Problems based upon a 9-pin Geoboard

a) Finding all the possible non-congruent triangles.
b) Describing their properties and align these to their names.
c) Classifying them in terms of equal lengths of sides, right-angles.
d) Measuring the perimeter of each triangle to the nearest 0.1cm.
e) Finding all the different angles that can be drawn.
f) Measuring these angles with a protractor.
g) How do we know a complete set of triangles has been found?
h) How many new triangles will there be on a 16-dot grid?
i) Finding all the possible non-congruent quadrilaterals.
j) Calculating the area of each quadrilateral (assuming the area of one square is 1 unit).
k) Using algebraic coding to write the perimeter of each quadrilateral.
l) Defining shapes drawn using co-ordinate notation.
m) Defining shapes drawn using vector notation.
n) Calculating the area of overlap between two shapes.
**Congruent triangles on a square 9-pin geoboard**

This task builds upon the ideas above and is about finding all the different ways each of the possible eight triangles and sixteen quadrilaterals can be placed on a square 9-dot. By determining which is the starting shape for each one, students can explain what kind of transformation is required to move from the start shape to each of the others. This in turn provides opportunities to for students to engage in the vocabulary of rotation, reflection and translation.

One way into this task is to announce there are 76 different ways all the possible triangles can be drawn on a 9-dot grid. The challenge is for students to identify how many ways each individual triangle can be placed on the grid.

Creating a proof by exhaustion that all 76 solutions have been found is a worthy task. Seeking a proof through combinations would be suitable for A-level students.

**A warning**

Students can all too easily become drawn into looking for numerical patterns within geometric situations. So, for example there is a danger that because there are 8 different triangles and 16 different quadrilaterals that can be made on a 9-pin grid, we might generalise there are 24 pentagons. This is not the case. However, searching out and classifying the different pentagons using similar properties to the way we define quadrilaterals (parallel sides, right angles, equal sides) would be a significant undertaking.