Physics I: Midterm Exam Example Problems

(taken directly from the past Physics I Midterms)

Disclaimer: These problems do **not** represent the full range of topics or problem styles that will be covered on the midterm. They are only meant to be representative of the types of problems you may be asked.

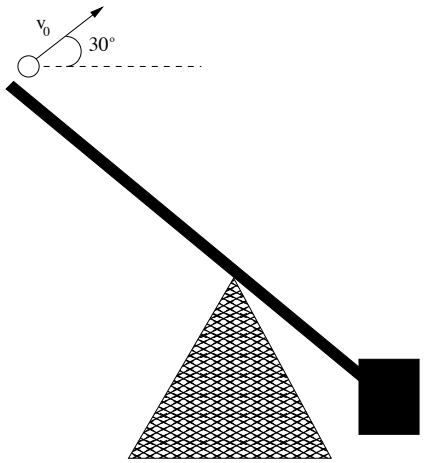
Example Short Answer Questions

1. A 10 ft ladder with mass 10 kg is leaning against the side of a building. The ground is ice, so the ladder effectively feels no friction with the ground. The wall, on the other hand, is a normal wall and there is some coefficient of static friction between the ladder and the wall. A 100 kg person is standing 1/3 of the way up the ladder. Draw a free body diagram that portrays the forces *on the ladder*.

2. Beth attaches a rope to a large box (m =1000 kg) sitting on a flat surface and pulls on the rope horizontally. The box doesn't move. She carefully measures the force she applied to be 500N in the horizontal direction. From these measurements, can she determine the coefficient of static friction? If so, what is it? If not, why not?

Example Problem

On Halloween, Shelby and Fann use a Trebuchet to launch pumpkins. The trebuchet releases the pumpkins at an angle of 30° above the horizontal.



a. With what speed do they need to launch the pumpkins in order for them to reach the pond 30.0 meters away (*Note: assume the height of the pond is the same as the launch height of the pumpkin*)?

b. Without changing the Trebuchet setup, Chase attaches a special rocket to the front of the pumpkin. That rocket expels its gas *opposite* the direction of horizontal motion of the pumpkin and is *perfectly horizontal*. It causes an acceleration of 5.00 m/s^2 horizontally. How far does the pumpkin go now?

c. What is the net force on a rocket-propelled pumpkin at the peak of its flight? Assume that, at the apex, the rocket and pumpkin together have a mass of 2 kg.