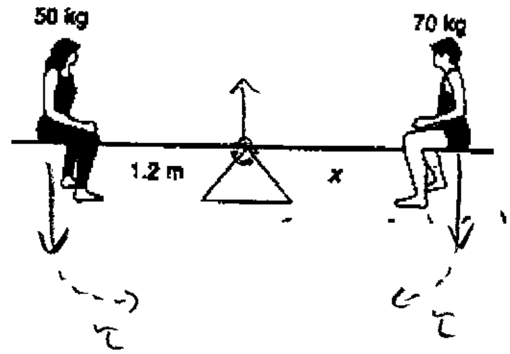
AP 13: Rotational Equilibrium

1. A 50 kg person is sitting on a seesaw 1.2 meters from the balance point. On the other side, a 70 kg person is balanced. How far from the balance point is the second person sitting?



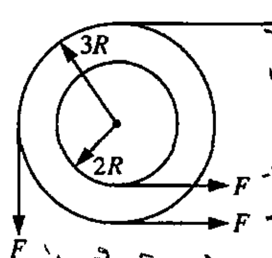
50 (1.2) = 70 (x)

X = .857 m

a. 0.57 m
b. 0.63 m
c. 0.75 m
d. 0.86 m
e. 1.2 m

2. A system of two wheels fixed to each other is free to rotate about a frictionless axis through the common center of the wheels and perpendicular to the page. Four forces are exerted tangentially to the rims of the wheels, as shown. The magnitude of the net torque on the system about the axis is

a) zero
b) FR
c) 2FR
d) 5FR
e) 14FR



2F(3R) 6FR

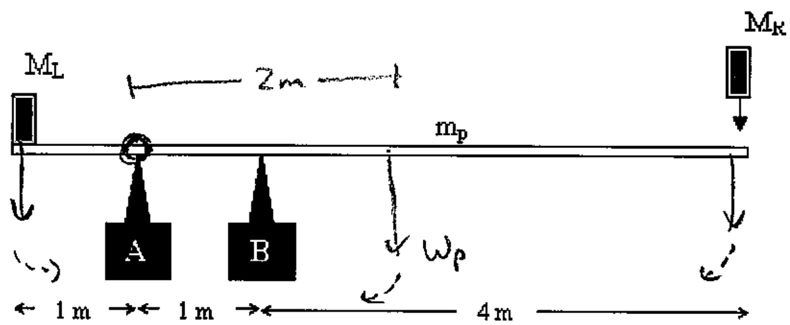
F(2R)

F(5R) 8FR

F(3R)

Net 8FR - 6FR = 2FR

wooden plank of length 6 m and mass $m_p = 4$ kg rests on two supports, denoted A and B. At the left end of the plank rests a weight with mass $M_L = 25$ kg. Another mass M_R is placed at the other end. The positions of the supports are as shown.



1. What is the *smallest* value of M_R required to keep the plank from tipping?
   - (a) 3.4 kg
   - (b) 4.1 kg
   - (c) 5.5 kg
   - (d) 6.8 kg
   - (e) 7.7 kg

A is the important pivot pt! W/o M_R board pivots @ A

$\tau = \tau$

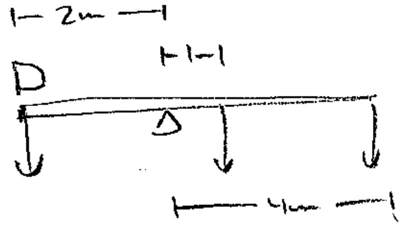
25(1) = 4(2) + M_R(5)

M_R = 3.4 kg

2. What is the largest mass, MR, that can be added to the right end without tipping the plank?
   - (a) 5.7 kg
   - (b) 9.2 kg

Now 'B' becomes the pivot pt.

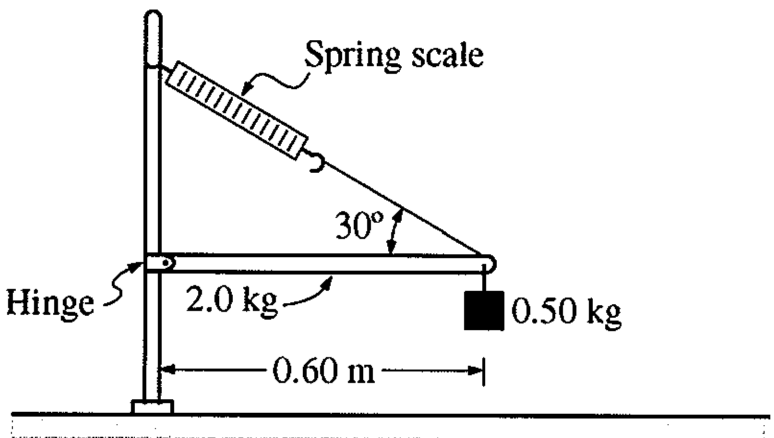
- [x] (c) 11.5 kg
- [ ] (d) 13.8 kg
- [ ] (e) 15.1 kg



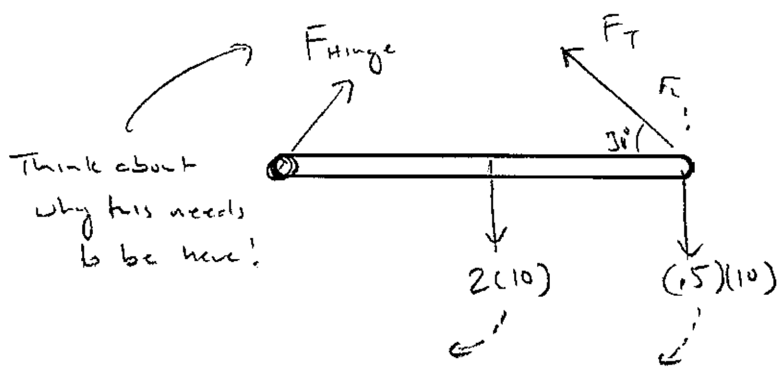
$25(2) = 4(1) + M_R(4)$

$M_R = 11.5$ kg

1. The horizontal uniform rod shown above has length 0.60 m and mass 2.0 kg. The left end of the rod is attached to a vertical support by a frictionless hinge that allows the rod to swing up or down. The right end of the rod is supported by a cord that makes an angle of 30° with the rod. A spring scale of negligible mass measures the tension in the cord. A 0.50 kg block is also attached to the right end of the rod. (20 points, units 1 pt..)



(a) On the diagram below, draw and label vectors to represent all the forces acting on the rod. Show each force vector originating at its point of application. (4 pts.)



(b) Calculate the reading on the spring scale. (4 pts.)

* Can't be done using ΣF_y ...

* Pivot @ Hinge.

$\tau_{\circlearrowleft} = \tau_{\circlearrowright}$

$2(10)(.3) + (.5)(10)(.6) = (T \sin 30°)(.6)$

$T = 30$ N

(c) Determine the x-component and the y-component of the force provided by the hinge. (4 pts.)

SKIP THIS .... IT IS HARDER THAN I WANT YOU TO SPEND TIME ON. :)