**54.** The steel I-beam in the drawing has a weight of 8.00 kN and is being lifted at a constant velocity. What is the tension in each cable attached to its ends?



70.0° 70.0°
I-beam

**55.** 🩺   The drawing shows a wire tooth brace used by orthodontists. The topmost tooth is protruding slightly, and the tension in the wire exerts two forces $\vec{T}$ and $\vec{T}'$ on this tooth in order to bring it back into alignment. If the forces have the same magnitude of 21.0 N, what is the magnitude of the net force exerted on the tooth by these forces?



16.0°      16.0°
$\vec{T}'$      $\vec{T}$
—Brace
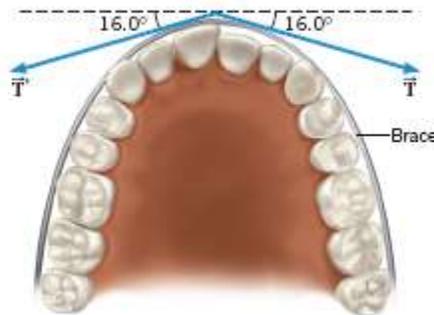
**56.** Part *a* of the drawing shows a bucket of water suspended from the pulley of a well; the tension in the rope is 92.0 N. Part *b* shows the same bucket of water being pulled up from the well at a constant velocity. What is the tension in the rope in part *b*?
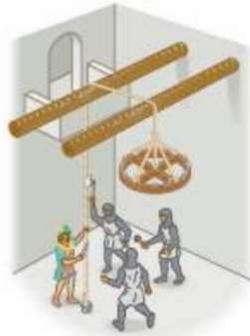


(a)         (b)
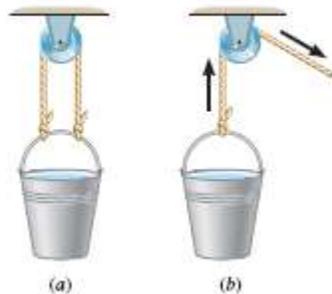
**60.** 🟢   The drawing shows a circus clown who weighs 890 N. The coefficient of static friction between the clown's feet and the ground is 0.53. He pulls vertically downward on a rope that passes around three pulleys and is tied around his feet. What is the minimum pulling force that the

clown must exert to yank his feet out from under himself?



*107. **ssm mmh** The drawing shows Robin Hood (mass = 77.0 kg) about to escape from a dangerous situation. With one hand, he is gripping the rope that holds up a chandelier (mass = 195 kg). When he cuts the rope where it is tied to the floor, the chandelier will fall, and he will be pulled up toward a balcony above. Ignore the friction between the rope and the beams over which it slides, and find **(a)** the acceleration with which Robin is pulled upward and **(b)** the tension in the rope while Robin escapes.



Problem 107