Magnetic Forces and Magnetic Fields

Magnetic Fields:

⇒ all magnets have both a north pole and a south pole
⇒ like poles repel, opposite poles attract
⇒ a magnetic field surrounds every magnet or moving electric charge (magnetic field points from north to south pole)

Force on a Charge Moving in a Magnetic Field:

⇒ magnitude is given by $F = |q|vB \sin \theta$
⇒ direction is given by $RHR_1$: point fingers of right hand along $\vec{B}$ and thumb along $\vec{v}$; your palm points in the direction of $\vec{F}$ on a positive charge
⇒ a charge moving in a magnetic field will travel in a circular path of radius: $r = \frac{mv}{|q|B}$

Current Carrying Wire:

⇒ the force on a current carrying wire in a magnetic field is given by: $F = ILB \sin \theta$
⇒ the magnetic field a distance r away from a long-straight wire is given by: $B = \frac{\mu_0 I}{2\pi r}$

$$\mu_0 = 4\pi \times 10^{-7} \frac{Tm}{A}$$

direction is given by $RHR_2$: point thumb in the direction of conventional current; your fingers curl in the direction of the magnetic field

Loop of Wire:

⇒ the magnetic field at the center of a circular loop of wire is given by: $B = N\frac{\mu_0 I}{2R}$
⇒ the direction of the magnetic field inside a coil or loop of wire is given by $RHR_3$

*RHR_3*: curl the fingers of your right hand in the direction of conventional current; your thumb points in the direction of $\vec{B}$ (within the loop)