11. Which of the configurations of brick, (*a*) or (*b*) of Fig. 9–39, is the more likely to be stable? Why?

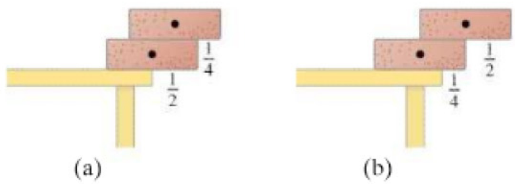

FIGURE 9–39 Question 11. The dots indicate the CG of each brick. The fractions $\frac{1}{4}$ and $\frac{1}{2}$ indicate what portion of each brick is hanging beyond its support.

12. Why do you tend to lean backward when carrying a heavy load in your arms?

13. Place yourself facing the edge of an open door. Position your feet astride the door with your nose and abdomen touching the door's edge. Try to rise on your tiptoes. Why can't this be done?

14. Why is it not possible to sit upright in a chair and rise to your feet without first leaning forward?

15. Why is it more difficult to do sit-ups when your knees are bent than when your legs are stretched out?

16. Name the type of equilibrium for each position of the ball in Fig. 9–40.

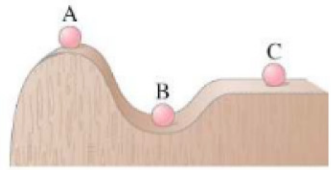

FIGURE 9–40 Question 16.

* 17. Is the Young's modulus for a bungee cord smaller or larger than that for an ordinary rope?

* 18. Examine how a pair of scissors or shears cuts through a piece of cardboard. Is the name "shears" justified? Explain.

* 19. Materials such as ordinary concrete and stone are very weak under tension or shear. Would it be wise to use such a material for either of the supports of the cantilever shown in Fig. 9–9? If so, which one(s)? Explain.

Problems

9–1 and 9–2 Equilibrium

1. (I) Three forces are applied to a tree sapling, as shown in Fig. 9–41, to stabilize it. If $\vec{\mathbf{F}}_A = 310\,\text{N}$ and $\vec{\mathbf{F}}_B = 425\,\text{N}$, find $\vec{\mathbf{F}}_C$ in magnitude and direction.

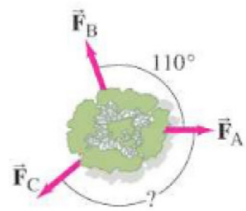

FIGURE 9–41 Problem 1.

2. (I) Calculate the torque about the front support post (B) of a diving board, Fig. 9–42, exerted by a 58-kg person 3.0 m from that post.

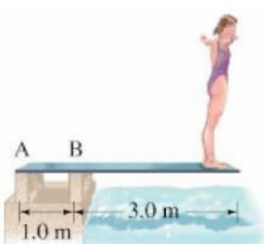

FIGURE 9–42 Problems 2, 4, and 6.

3. (I) Calculate the mass *m* needed in order to suspend the leg shown in Fig. 9–43. Assume the leg (with cast) has a mass of 15.0 kg, and its CG is 35.0 cm from the hip joint; the sling is 80.5 cm from the hip joint.

FIGURE 9–43 Problem 3.

4. (I) How far out on the diving board (Fig. 9–42) would a 58-kg diver have to be to exert a torque of 1100 m·N on the board, relative to the left (A) support post?

5. (II) Two cords support a chandelier in the manner shown in Fig. 9–4 except that the upper wire makes an angle of 45° with the ceiling. If the cords can sustain a force of 1550 N without breaking, what is the maximum chandelier weight that can be supported?

6. (II) Calculate the forces F_A and F_B that the supports exert on the diving board of Fig. 9–42 when a 58-kg person stands at its tip. (*a*) Ignore the weight of the board. (*b*) Take into account the board's mass of 35 kg. Assume the board's CG is at its center.

7. (II) A uniform steel beam has a mass of 940 kg. On it is resting half of an identical beam, as shown in Fig. 9–44. What is the vertical support force at each end?

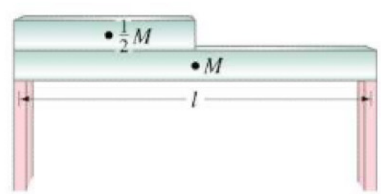

FIGURE 9–44 Problem 7.

8. (II) A 140-kg horizontal beam is supported at each end. A 320-kg piano rests a quarter of the way from one end. What is the vertical force on each of the supports?

9. (II) A 75-kg adult sits at one end of a 9.0-m-long board. His 25-kg child sits on the other end. (*a*) Where should the pivot be placed so that the board is balanced, ignoring the board's mass? (*b*) Find the pivot point if the board is uniform and has a mass of 15 kg.

10. (II) Calculate F_A and F_B for the uniform cantilever shown in Fig. 9–9 whose mass is 1200 kg.