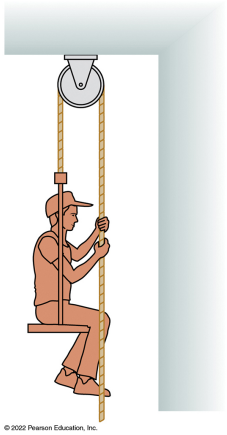
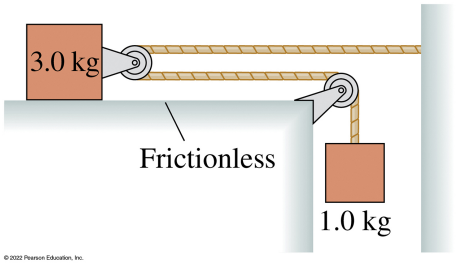
PHY151 Practical Questions for Oct 10 to 14

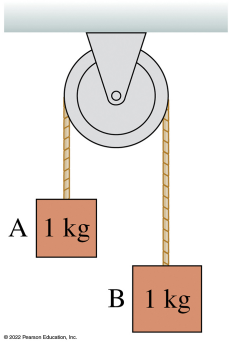
1. With what force must the pictured painter pull down on the rope to accelerate themself upward at a rate of 0.20 m/s^2 if the painter and chair have a mass of 80 kg?



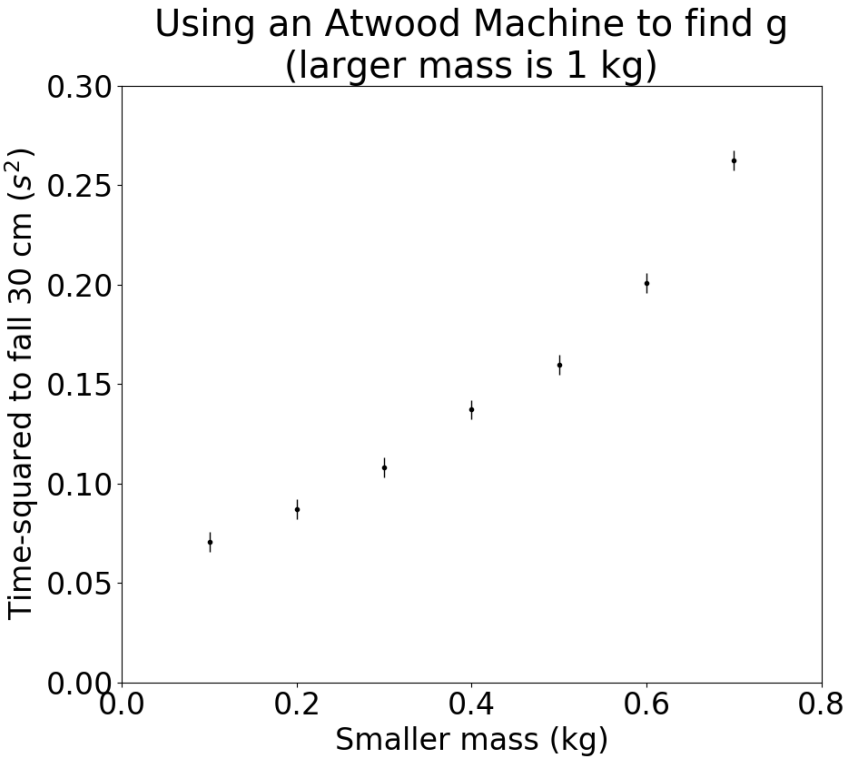
2. What is the acceletarion of the 3.0 kg box pictured below?



3. An Atwood machine is pictured below.



   Usually the masses are different, so the system accelerates. Pictured below is some fictitious data taken when one of the masses is always 1 kg, but the other mass varied in 0.1 kg increments. The y-axis is the square of the time taken for the heavier mass to fall 30 cm. From this data, find g. Include some uncertainty estimate. This need not be rigorous.



4. Challenge: What is the acceletarion constraint between the foot brace and the hanging mass in this system pictured below? Let y be the height of the hanging mass and let x be the horizontal position of the moving pulley attached to the foot. The acceleration constraint is equivalent to $\frac{dx}{dy}$. *Hint:* If you set L as the total length of the string above the bottom pulley (i.e. the parts of the string which are not vertical), then $\frac{dL}{dy} = 1$. Note that L depends on x.