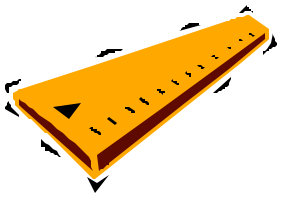
Torque and Rotational Equilibrium

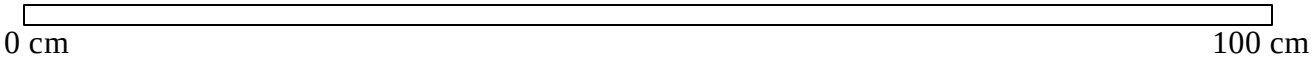
In this lab, you will pull on a meter stick at various locations until the meter stick is "at rest" (neither translating nor rotating, which is a state of equilibrium). You will then verify the two conditions for equilibrium by examining the total amounts of upward and downward force and the total amounts of clockwise and counterclockwise torques.



1. Place the scales at the locations indicated. Scales A and C should pull in the same direction, with scale B (and D if given) pulling in the opposite direction. Place arrows on the meter stick diagram in order to show the location of each force.
2. Record the readings on each scale when equilibrium is achieved.
3. Use the "zero" end of the meter stick as your pivot point and calculate your torques (in this lab, "torque = force x location" since the location is the distance from the zero end).
4. Sum the forces and torques. Look at each of these values to see how well each trial verified the conditions for equilibrium.

I.

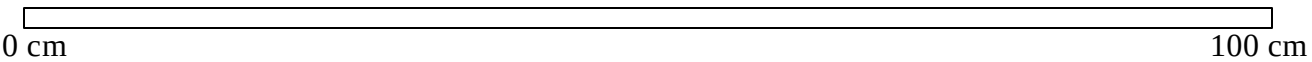
Scale	Location, cm	Force, N	Up or Down?	Torque, N·cm	cw or ccw?
A	20				
B	50				
C	80				



ΣF_{up}	ΣF_{down}	Σt_{cw}	Σt_{ccw}

II.

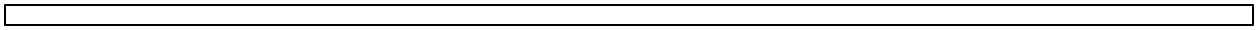
Scale	Location, cm	Force, N	Up or Down?	Torque, N·cm	cw or ccw?
A	30				
B	60				
C	90				



ΣF_{up}	ΣF_{down}	Σt_{cw}	Σt_{ccw}

III.

Scale	Location, cm	Force, N	Up or Down?	Torque, N·cm	cw or ccw?
A	10				
B	70				
C	90				

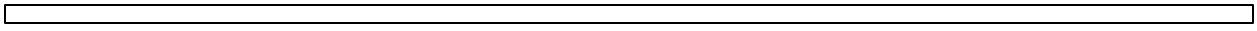


0 cm 100 cm

ΣF_{up}	ΣF_{down}	Σt_{cw}	Σt_{ccw}

IV.

Scale	Location, cm	Force, N	Up or Down?	Torque, N·cm	cw or ccw?
A	25				
B	40				
C	70				
D	80				

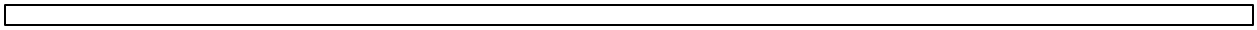


0 cm 100 cm

ΣF_{up}	ΣF_{down}	Σt_{cw}	Σt_{ccw}

V.

Scale	Location, cm	Force, N	Up or Down?	Torque, N·cm	cw or ccw?
A	5				
B	50				
C	70				
D	85				



0 cm 100 cm

ΣF_{up}	ΣF_{down}	Σt_{cw}	Σt_{ccw}