

PHYS 109: Suggested problems

CHAPTER 6

6.1. If the torque required to loosen a nut has a magnitude of $t = 40 \text{ N m}$, what minimum force must be exerted at the end of a 30-cm-long wrench?

6.3. A steel band of a brace exerts an external force of magnitude $F_{\text{ext}} = 40 \text{ N}$ on a tooth. The tooth is shown in Fig. 6.53, with point B a distance 1.33 cm above point A, which is the fulcrum. The angle between the normal to the tooth and the external force is $\theta = 40^\circ$. What is the torque on the root of the tooth about point A?

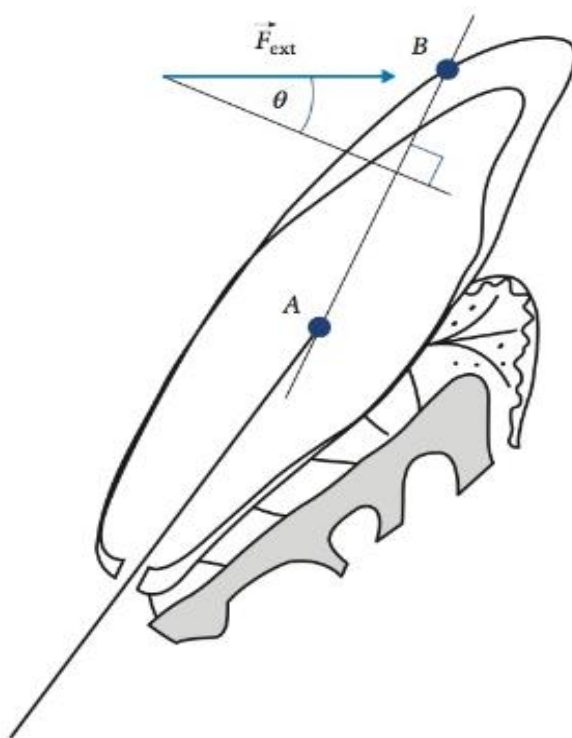


Figure 6.53 A horizontal force \vec{F}_{ext} acts at point B on a tooth with the fulcrum at point A.

6. 6. A force of 120 N in positive x-direction is applied perpendicularly to the middle of a 3-m-long stick standing vertically. What is the magnitude and direction of torque about each end of the stick?

6.23. Determine the torque about the knee by a hamstring tendon exerting an 80 N force on bones in the lower leg, as shown in Fig. 6.69. Assume that the knee bend is 75° , and that the tendon acts horizontally 6.0 cm below the knee, the pivot point.

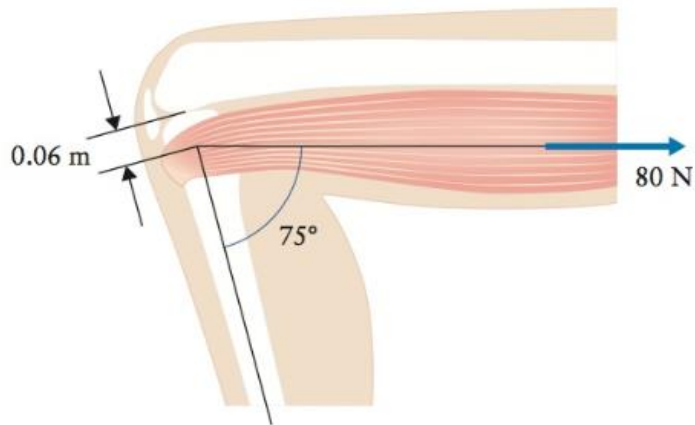


Figure 6.69

6.26. A 10 kg object rotating on a circle of 2.5 m has an angular momentum of $0.75 \text{ kg m}^2/\text{s}$ with respect to the centre of the circle. What is its speed?

6.27. Two objects of masses $m_1 = 157.6 \text{ kg}$ and $m_2 = 54.5 \text{ kg}$, with speeds of $v_1 = 53.6 \text{ m/s}$ and $v_2 = 55.2 \text{ m/s}$, are moving in a perpendicular direction around the origin O, as shown in Fig 6.71. If at one moment their distance from the origin O is $r_1 = 52.5 \text{ m}$ and $r_2 = 53.8 \text{ m}$, what is their total (net) angular momentum about point O?

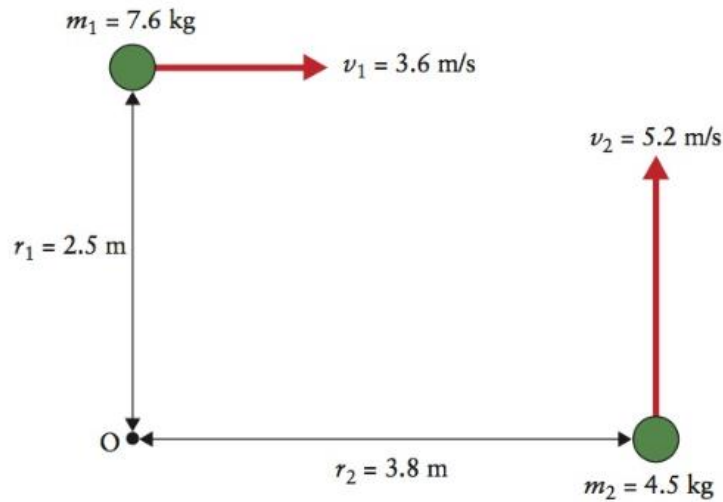


Figure 6.71