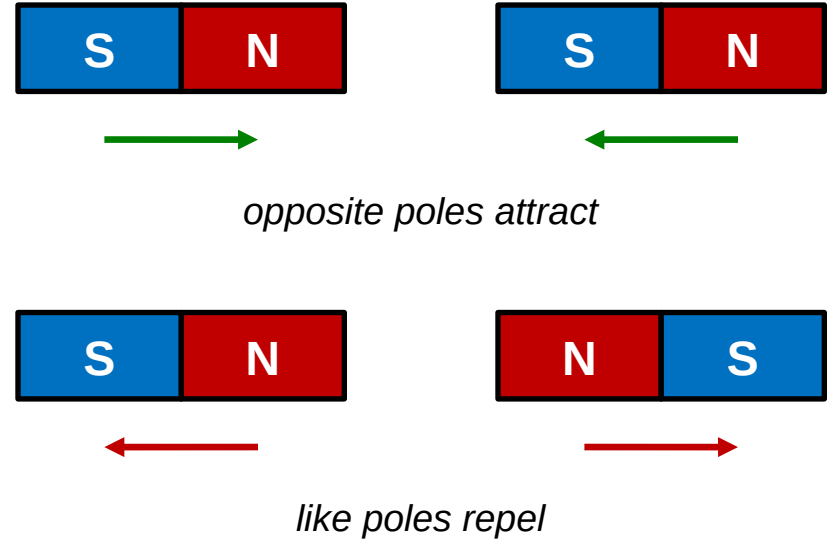


Essential Question

How do magnets push and pull without touching?

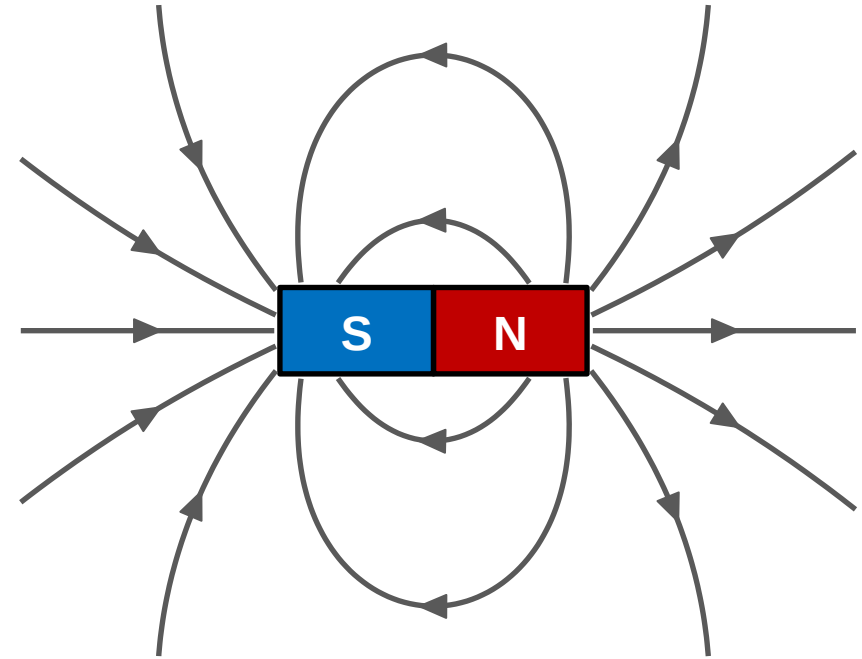
Magnetic Poles

- Every magnet has an N and S pole
- Opposite poles attract
- Like poles repel



Magnetic Fields

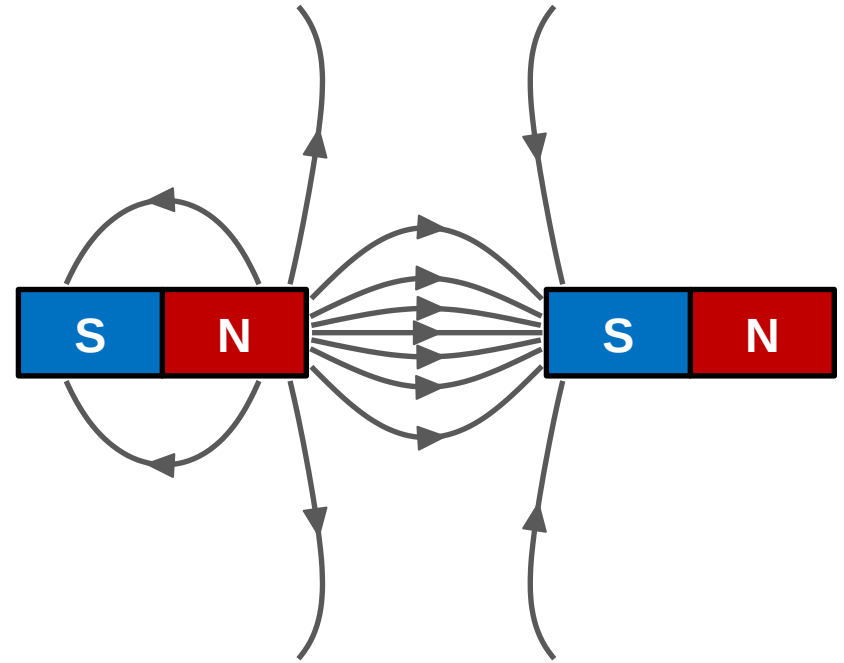
- Space around a magnet where it pushes or pulls
- Drawn with field lines
- Outside the magnet: lines go N to S



