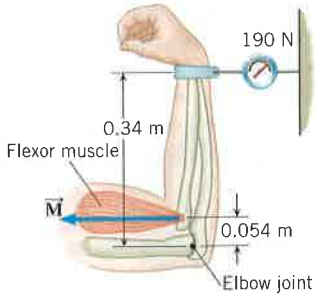
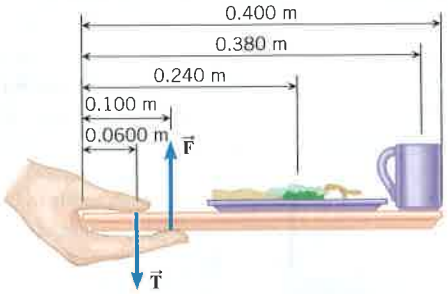
concrete support exerts on the bridge (a) at the near end and (b) at the far end?

14. Review Multiple-Concept Example 8 before beginning this problem. A sport utility vehicle (SUV) and a sports car travel around the same horizontal curve. The SUV has a static stability factor of 0.80 and can negotiate the curve at a maximum speed of 18 m/s without rolling over. The sports car has a static stability factor of 1.4. At what maximum speed can the sports car negotiate the curve without rolling over?

15. **Interactive Solution 9.15** at **www.wiley.com/college/cutnell** illustrates how to model this type of problem. A person exerts a horizontal force of 190 N in the test apparatus shown in the drawing. Find the horizontal force $\vec{\mathbf{M}}$ (magnitude and direction) that his flexor muscle exerts on his forearm.

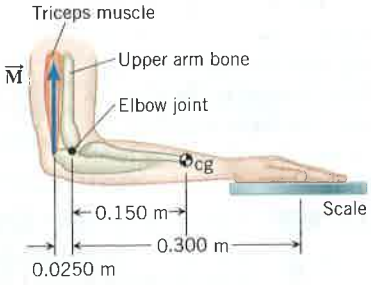


16. A lunch tray is being held in one hand, as the drawing illustrates. The mass of the tray itself is 0.200 kg, and its center of gravity is located at its geometrical center. On the tray is a 1.00-kg plate of food and a 0.250-kg cup of coffee. Obtain the force $\vec{\mathbf{T}}$ exerted by the thumb and the force $\vec{\mathbf{F}}$ exerted by the four fingers. Both forces act perpendicular to the tray, which is being held parallel to the ground.



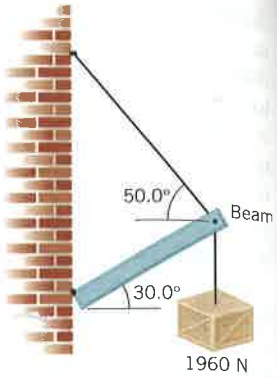
17. ssm A uniform door (0.81 m wide and 2.1 m high) weighs 140 N and is hung on two hinges that fasten the long left side of the door to a vertical wall. The hinges are 2.1 m apart. Assume that the lower hinge bears all the weight of the door. Find the magnitude and direction of the horizontal component of the force applied ***to the door*** by (a) the upper hinge and (b) the lower hinge. Determine the magnitude and direction of the force applied ***by the door*** to (c) the upper hinge and (d) the lower hinge.

18. In an isometric exercise a person places a hand on a scale and pushes vertically downward, keeping the forearm horizontal. This is possible because the triceps muscle applies an upward force $\vec{\mathbf{M}}$ perpendicular to the arm, as the drawing indicates. The forearm weighs 22.0 N and has a center of gravity as indicated. The scale registers 111 N. Determine the magnitude of $\vec{\mathbf{M}}$.



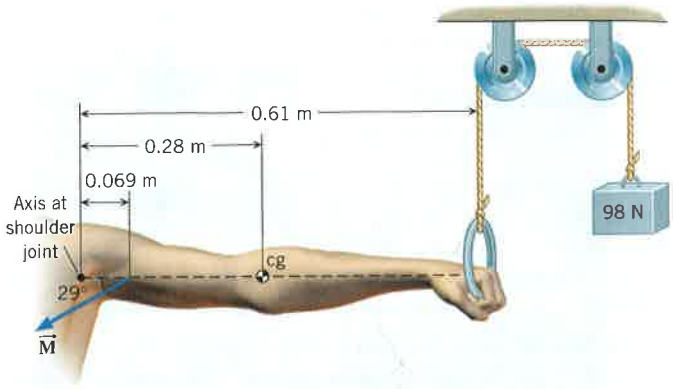
19. Review **Concept Stimulation 9.2** at **www.wiley.com/college/cutnell** and Conceptual Example 7 as background material for this problem. A jet transport has a weight of 1.00×10^6 N and is at rest on the runway. The two rear wheels are 15.0 m behind the front wheel, and the plane's center of gravity is 12.6 m behind the front wheel. Determine the normal force exerted by the ground on (a) the front wheel and on (b) *each* of the two rear wheels.

20. A 1220-N uniform beam is attached to a vertical wall at one end and is supported by a cable at the other end. A 1960-N crate hangs from the far end of the beam. Using the data shown in the drawing, find (a) the magnitude of the tension in the wire and (b) the magnitude of the horizontal and vertical components of the force that the wall exerts on the left end of the beam.

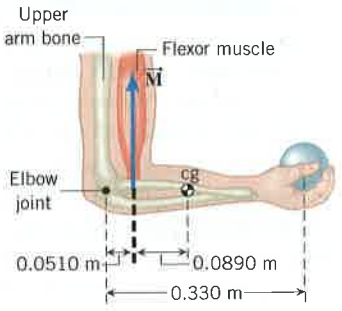


21. ssm www A massless, rigid board is placed across two bathroom scales that are separated by a distance of 2.00 m. A person lies on the board. The scale under his head reads 425 N, and the scale under his feet reads 315 N. (a) Find the weight of the person. (b) Locate the center of gravity of the person relative to the scale beneath his head.

22. The drawing shows an outstretched arm (0.61 m in length) that is parallel to the floor. The arm is pulling downward against the ring attached to the pulley system, in order to hold the 98-N weight stationary. To pull the arm downward, the latissimus dorsi muscle applies the force $\vec{\mathbf{M}}$ in the drawing, at a point that is 0.069 m from the shoulder joint and oriented at an angle of 29°. The arm has a weight of 47 N and a center of gravity (cg) that is located 0.28 m from the shoulder joint. Find the magnitude of $\vec{\mathbf{M}}$.



23. ssm A man holds a 178-N ball in his hand, with the forearm horizontal (see the drawing). He can support the ball in this position because of the flexor muscle force $\vec{\mathbf{M}}$, which is applied perpendicular to the forearm. The forearm weighs 22.0 N and has a center of gravity as indicated. Find (a) the magnitude of $\vec{\mathbf{M}}$ and (b) the magnitude and direction of the force applied by the upper arm bone to the forearm at the elbow joint.



24. A woman who weighs 5.00×10^2 N is leaning against a smooth vertical wall, as the drawing shows. Find (a) the force $\vec{\mathbf{F}}_N$ (directed perpendicular to the wall) exerted on her shoulders by the wall and the (b) horizontal and (c) vertical components of the force exerted on her shoes by the ground.