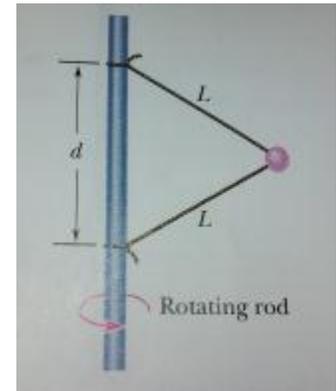


Written homework # 3

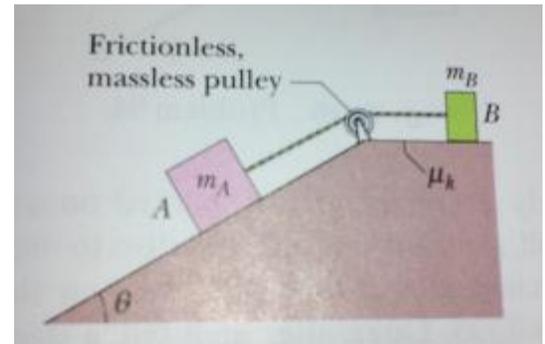
All problems will be graded out of 6 points.

Problem # 1: A 1.34 kg ball is connected by means of two massless strings, each of length $L = 1.70\text{m}$, to a vertical, rotating rod. The strings are tied to the rod with separation $d=1.70\text{ m}$ and are taut. The tension in the upper string is 35 N.



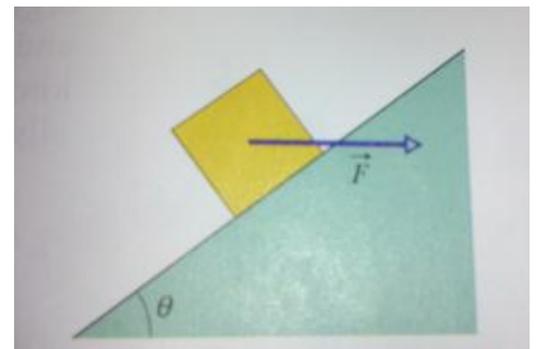
- Draw the freebody diagram of the ball. Choose an appropriate set of axes (explain your choice) and draw a component diagram with respect to the axes you have chosen.
What are the
- Tension in the lower string
- The magnitude of the net force on the ball and
- Speed of the ball
- What is the direction of the net force on the ball?

Problem # 2: Block A has a mass $m_A = 4.0\text{ kg}$ and block B has a mass $m_B = 2.0\text{ kg}$. The coefficient of kinetic friction between block B and the horizontal plane is $\mu_k = 0.50$. The inclined plane is frictionless and at angle $\theta = 30^\circ$. The pulley and the string are massless. Draw



- The free body diagram for both masses. Choose appropriate set of axes for each mass and explain your choice. Draw another diagram for m_A showing all forces/components along your chosen axes.
- Find the magnitude of the acceleration of the blocks.
- Find the tension in the cord.
- How long will mass take to move 1 m?
- What is the velocity of the blocks at this time?

Problem # 3: A 5.0 kg block is sent sliding up a plane inclined at $\theta = 37^\circ$, with an initial speed of 4.0 m/s while a horizontal force F of magnitude 50N acts on it. The coefficient of kinetic friction between the block and plane is 0.30.



- Draw a free body diagram of the object. Choose appropriate axes and draw a component diagram.
- What are the magnitude and direction of the resultant acceleration of the block?
- How far does the block go before it stops?

Written homework # 3

Problem # 4 (3 points) A sling-thrower puts a stone (0.250 kg) in the sling's pouch (0.010 kg) and then begins to make the stone and pouch move in a vertical circle of radius 0.650 m. The cord between the pouch and the person's hand has negligible mass and will break when the tension in the cord is 33.0 N or more. Suppose the sling thrower could gradually increase the speed of the stone.

- a) Draw and free body diagram of the stone and pouch at the lowest point of the circle and the highest point. At which point will the breaking occur? Explain why.
- b) At what speed of the stone will that breaking occur?

Problem # 5 (3 points) A child places a picnic basket on the outer rim of a merry-go-round that has a radius of 4.6 m and revolves once every 30 seconds.

- a) Draw the free body diagram of the basket and choose appropriate axes to analyzed the problem. (Explain your choice)
- b) What is the speed of a point on the rim?
- c) What is the lowest value of the coefficient of static friction between the basket and the merry-go-round that allows the basket to stay on the ride?