outside the magnet: N to S

Field Line Rules

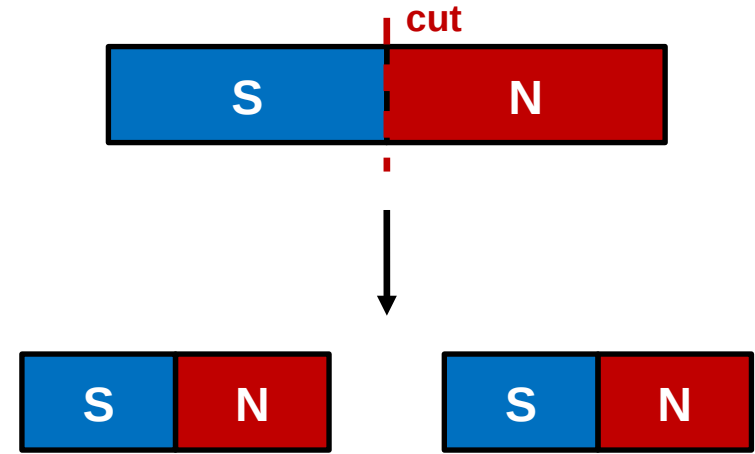
- Lines never cross
- Crowded lines: strong field
- Spread-out lines: weak field



crowded lines = strong field

No Single Poles

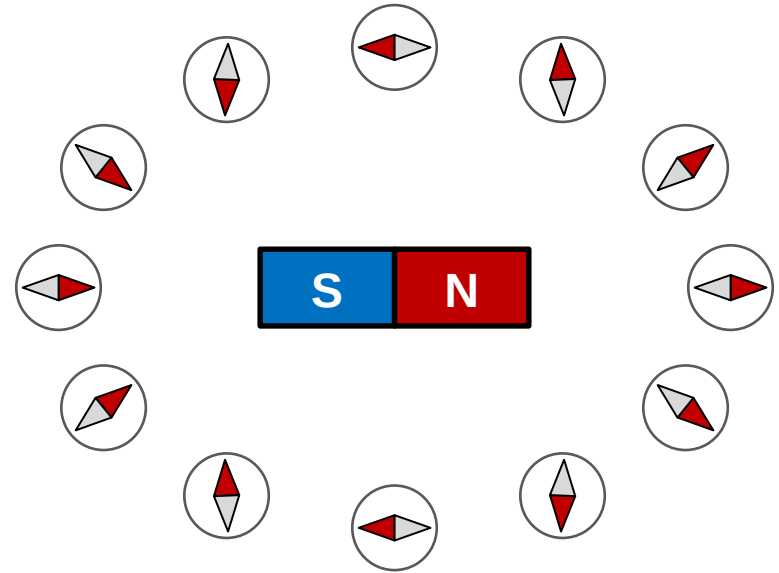
- Poles always come in pairs
- Cut a magnet: two new magnets
- Every piece has N and S



every piece has N and S

Compasses Map the Field

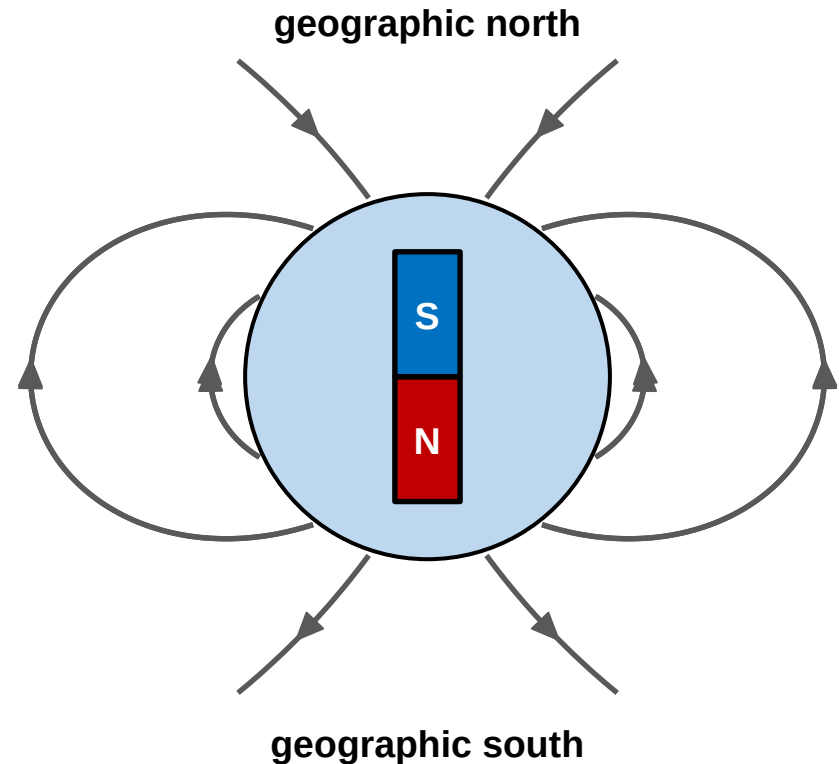
- A compass is a tiny magnet
- Its N end points along the field
- Iron filings work the same way



