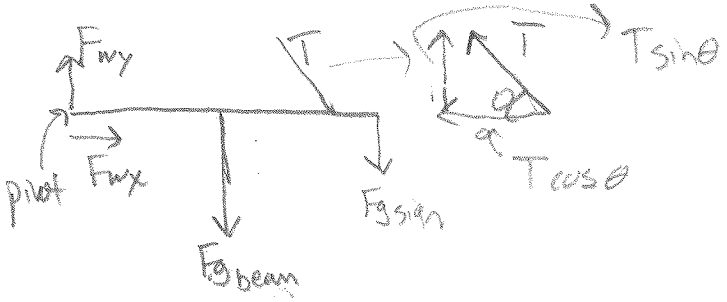
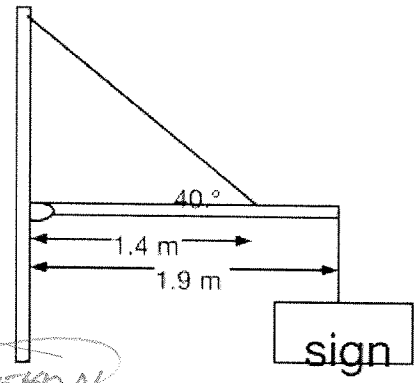
Rotational Motion Practice Quiz

Name: Key

1. A sign weighing 200. N is supported by a uniform 150. N beam as shown. Find the tension in the cable attaching the beam to the wall.





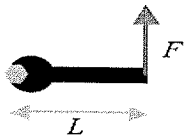
$\Sigma\tau_y = (F_{g\,beam} \cdot .95m) + (F_{g\,sign} \cdot 1.9m) - (T\sin\theta \cdot 1.4m) = 0N$

$(150N \cdot .95m) + (200N \cdot 1.9m) = T\sin(40°)(1.4m) \rightarrow T = 580N$

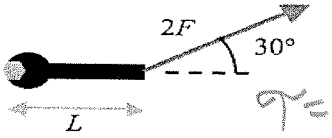
2. A series of wrenches of different lengths is used on a hexagonal bolt, as shown below. Which combination of wrench length and Force applies the greatest torque? Justify your answer.

$\tau = \vec{F} \cdot L = FL$

a.



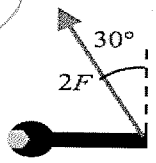
b.



$\tau = F_\perp d$

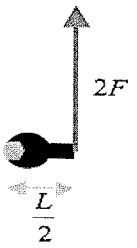
$\tau = 2F \cdot L \sin 30° = \vec{F}L$ (.50)

c.



$\tau = 2F \cdot L\cos 30° = 1.7FL$ (.866)

d.



$\tau = 2F \cdot \frac{1}{2}L = \vec{F}L$

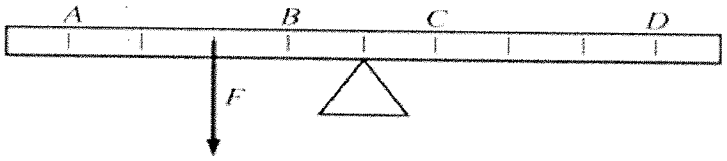
3. A cylinder rotates with constant angular acceleration about a fixed axis. At time t = 0 the cylinder is at rest. At time t = 2 seconds its angular velocity is 1 radian per second. What is the angular acceleration of the cylinder between t = 0 and t = 2 seconds?

$\omega = \omega_0 + \alpha t$

$1 rad/s = \alpha (2s)$

$\alpha = .50 rad/s^2$

θ	
ω_0	0
ω	1 rad/s
α	?
t	2 sec



4. The figure above shows a uniform meterstick that is set on a fulcrum at its center. A force of magnitude F toward the bottom of the page is exerted on the meterstick at the position shown. At which of the labeled positions must an upward force of magnitude $2F$ be exerted on the meterstick to keep the meterstick in equilibrium? Justify your answer:

B → F produces a ccw τ, so 2F has to produce a cw τ. That eliminates C & D. B is half distance from pivot as F is, so the force of 2F will create the equal, but opposite τ needed to cancel τ_F