced off will produce different polygons, for example: by making a vertical and then a horizontal fold and cutting an isosceles right-angled triangle off forms an octagon; by folding into thirds with two vertical folds a concave hexagon is formed; by folding into quarters with two vertical folds, heptagons are formed.