Torque Problems Name_____ Block____ Date___

A torque is a twisting force. *Torque* is a measure of the force that acts on an object and can cause that object to rotate. The object rotates about an axis, which we will call the pivot point. Recall that we measure force in Newtons (N). The distance from the pivot point to the point where the force acts is called the moment arm, and is denoted by 'r' because is it the radius of the arc of the circle. We can say that forces act in a clockwise or counterclockwise direction. In this assignment, you are trying to balance a meter stick by having the CW and CCW torques balance out. The formula for an individual torque can be found using this equation:

Torque

$$\tau = F_{\perp} \cdot r$$

If the system is balanced then the torques must be equal and opposite:

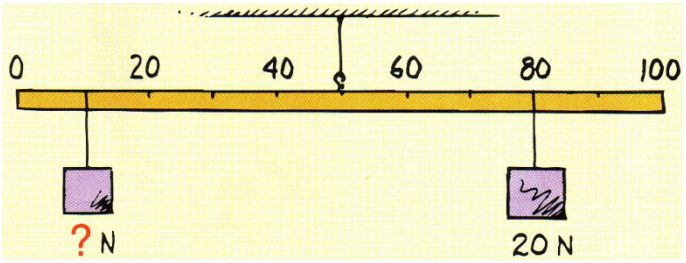
Balanced Torques

$$\tau_{cw} = \tau_{ccw}$$

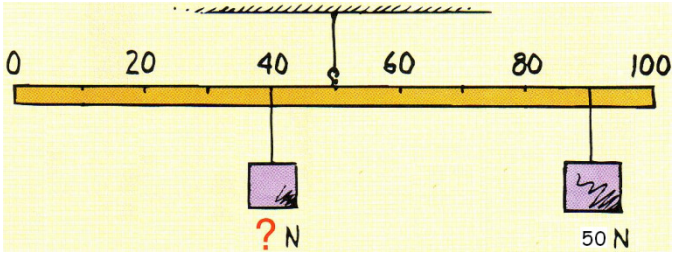
Finding unknown $F_{\perp}$ or r

$$F_{\perp} \cdot r = F_{\perp} \cdot r$$

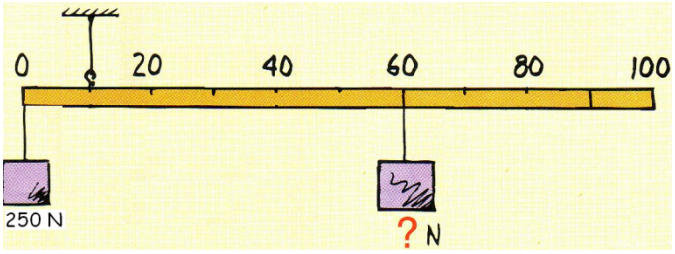
1. A 20 N weight hangs 30 cm or 0.3m from the pivot point. What weight must hang 40 cm or 0.4 m on the other side of the pivot point?



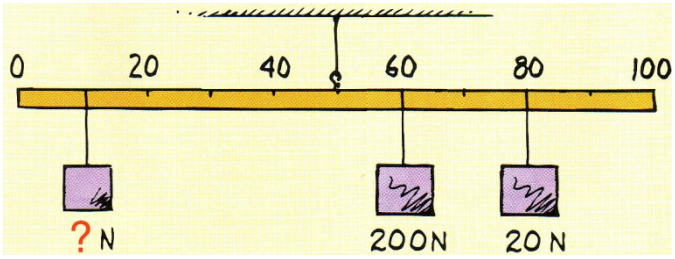
2. What weight is needed where the question mark is to make the system balance?



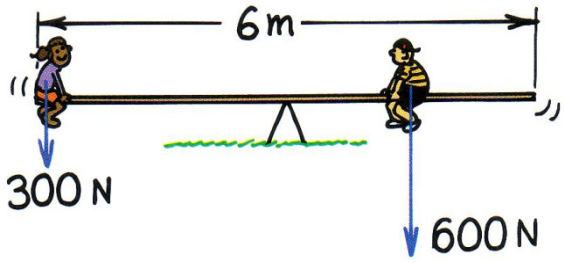
3. If a 250 N weight hangs from the 0 cm mark, 10 cm or 0.10 m from the pivot point (fulcrum). What weight is needed 50 cm or 0.5 m away to make it balance?



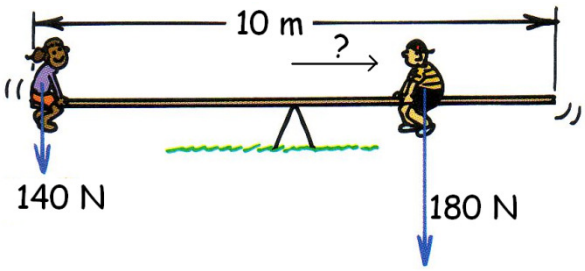
4. What weight is needed at the 10 cm mark to balance out the 200 N and 20 N weights on the other side?



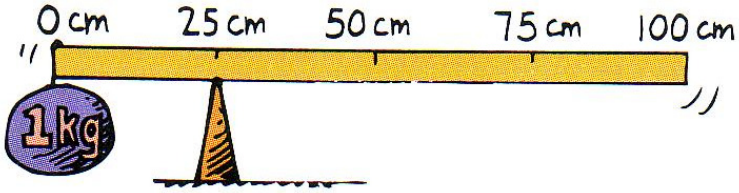
5. Calculate the individual torques produced by the weights of the girl and boy on the seesaw in the figure. (Hint: The fulcrum is in the middle, and the girl's distance is twice that of the boy's distance.



6. How far away should the 180 N boy sit to balance a 140 N girl who is 5 m away from the fulcrum?



7. What is the mass of the meter stick to the right of the fulcrum (0.75-m) if it balances the 1 kg mass 25-cm or 0.25-m away from the fulcrum? *(Hint: remember that the mass on the right side will essentially pull from the center of gravity halfway between 50 and 75 cm on the meter stick. Also remember that kg is mass and we need to be in force units (N), so remember that F=ma)*



8. If a 200-g mass is placed at the 20-cm mark (30 cm from the fulcrum), at what mark should a 500-g mass be placed so the system balances? *(Draw them in to scale.)*