Physics 7A, Section 2 (Prof. Hallatschek)
First Midterm, Fall 2014
Berkeley, CA

Rules: *This midterm is closed book and closed notes. You are allowed two sides of one-half sheet of 8.5" x 11" of paper on which you can whatever note you wish. You are also allowed to use scientific calculators in general, but not ones which can communicate with other calculators through any means.* ***Anyone who does use wireless-capable will automatically receive a zero for this midterm.*** *Cell phones must be turned off during the exam, and placed in your backpacks.* ***In particular, cell-phone-based calculators cannot be used.***

Please make sure that you do the following during the midterm:

- *Write your name, discussion number, ID number on all documents you hand in.*
- *Make sure that the grader knows what s/he should grade by circling your final answer.*
- *Answer all questions that require a numerical answer to three significant figures.*

We will give partial credit on this midterm*, so if you are not altogether sure how to do a problem , or if you do not have time to complete a problem , be sure to write down as much information as you can on the problem. This includes any or all of the following: Drawing a clear diagram of the problem , telling us how you would do the problem if you had the time, telling us why you believe (in terms of physics) the answer you got to a problem is incorrect, and telling us how you would mathematically solve an equation or set of equations once the physics is given and the equations have been derived. Don 't get too bogged down in the mathematics; we are looking to see how much physics you know, not how well you can solve math problems .*

If at any point in the exam you have any problems, just raise your hand, and we will see if we are able to answer it.

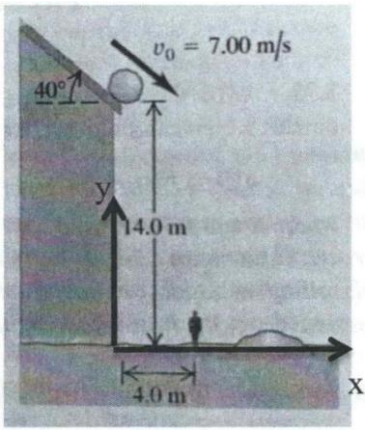
Name: _____ Disc Sec Number:_____

Signature:_____ Disc Sec GSI: _____

Student ID Number: _____

Problem	***Possible***	***Score***
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

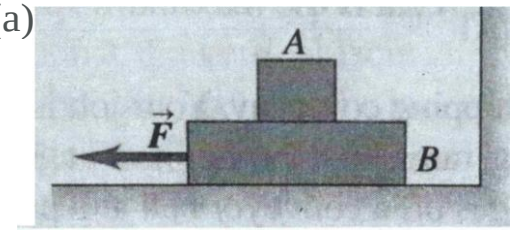
1. 40° (see figure). The edge of the roof is 14.0m above the ground, and the snowball has a speed of 7.00 *m/s* as it rolls off the roof. Ignore air resistance. (a) How far from the edge of the barn does the snowball strike the ground if it doesn't strike anything else while falling? (b) Draw *x-t*, *y-t*, v_x-*t*, and v_y-*t* graphs for the motion in part (a). origin of the coordinate frame. (c) A man 1.9 m tall is standing 4.0 m from the edge of the barn. Will the snowball hit him?



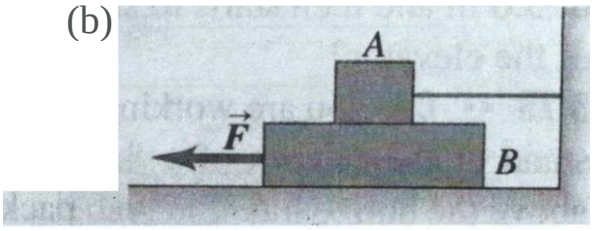
2. A physics major is working to pay his college tuition by performing in a traveling carnival. She rides a motorcycle inside a hollow, transparent plastic sphere. After gaining sufficient speed, she travels in a vertical circle with a radius of *R*. The physics major has mass m_p, and her motorcycle has mass m_m. (a) What minimum speed v_0 must she have at the top of the circle if the tires of the motorcycle are not to lose contact with the sphere? (b) At the bottom of the circle, her speed is v_1. What is the magnitude of the normal force exerted on the motorcycle by the sphere at this point.

3. Block A and block B in the figure below have mass m_A and m_B, respectively. Assume that the coefficient μ_K of kinetic friction between all surfaces is the same. Find the magnitude of the horizontal force ***F*** necessary to drag block *B* to the left at constant speed (a) if *A* rests on *B* and moves with it (Fig. a) and (b) if *A* is held at rest (Fig. b).

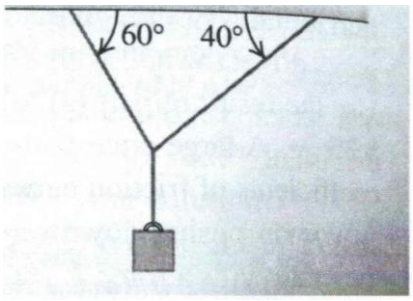
(a)



(b)



4. Two ropes are connected to a steel cable that supports a hanging weight as shown in the figure. (a) Draw a free-body diagram showing all of the forces acting at the knot that connects the two ropes to the steel cable. Based on your force diagram, which of the two ropes will have the greater tension? (b) If the maximum tension either rope can sustain without breaking is 5000N, determine the maximum value of the hanging weight that these ropes can safely support. You can ignore the weight of the ropes and the steel cable.



5. The masses of blocks *A* and *B in* the below figure are m_A and m_B, respectively. Assume that $m_A > m_B$. The blocks are initially at rest on the floor and are connected by a massless string passing over a massless and frictionless pulley. An upward force $\boldsymbol{F}$ is applied to the pulley. (a) Draw free-body diagrams for both blocks and the pulley. (b) What's the tension in the cord? (c) Find the acceleration $\boldsymbol{a_A}$ of block *A* and $\boldsymbol{a_B}$ of block *B*.