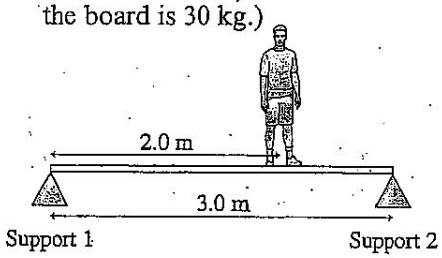
G2

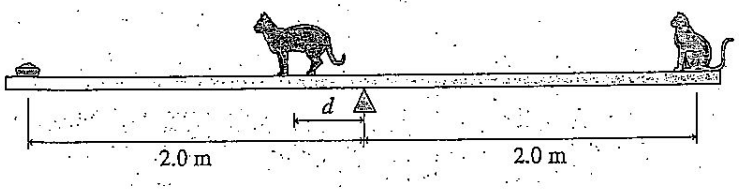
1

**PHY 111 Statics Problems**

62. || A 3.0-m-long rigid beam is supported at each end. An 80 kg student stands 2.0 m from support 1. How much upward force does each support exert on the beam? (The mass of the board is 30 kg.)




34. || A 5.0 kg cat and a 2.0 kg bowl of tuna fish are at opposite ends of a 4.0-m-long seesaw. How far to the left of the pivot must a 4.0 kg cat stand to keep the seesaw balanced?



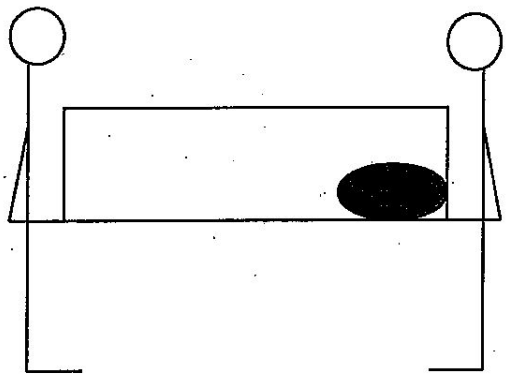
2

**PHY 111** **Carrying a trunk**

Two friends are carrying a closed wooden trunk whose length is 6 feet and whose weight is 50 pounds. Its center of mass is at the center of the trunk. Concealed inside the trunk, unknown to the two friends, is a 60-lb. bag of lead shot located 1 foot from the right end of the trunk. As the two friends carry the trunk, one comments how light the trunk is and the other how heavy it is.

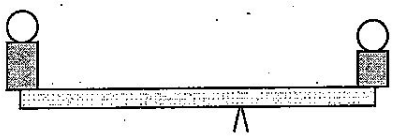
How much of the weight is each supporting?

**Let the right side be r = 0.**
*Note: You may use lbs. as a unit of force and feet as a unit of distance.*



**PHY 111 Additional Statics Problems**

**1.** A seesaw is 4 meters long and has a mass 20 kg. The fulcrum is located 2.5 meters from one end. A person with a mass of 30 kg sits on the long end. What must be the mass of a person sitting on the short end in order to balance the seesaw?

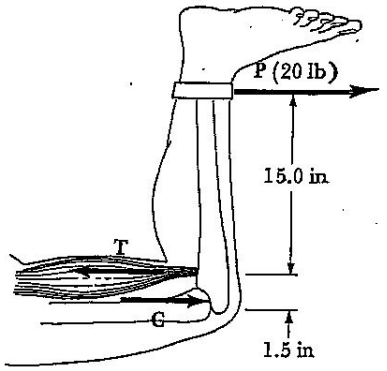


**2.** A 3-m long beam with a mass of 30 kg is supported at each end by a cable. A painter with a mass of 90 kg stands 1 meter from the left cable. Find the tension in each cable.

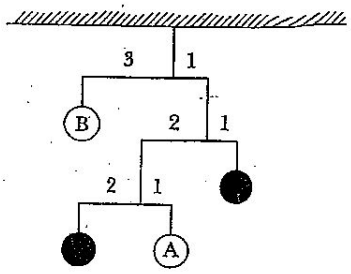
4

**3.** A plank 10 meters long is supported by cables from each end. The left cable has a tension of 300 N and the right cable, 400N. Find the weight and location of the person sitting on the plank. Ignore the weight of the plank.

**4.** Find the magnitude of the tension force **T** exerted by the hamstring muscle (in the back of the thigh) and the compression force **C** at the knee joint. A 20-lb force is pulling at the ankle.




