Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 10 points. You must show your work in a logical fashion starting with the correctly applied physical principles. The equations you need are on the equation sheet. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. Pumpkins dropped from the edge of Butte Hall fall 62.0m to the ground below. The crowd is 10.0m back from the edge of the building. Find the maximum horizontal velocity the pumpkins can have when released so that they can't reach the crowd.

2. A racecar goes completely around the racetrack shown at the right moving at a constant speed of 200km/h the entire way. Indicate in the diagram the direction of the acceleration at each of the labeled points and rank the accelerations from largest to smallest. Explain your thinking.
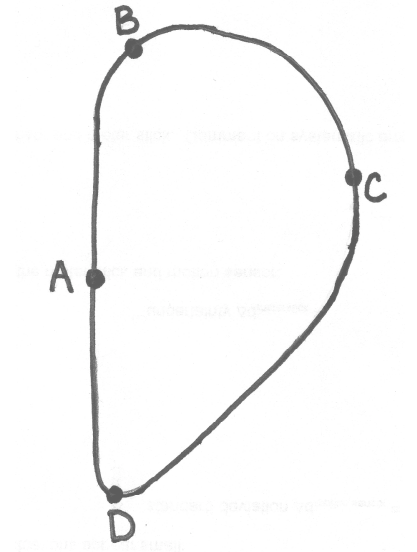
3. The car at the right has a mass of 750kg. The wheels of the car are broken and cannot roll. They will only slide. The coefficient of static friction between the tires and the road is 0.800. Find the tension in the cable needed to move the car.
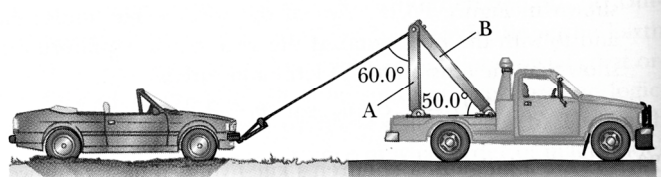
4.   The pogo stick at the right uses a spring (k = 25.0kN/m). At position A the child is at rest while the spring is compressed 10.0cm. At position B, the spring is relaxed and the child is moving upward. At position C the child is at the top of the jump. Find (a)the speed at position B and (b)the height if the jump. The mass of the child and pogo stick is 50.0kg.
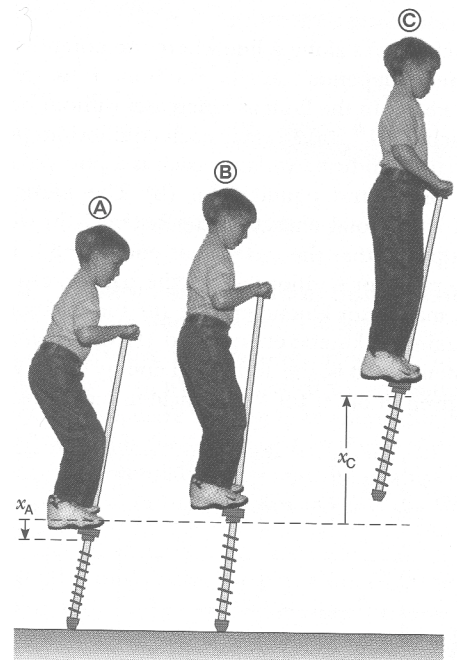
5. Two ice skaters are moving along together at 3.00m/s. The first skater has a weight of 700N. The first skater pushes the second skater forward so she speeds up to 4.00m/s. As a result, the first skater slows to 2.25m/s. Find the weight of the second skater.

6. A frictionless 500g air puck (object A) slides down an incline. In addition, the four objects described in the table below roll down the same incline. Rank from shortest to longest the time for the object to go from the top to the bottom. Explain your reasoning.

Object	Mass	Inner radius	Outer radius	Length
B. Solid Rod	450g	None	3.00cm	12.0cm
C. Hoop	600g	3.00cm	5.00cm	6.00cm
D. Disk	200g	None	5.00cm	10.0cm
E. Ring	300g	10.0cm	10.0cm	3.00cm
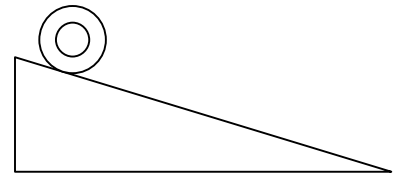
7. A 9.00m - 1500kg tree is cut down by a logging company. A machine uses a short cable to lift it by one end until it is in the position shown at the right. Find the magnitude and show the direction of each force that acts on the log .

160°

40°
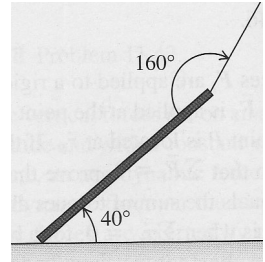
8. The machine in the previous problem continues to lift the log until it is off the ground. It gently swings back and forth pivoted at the end of the cable. Find the period of oscillation.

9. The following is a quote from a periodical I read over the summer, "It is a bit bigger than Pluto, an astounding 14.5 billion kilometers from the sun, and the most distant object ever seen in the solar system. Last week's discovery of a "10th planet"…." Find the time for this "new planet" to orbit the sun.

10. Legend has it that Archimedes was asked by the king to determine whether his crown was made of solid gold without damaging the crown in any way. Archimedes knew that the density of gold was $19.3 \times 10^3 \, kg/m^3$. So he weighted the crown in air and got 7.84N. He then weighted the crown in water and got 6.84N. Figure out what Archimedes told the king.