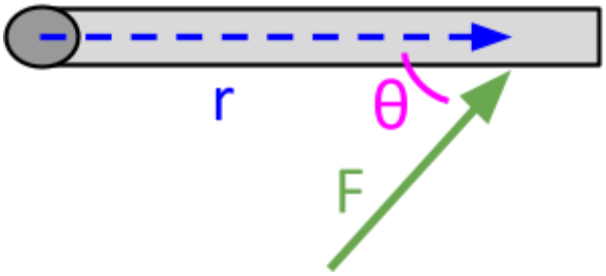
New Variable: ***Torque*** τ *Units:* ***Nm*** *Vector?* ***Yes***

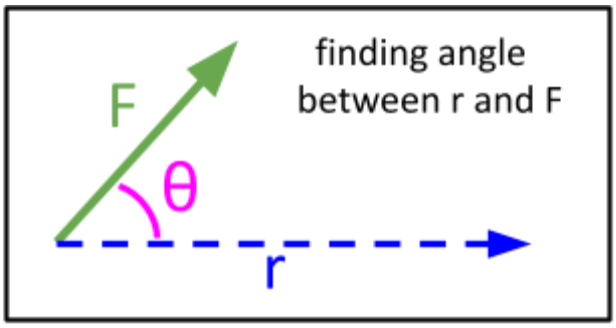
What does torque mean?

Force is what causes acceleration. Torque is what causes angular acceleration.

You need a force to apply a torque. The farther the force is from the axis of rotation, the greater the torque. Also, the angle should be perpendicular to the "lever arm" to maximize torque.

$$\tau = rF\sin\theta$$





Are there conditions that must be met in order for the formulas to be true?

No, this is the definition of torque so $\tau = rF\sin\theta$ is true by definition.

Warning: Torque is a vector, so it can be positive (CCW) or negative (CW).

Conditions for equilibrium

If there is no angular acceleration (i.e. constant rotation or no rotation) then the net torque is zero and we call this "rotational equilibrium". If there is no acceleration of the center of mass (i.e. constant translational motion or no translational motion) then the net force is zero and we call this "translational equilibrium".

Rotational Equilibrium: $\Sigma\tau = 0$

Translational Equilibrium: $\Sigma F = 0$