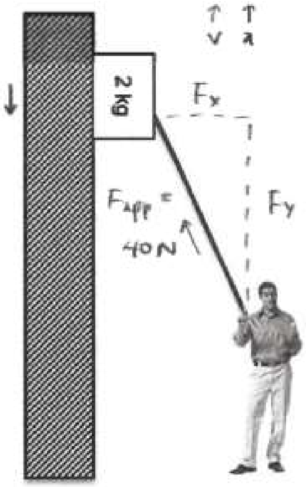
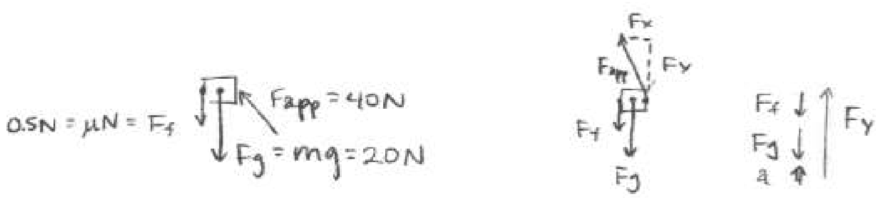
Assessment #9 121 Schwartz

1. You push on a stick with a force of 40 N. The stick is connected to a 2 kg block so it doesn't slip off the block. I took a picture of you, so you have a clear idea of what exactly is going on. There is a dynamic coefficient of μN friction of 0.5 between the wall and the bock. Assume the block starts with an upward velocity. Find the acceleration of the block.



$\Sigma\vec{F} = m\vec{a}$ I will use the dynamics lens because the applied force will cause acceleration of the block



$\Sigma\vec{F} = m\vec{a}$

$\vec{F}_y + \vec{F}_g + \vec{F}_f = m\vec{a}$

$F_y - mg - \mu N = ma$

$F_y - (2\,kg)(10\,m/s^2) - (0.5)F_x = (2\,kg)(a)$

$$\frac{(37N) - (20N) - (0.5)(15N)}{(2\,kg)} = a$$

estimating

$F_x = 15\,N$

$F_y = 37\,N$

$a \approx 5\,m/s^2$

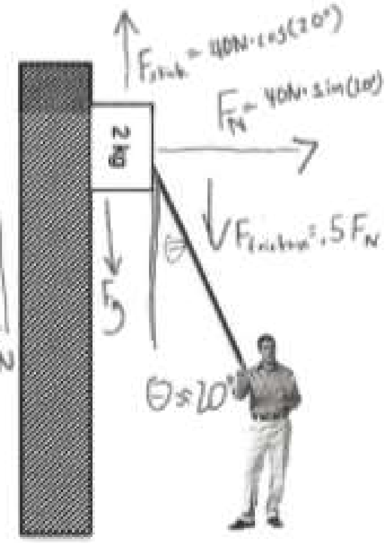
I used F_x for normal force because the block is being pressed against the wall with force of F_x

I used F_y as the force vector because against the wall, the block can only accelerate vertically

this makes sense because with the angle of the force applied and the force of friction, the acceleration would be less than that of 40 N

Assessment #9 121 Schwartz

1. You push on a stick with a force of 40 N. The stick is connected to a 2 kg block so it doesn't slip off the block. I took a picture of you, so you have a clear idea of what exactly is going on. There is a dynamic coefficient of friction of 0.5 between the wall and the bock. Assume the block starts with an upward velocity. Find the acceleration of the block.



Dynamics lens

$F_g = 2kg \cdot 10 m/s^2$

$F_{stick\,(up)} = \cos(20°) \cdot 40N \rightarrow 37.58N$

$F_{stick\,(normal)} = \sin(20°) \cdot 40N \rightarrow 6.84N$

* without an angle between the stick and the wall I will guess that $\theta \approx 20°$ *

$F = F_g + F_{stick} - F_{friction}$

$F = -20N + \cos(20°) \cdot 40N - .5\sin(20°)(40N)$

$F = -\sin(20°)(20N) - 20N + \cos(20°)40N$

$F = 37.59 - 6.84 - 20N = 10.74N$

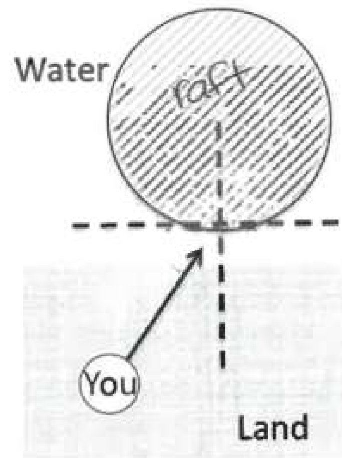
$F = ma$

$10.74 = 2kg(a)$

$a = \frac{10.74}{2} = 5.37 m/s^2$ up

A+

2. You see a round floating raft on the water as shown at right. You run (solid line) and jump onto the edge of the raft, landing where the dotted lines meet. Qualitatively describe the subsequent motion of the raft with you on it. Fully support how you came to your answer.



Angular Momentum Lens — collision conserved

The raft will gain momentum ↗ parallel to you velocity & will also gain angular momentum ⊙ because you will land off center & objects traveling linearly have angular momentum if the hit another object of center (vmr).

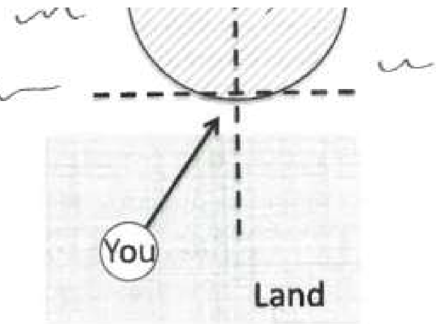
$p_1 = p_2$

$m_1 v_1 = m_s v_s$

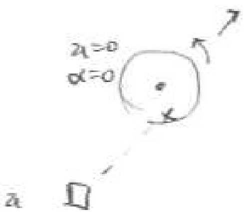
$l_1 = l_1$

$m_1 v_1 r = I\omega$

the raft with you on it. Fully support how you came to your answer.



I will use a momentum lens because within the body-raft system, there are no outside forces (maybe water's surface tension or something) but momentum should be conserved



because the raft isn't fixed, we can assume their will be a linear velocity of the system smaller than the velocity I ran with

$\tau_{outside} = 0$

$\Delta \vec{l} = \vec{\tau} \Delta t = 0$

closer to about body

because I am striking the raft off center and the raft isn't fixed, there should be angular velocity and acceleration as well

What’s your name?____