Torque and Rotational Equilibrium Practice

Concept: Torque is the rotational counterpart of force. The magnitude of the torque about a pivot point is given by: $\tau = r F \sin\phi$

where r is the distance from the pivot to the point of application of the force; F is the magnitude of the force; and ϕ is the angle between the tails of r and F.

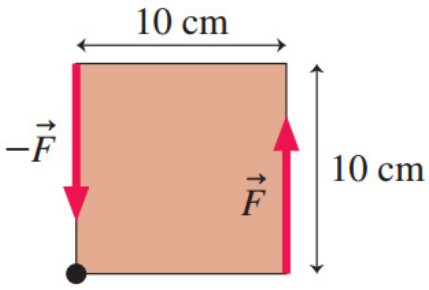
Remarks:

- Use the Right-Hand-Rule to figure out direction.
- Recall there are two ways to visualize torque.

Problem 1. Magnitude of Force

What force would provide a 7.0 N·m torque about the axle?

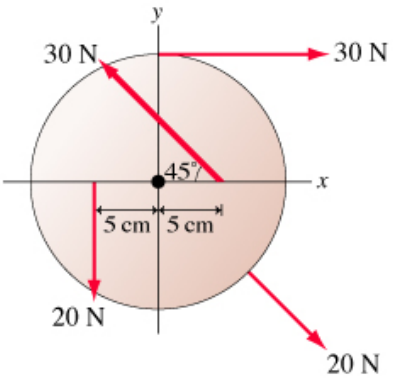
[***F*** = 70 N]



Problem 2. Net Torque

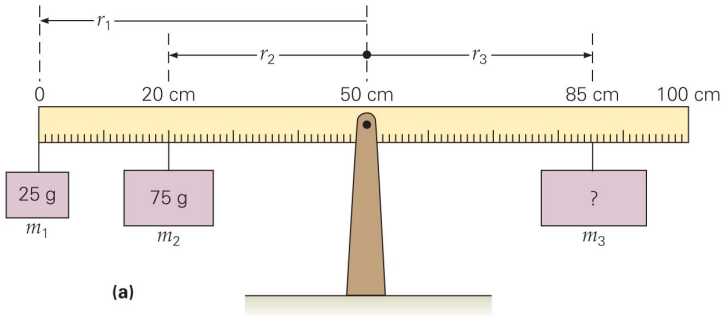
The 25-cm-diameter disk in can rotate on an axle through its center. What is the **net** torque about the axle?

[τ = –1.69 N·m]



Problem 3. Balancing Meterstick

Three masses are suspended from a meter-stick. We want to determine the mass to be suspended on the right side for the system to be in **rotational equilibrium**. Neglect the mass of the meter-stick.



a. Why can we neglect the mass of the meterstick? Explain it in terms of the torque produced by it.

b. Draw the Free-Body Diagram for the object of interest.

c. Find the value of the unknown mass.
[m_3 = 100 g]