Torque

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Torque is the strength of a twist.

- A torque is clockwise or counterclockwise.
- Symbol for torque: τ
- SI unit for torque: N m (not J)

A force can produce a torque.

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

- F is the magnitude of the force.
- r is the distance from where the force acts to the axis of rotation.
- θ is the angle between r and F: $0^\circ \leq \theta \leq 180^\circ$
- τ is clockwise or counterclockwise (about the axis of rotation)

Things simplify if $\theta = 90°$.

If the angle θ between r and F is 90°, as it is everywhere in this experiment, then

$$\tau = rF$$

- If $\theta = 90°$, then r is called the *moment arm*.
- Torque is force times moment arm.
- τ is clockwise or counterclockwise (about the axis of rotation)

Conditions for equilibrium

- Net force in the x direction must be zero.
- Net force in the y direction must be zero.
- Net torque must be zero.
- For this experiment, we consider a counter-clockwise torque to be a positive torque, and a clockwise torque to be a negative torque.

What if there is no rotation?

- This experiment is interested in equilibrium.
- In equilibrium, there is no rotation.
- If there is no rotation, there is no axis of rotation.
- We can choose an "axis of rotation" to be anywhere we want. The theory continues to work regardless of the place we choose to be the "axis of rotation".