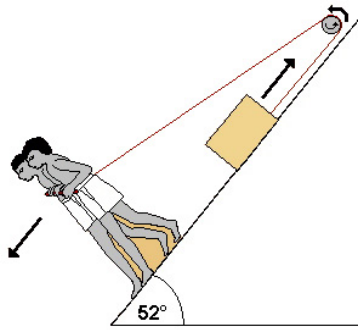
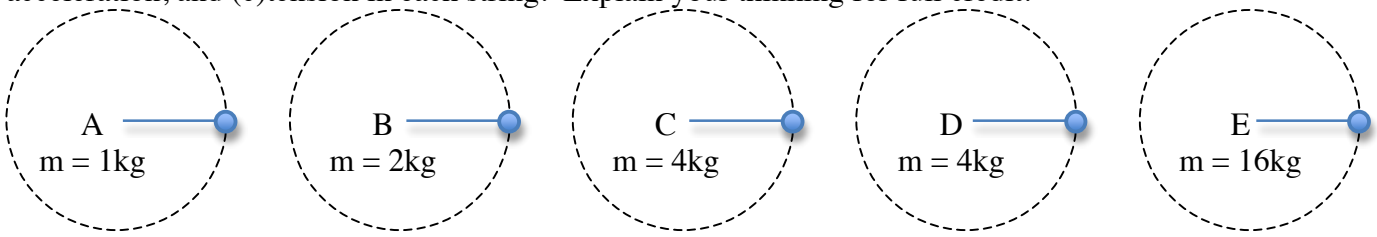
Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied and clearly stated 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.

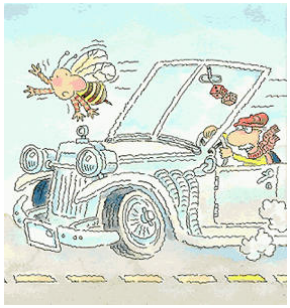
1. Who knows if this is how the pyramids were really built? Let's suppose it was. A 500kg block is pulled up the incline at a slow but constant speed by a rope with a tension of 4500N. (a)Find the acceleration of the block and (b)the coefficient of kinetic friction between the block and the ramp.



2. Below are depictions of five balls on the ends of light strings spinning in circles at identical constant speeds. The systems are out in empty space. The speed is large enough to keep the balls in circular motion. The strings are all the same length, but the masses of the balls are different as indicated. Rank these situations from greatest to least based upon the (a)centripetal acceleration, (b)tangential acceleration, and (c)tension in each string. Explain your thinking for full credit.



3. A bug flying northward at 8.00m/s collides with the windshield of a car traveling southward at 20.0m/s. Answer the following questions. For full credit, you must explain your thinking. Be sure to cite any relevant principles of physics. Which object, the bug or the car (a)feels the greater force during the collision? (b)has the greater acceleration during the collision? (c)feels the greater impulse on it during the collision? (d)has the greater change in momentum during the collision? (e)has the greater momentum after the collision?



4. A 60.0kg bungee jumper steps off a 55.0m high bridge. The unstretched length of the cord is 30.0m and it stretches an additional 20.0m when the jumper is at the lowest point. Find the spring constant of the cord assuming both air resistance and the mass of the cord can be neglected.

5. A nickel (m = 5.00g) slides along a smooth counter at 3.00m/s and collides head-on with a quarter (m = 5.67g) originally at rest. The speed of the quarter just after the collision is 2.75m/s. (a)Find the speed of the nickel just after the collision and (b)determine if the collision is elastic.