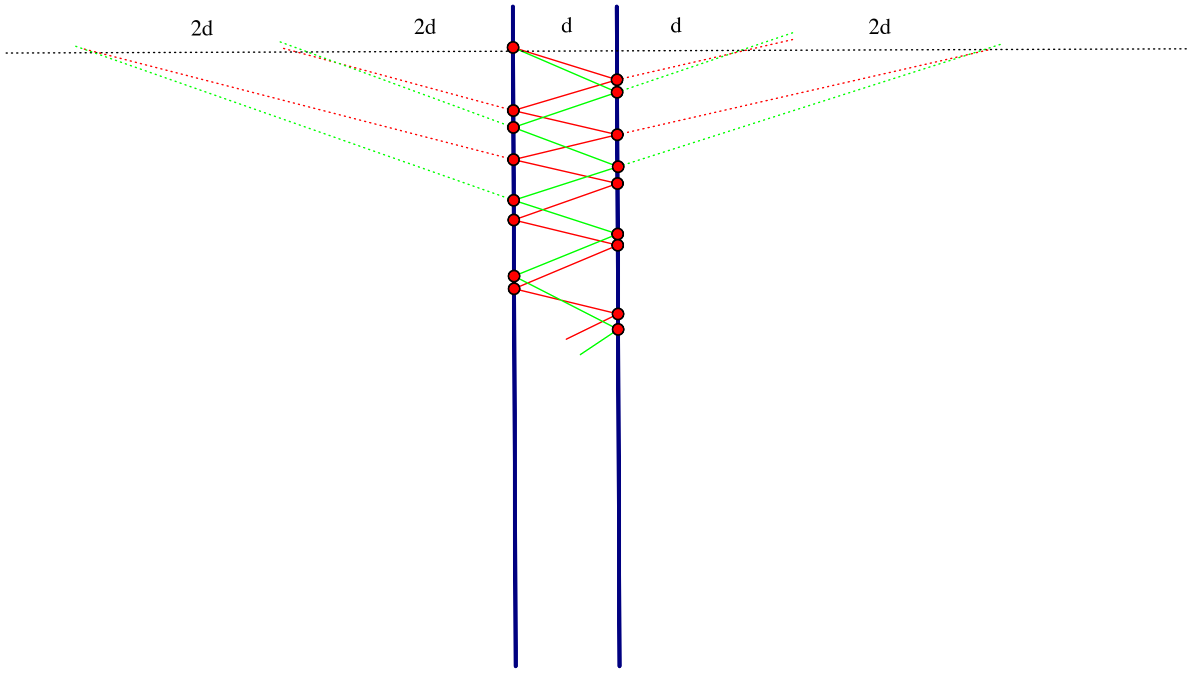
PARALLEL MIRRORS

Slide the two mirrors into the correct slots so that, when you look into one, you see an infinite keyboard.

Notes

Compare the figure below with those for the dihedral kaleidoscope 'in the bedroom'.



Were the rays perfectly parallel, a ray bouncing back and forth along a normal would make an infinite number of collisions, corresponding to an infinite number of reflections. You see, by similar triangles, that the successive image distances follow an arithmetic progression. The image positions fall on alternate sides of the diagram, at distances $2kd$ to the left, $(2k + 1)d$ to the right.

THE ARMCHAIR

The armchair is heavy. To move it, you must swing it about corners. Can you bring it to

position A?

