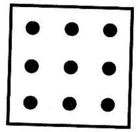
IDEA 43

SQUARE 9-PIN GEOBOARD 1

If I could take just one resource with me to Mars to demonstrate how I teach mathematics to its inhabitants it would certainly be a square 9-pin geoboard.



There are many problems that can be posed using the equipment and some are:

1 Find all the possible non-congruent triangles.
  - Describe their properties and align these to their names.
  - Classify them in terms of equal lengths of sides and right-angles.
  - Prove a complete set has been made.
  - Find how many congruent triangles there are for each different one. This can provide an opportunity for students to engage in the vocabulary of rotation, reflection and translation.
  - Calculate the area of each triangle (assuming the area of one square is 1 unit).
  - Measure the perimeter of each triangle (to the nearest mm).
  - Students who have met Pythagoras' theorem and surds can work out the different possible lengths on a 9-pin board, i.e. 1, 2, $\sqrt{2}$, $2\sqrt{2}$ and $\sqrt{5}$. Students can then use these to determine the perimeter of each triangle.
  - Code the possible lengths as *a*, (for length 1), *b* (for length $\sqrt{2}$) and *c* (for length $\sqrt{5}$) then write the perimeter of each triangle in terms of *a*, *b* and *c*. This will provide students with an elementary experience of collecting like terms.

2 Find all the possible quadrilaterals.

3 Find all the possible pentagons.

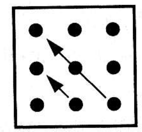
For problems 2 and 3, all the ideas in the first problem can be applied to the shapes created.

IDEA 44

SQUARE 9-PIN GEOBOARD 2

Further problems on a square 9-pin geoboard:

1 How many different vectors are there? This can be developed to consider how many vectors there are on 16-dot and 25-dot grids and a general result can be looked for.
  - How many pairs of parallel vectors can be made on different sizes of geoboards?



  - How many pairs of vectors can be made that are perpendicular to one another?

2 By marking out the geoboard as a coordinate grid, a problem can be posed about how many different straight lines there are and describing them in terms of $y = mx + c$. Again this problem can be developed by increasing the size of the geoboard.
  - Draw a pair of lines that intersect but not at one of the marked grid points. What are the coordinates of the point of intersection? How many non-grid point intersections can be found? What are the coordinates of each one?

3 Is it possible to draw an equilateral triangle on a square-based geoboard? For example, on a 9-pin geoboard, the nearest we can get to an equilateral triangle is an isosceles triangle with lengths 2, $\sqrt{5}$ and $\sqrt{5}$. Can an equilateral triangle be drawn on a 16-pin, a 25-pin . . . a *n*-by-*n* board?

4 Make two shapes on the same 9-pin board so they cross over each other. What is the area of the shape formed by the overlap of the original two shapes?