**5.** The object marked A in the mobile weighs 10 N. Find the weight of object B. The distances are relative lengths.



64. || A 40 kg, 5.0-m-long beam is supported, but not attached to, the two posts in **FIGURE P12.64**. A 20 kg boy starts walking along the beam. How close can he get to the right end of the beam without it falling over? (At the point where the board starts to tip, the support on the left is no longer part of the problem.)

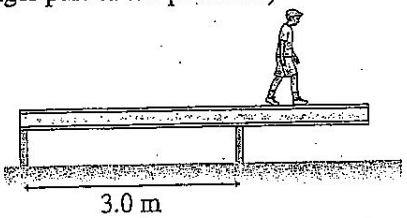


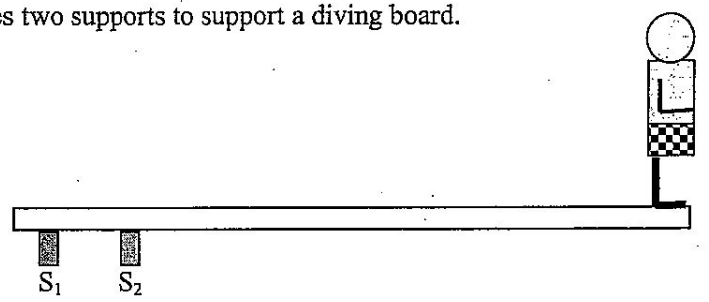

**FIGURE P12.64**

65. (Same diagram as above.) The supports are labeled $S_1$ (left) and $S_2$ (right). How much weight is supported by each support when the boy stands 40 cm to the right of $S_2$? (You may label either support as $r = 0$.)

6

**PHY 111 Supports on a diving board**

It takes two supports to support a diving board.




The board is 8 feet long. Support1 $S_1$ is 6 inches from the left end. $S_2$ is 2 feet from the left end. The diver has a weight of 180 lbs. Ignore the weight of the board. What is the magnitude and direction of the force at each support?

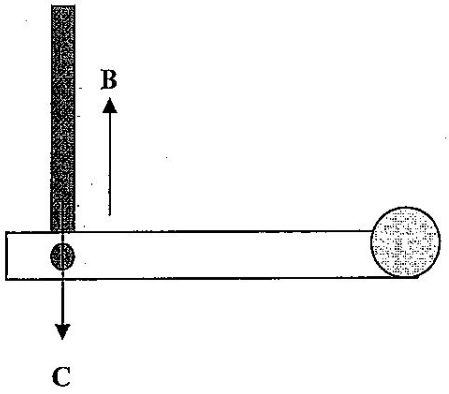
a) Consider the $S_1$ to the pivot point ($r = 0$).

b) Consider the $S_2$ to the pivot point ($r = 0$).

**PHY 111 Biceps/Triceps**

**In these problems it is easier to use inches as the unit of distance. Thus torques will be expressed in "inch-pounds".**

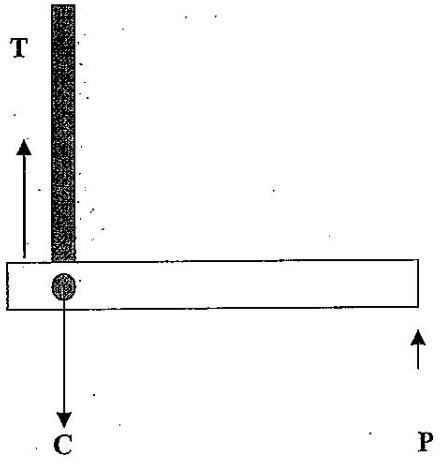
**1.** A person is holding a 10-lb. weight in his hands. The distance from the elbow to the hand is 15 inches long. The lower arm has a weight of 5 lbs and its center of mass is located 6 inches from the elbow. The bicep muscle is attached to the forearm 1.5 inches from the elbow.




a) Find the tension force (in lbs) in the bicep muscle.

b) Find the compression of the upper arm bone against the elbow.

**2.** This time the person is pushing on the table with a force of 25 lbs with his hand. Find the force in the triceps. Find the compression force. The triceps muscle is attached 1.5 inches from the elbow.



8

**3.** The diagram shows a person (facing right) holding up a beam which is hinged to the wall. The beam can rotate, but it is fixed to the wall by a hinge. The beam is 10 feet long and has a weight of 120 lbs. The box sitting on the beam at the far right end of the beam (10 feet from the pivot) has a mass of 30 lbs. The person is supporting the beam at a point 7 feet from the wall.

a) How much weight does the person support?
b) How much weight is supported by the hinge?

Note: You may use lbs. as a unit of force and feet as a unit of distance. You do not need to convert to kg and meters.