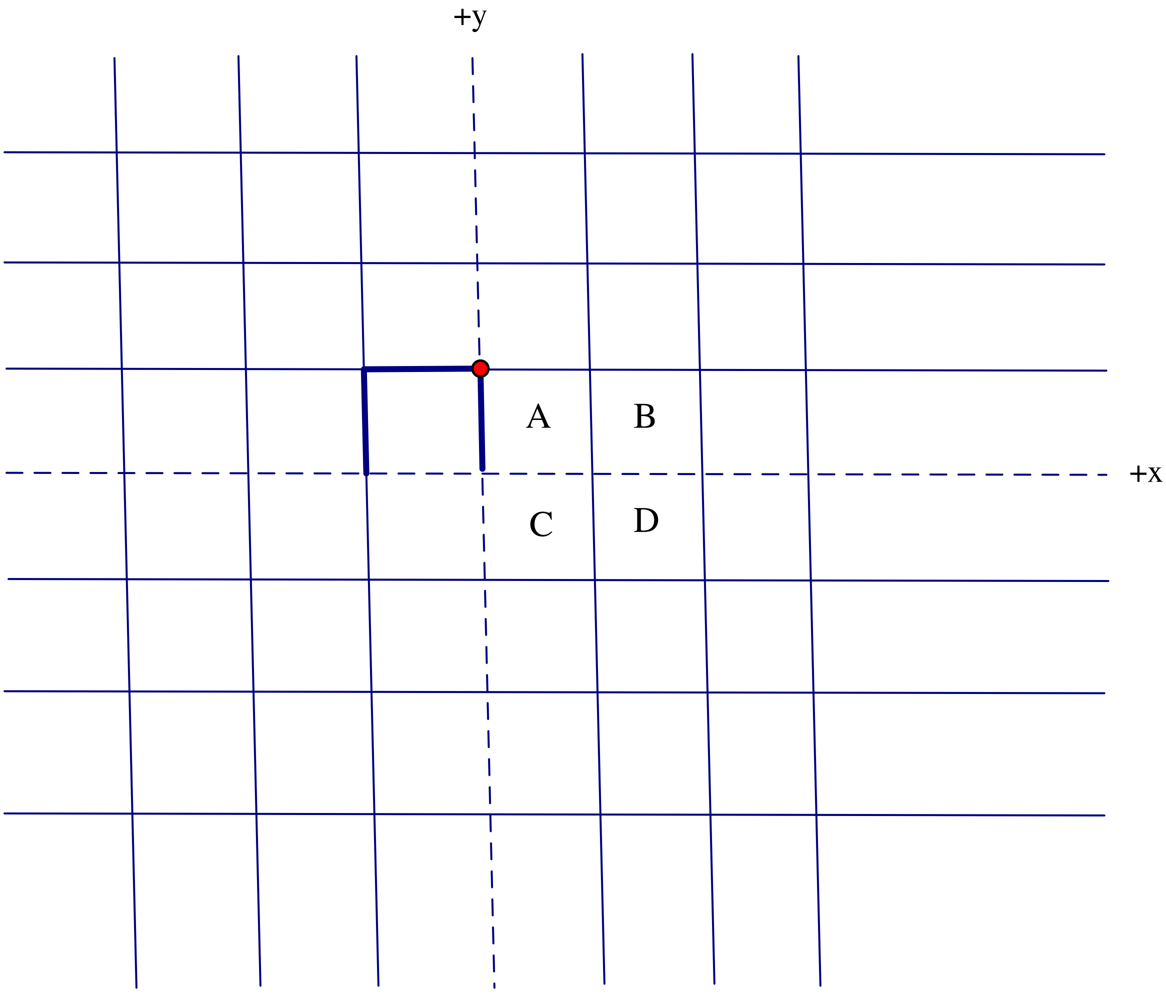
position B?

position C?

position D?

Notes

The turns required are multiples of a right angle. Here is the armchair shown in plan on a Cartesian grid, the left back corner marked with a dot.



If you track its progress as you move the toy chair around, and note the difference in the x-coordinate and the y-coordinate on each swing, you find that the sum changes by either 2 or 0. To get the chair into positions **A** and **D** would require a change in this sum of 1 and 3 respectively. Only positons **B** and **C** (and squares with the same checkerboard colouring) are possible.

This problem is taken from 'Thinking mathematically' by J. Mason, L. Burton & K. Stacey.