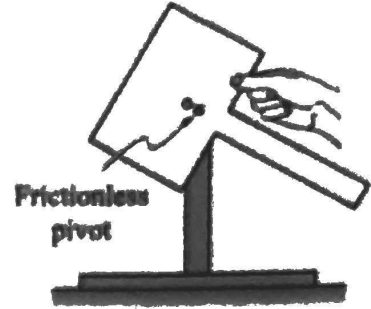


EQUILIBRIUM OF RIGID BODIES

Name _____

Mech
HW-75

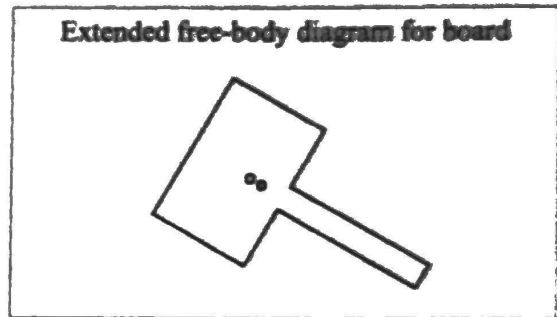
1. Recall that in part C of section II of the tutorial *Equilibrium of rigid bodies* a T-shaped board was hung from the hole through the center of mass and held at an angle as shown. You observed that the board remained at rest when released.



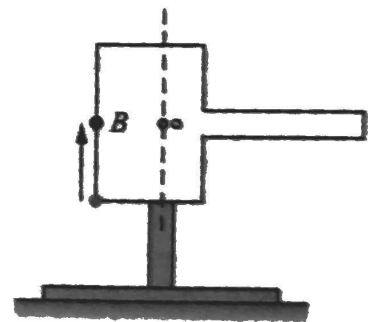
- a. What does this observation imply about the net torque about the pivot? Explain.

Draw an extended free-body diagram for the board in the space at right.

Is the point at which you placed the gravitational force on your diagram consistent with your answer for the net torque about the pivot? Explain.

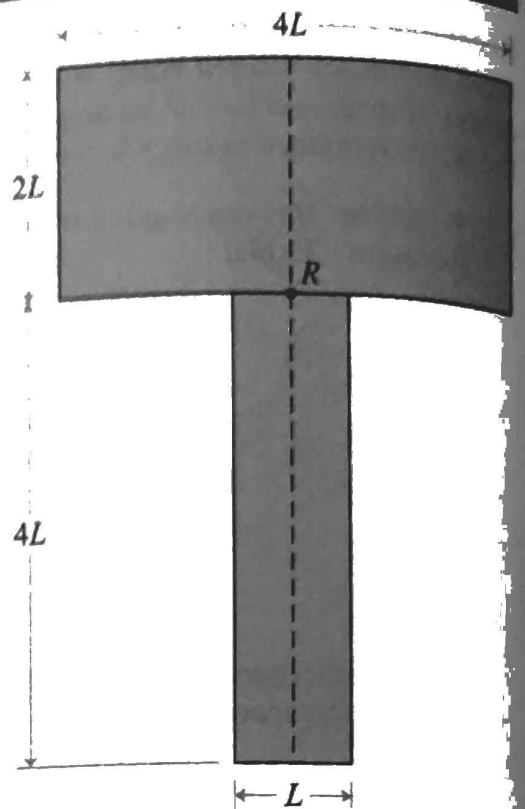


2. Suppose the board and piece of clay were in equilibrium as in section II of the tutorial *Equilibrium of rigid bodies*. Imagine that the piece of clay is moved to a location closer to the pivot by moving it directly upward to point *B*. Neglect friction.



- a. Would the board remain at rest in this case? Explain.
- b. On the figure above, mark the approximate location of the center of mass of the system composed of clay (at point *B*) and board with an "x." Explain.
- c. Is the amount of mass of the system (clay and board) to the left of the dashed line *greater than, less than, or equal to* the amount of mass of the system to the right of the dashed line? Explain.

3. A T-shaped sheet of uniform thickness has a uniform mass density.
- a. Is the center of mass of the sheet located *above* point *R*, *below* point *R*, or *at* point *R*? Explain your reasoning. (*Hint: Do not assume that this board is identical to the one used in the tutorial Equilibrium of rigid bodies.*)



- b. Now consider a T-shaped sheet of uniform thickness that is composed of two different materials designated by the shaded and unshaded regions in the diagram at right. The mass density of *each* piece is uniform throughout its volume. The mass density of the shaded piece is twice as large as the mass density of the unshaded piece.

Is the center of mass of the sheet located *above* point *R*, *below* point *R*, or *at* point *R*? Explain your reasoning.

