



## Concept:

This demonstration reveals the key characteristics of the field lines of a permanent magnet:

- There are (to date) no magnetic monopoles, only dipoles and combinations of dipoles. Hence, the field lines must begin and end at opposite poles. The B-field vectors are tangent to the lines at all points.
- The density of field lines is proportional to the magnetic field strength in that region.
- Field lines never cross themselves (otherwise the field would have an ambiguous direction at the crossings).

## Equipment:

- Compass Array Board
- Small Bar Magnet
- Overhead Projector (if not in classroom)

## Procedure:

1. Place the compass array board on the overhead projector or document camera.
2. Notice the magnetic domains formed by tiny magnets in the compass array (as shown in the top-right picture).
3. Place the small bar magnet vertically on the compass array board.
4. Notice the direction and shape of the magnetic field for each of the magnet's poles.
5. Place the small bar magnet horizontally on the compass array board.
6. Notice the direction and shape of the magnetic field lines for the entire bar magnet.