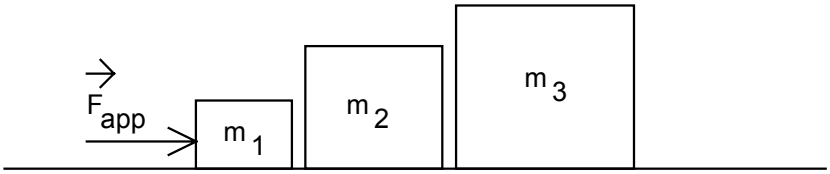
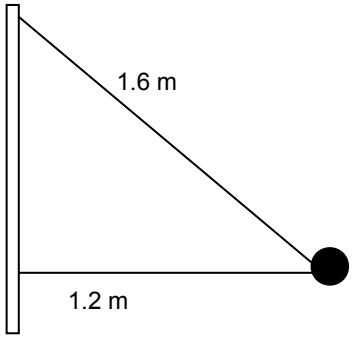
PHY 140Y – FOUNDATIONS OF PHYSICS
2001-2002
Tutorial Questions #5
October 15/16

Applying Newton's Laws of Motion

1. Blocks of 1.0, 2.0, and 3.0 kg are lined up from left to right in that order on a table so that each block is touching the next one. A rightward-pointing 12-N force is applied to the leftmost block, as shown below. What is the acceleration of the blocks and what force does the middle block exert on the rightmost one?



2. The figure below shows a 0.84-kg ball attached to a vertical post by strings of length 1.2 m and 1.6 m. If the ball is set whirling in a horizontal circle, find
(a) the minimum speed necessary for the lower string to be taut, and
(b) the tension in each string if the ball's speed is 5.0 m/s.



3. A block of mass M and height h slides down a slope as shown below. The slope is inclined at angle θ from the horizontal. Connected to the top of the box is an object of mass m. The object is directly above point A on the floor of the box, as shown.
(a) Draw free-body diagrams for mass m and for mass M and identify all forces acting on each at the point when mass m has just been released from the top of the box (i.e., ignore any normal force between the two masses).
(b) If mass m drops from the top of the box, where will it fall relative to A when it reaches the floor, and how long will it take to fall, assuming that the slope is frictionless.