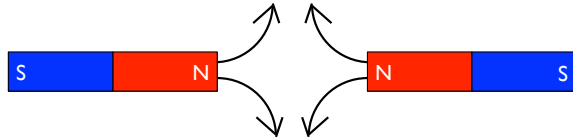


ATTRACTION/REPULSION PRODUCED BY MULTIPLE MAGNETIC-FIELD SOURCES

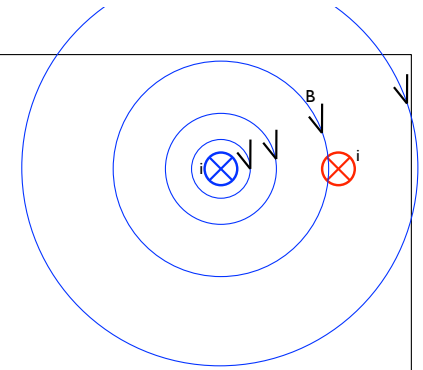
Consider two **north poles** juxtaposed against one another. You know from experience that these two magnets will repulse one another. Notice that the direction of the magnetic field lines generated by the two in this case are *parallel*.



The rule: If the magnetic field lines generated by two field-producing objects are parallel to one another, the two objects will repulse one another.

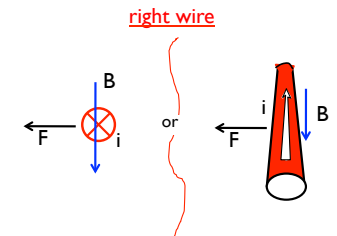
1.)

Example: Consider two wires directed perpendicular to the page each of which has current “i” going *into* the page. Each is generating a magnetic field in the region between the wires. Will the two wires attract or repulse one another.



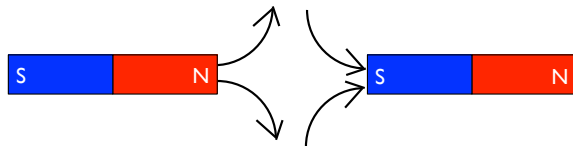
Analysis the hard way: Using the right-thumb rule, the wire to the left is generating a magnetic field that circles as shown.

Using the *right-hand* rule associated with cross products and the magnetic force expression $F_{\text{on wire}} = i\vec{L} \times \vec{B}$ on the wire to the *right*, we find that there is a magnetic force on that wire to the left. This suggests that there is an attraction between the wires.



3.)

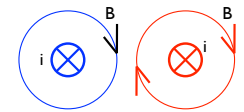
Consider a **south pole** juxtaposed against a **north pole**. You know from experience that the two magnets will attract one another. Notice that the direction of the magnetic field lines generated by the two in this case are *anti-parallel*.



The rule: If the magnetic field lines generated by two field-producing objects are antiparallel to one another, the two objects will attract one another.

2.)

Analysis the easy way: Using the right-thumb rule, identify the direction of each wire’s magnetic field as they exist between the wires. In this case, those lines are anti-parallel, so the wires must be attracted to one another.



4.)