

In the Bedroom

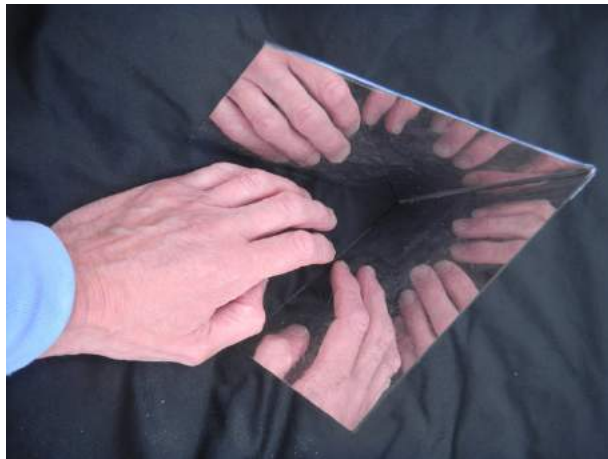


## THE SINGLE MIRROR



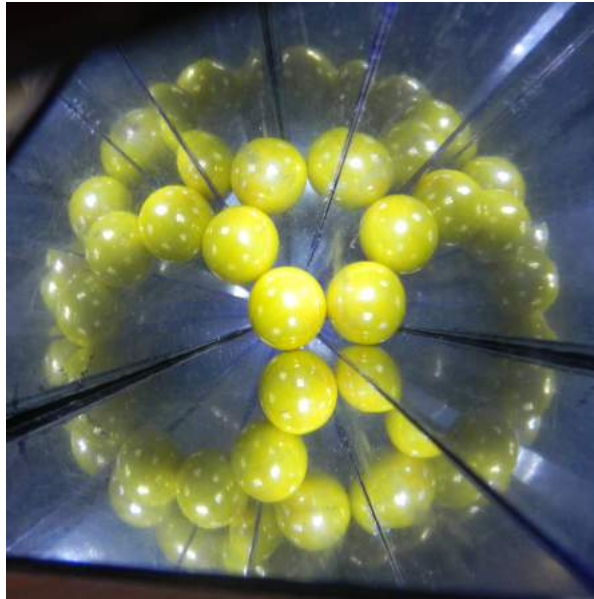
Why is the reflection of a left hand, a right hand?

## THE DIHEDRAL KALEIDOSCOPE



Why do I see more reflections when I reduce the angle between the mirrors? (For the limiting case, try PARALLEL MIRRORS 'in the living room'.)

## POLYHEDRAL KALEIDOSCOPES



Drop marbles in the 3-mirror kaleidoscopes.

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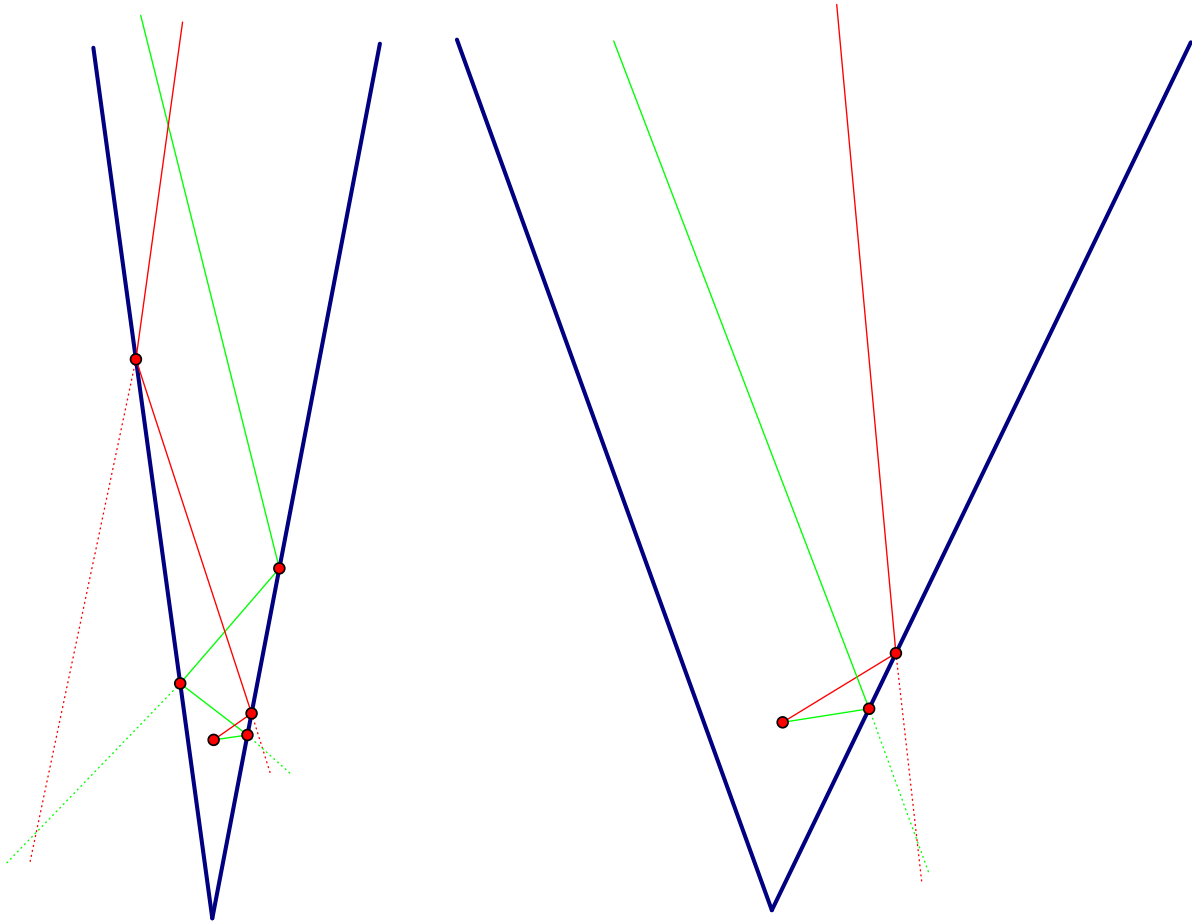
Notes

### **The single mirror**

A plane mirror reverses front and back. This is equivalent to turning the hand - or a glove containing it - inside out. The left and right hands cannot be superimposed: they are the definitive *enantiomorphs*.

### **The dihedral kaleidoscope**

Below we contrast the effect of setting the kaleidoscope at different angles. We have taken a 'red' and a 'green' ray leaving the object at the same angles in each case. On the left a number of subsequent collisions lead to more reflected images, represented by the intersecting pairs of dotted red and green lines.



### Polyhedral kaleidoscopes

These kaleidoscopes are to the prismatic kaleidoscopes used to construct tilings 'on the patio' as the dihedral kaleidoscope is to the pair of parallel mirrors 'in the living room'. The former construct something finite; the latter, something infinite. What is created here is a polyhedron. A tiling is a polyhedron with an infinite number of faces. In the case of a tiling the *angular defect* at each vertex which causes the polyhedron to close around a sphere, is zero.

We can imagine fitting together the solid angles defined by the 3 mirrors, to make the complete polyhedron. If the kaleidoscope has the smallest possible solid angle  $\theta$  steradians to reproduce the whole solid, the full order of symmetry of the latter is  $\frac{4\pi}{\theta}$ .

Go to [www.magicmathworks.org/masterclasses](http://www.magicmathworks.org/masterclasses) and select 'The Cube' as a .pdf . (Like the others cited in these notes, this workshop is for 13-14-year-old children.)