IDEA 47

TRIANGLES WITH CONSTANT PERIMETER 2

Some extension tasks to the problem in Idea 46 are:

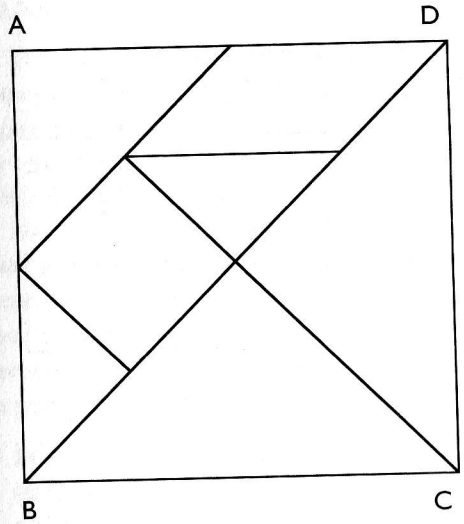
1. Discuss conditions for forming triangles regarding edge lengths and write a list of values without actually constructing triangles. For example, with a perimeter of 30 the complete set (not counting rearrangements that will produce congruent triangles) contains between 15 and 25 solutions. The task is for students to create a systematic list to prove they have found them all.
2. Questions might also be posed about the types of triangles formed, for example: 'How many scalene, isosceles and equilateral triangles are there?' Scalene and isosceles triangles can be further classified according to whether they have three acute angles or one obtuse and two acute angles. A further question could be: 'Is there a right-angled triangle?'
3. What happens if order matters and congruent triangles are counted? For example, for any isosceles triangle there are three solutions and for any scalene triangle there will be six solutions.
4. Students in the upper KS4 and KS5 have a context for calculating angles and areas of triangles produced. Suppose a 'base' length is plotted on a coordinate grid so the end-points lie on grid points. How can the coordinates of the third point be calculated?
5. What happens if we remove the rule of integer values? Clearly there will be an infinite set of results, however, if students work with a fixed base length then the construction of the loci of an ellipse will not be too far away from realization.
6. By changing the size of the perimeter, students can explore how many triangles can be formed from different perimeters.

IDEA 48

TANGRAMS 1

An interesting way to engage students in the production of the seven tangram pieces, shown below, is to give a sequence of verbal instructions and see if they can construct the final set of shapes. The following instructions might be used to begin this process:

- 'Draw a square ABCD'.
- 'Mark the mid-points of each side'.
- 'Join corner B to corner D'.
- 'Draw a line from the mid-point of line BD to corner C'.
- 'Join the mid-point of AB to the mid-point of AD', and so on.



By describing the length of the small square piece as a (or 1) and the length of the large, overall square as b (or $2\sqrt{2}$), then areas and the perimeters of each individual shape can be defined (or calculated).

Students can try to find other 'simple' polygons, such as a right-angled isosceles triangle, a rectangle, a parallelogram and an isosceles trapezium. Once found, students can try to work out the perimeters of these shapes.