the red N end follows the field

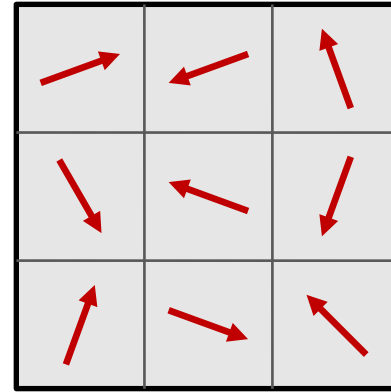
Earth Is a Magnet

- Earth has a magnetic field
- Compass N points to geographic north
- So a magnetic S pole is up north

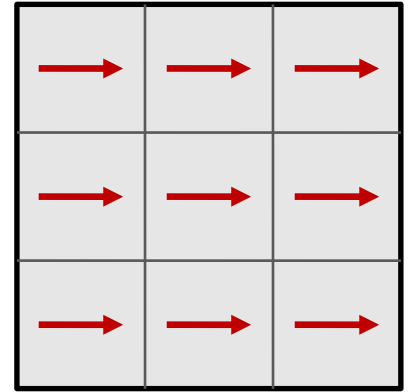


Magnetic Domains

- Domains: tiny regions of lined-up atoms
- Random domains: not a magnet
- Aligned domains: a magnet



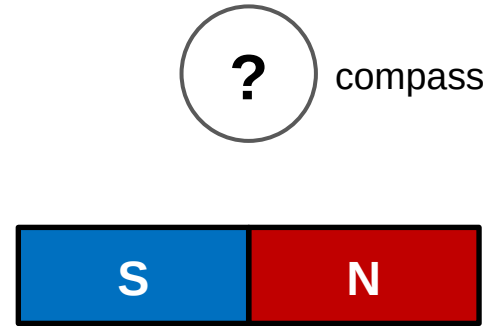
unmagnetized



magnetized

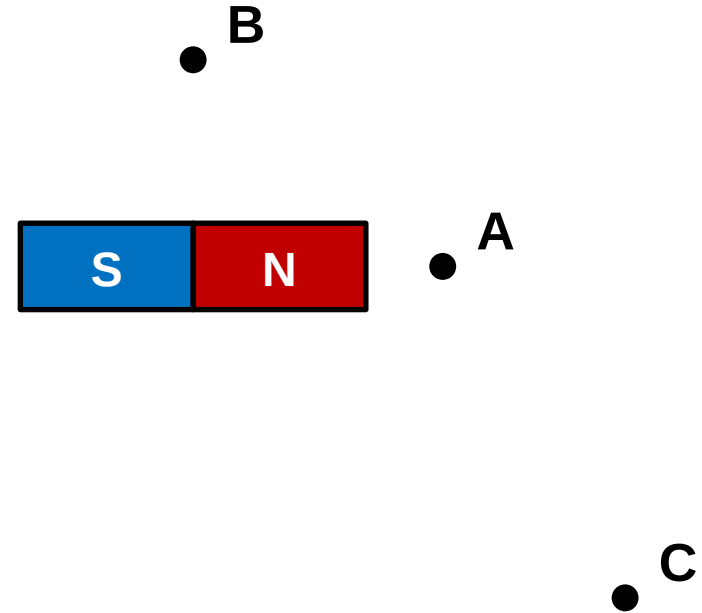
Example: Compass Direction

A compass sits just above the middle of a bar magnet. The magnet's N pole is on the right. Which way does the compass needle's N end point?



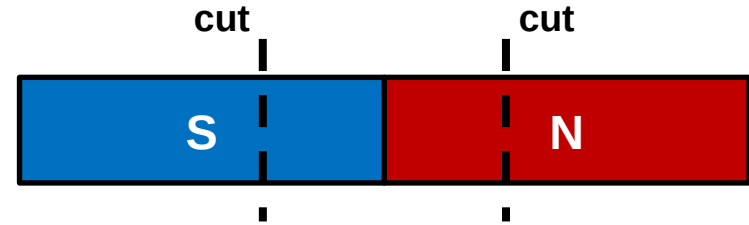
Example: Strongest Field

Points A, B, and C are near a bar magnet, as shown. Rank the strength of the magnetic field at the three points, strongest to weakest.



Example: Cutting a Magnet

A bar magnet with its N pole on the right is cut into three equal pieces. How many N poles are there now? Which pole is on the left end of the middle piece?



Big Ideas

- Opposite poles attract, like poles repel
- Field lines go N to S outside, never cross
- Crowded lines mean a stronger field
- Poles come in pairs; aligned domains make magnets