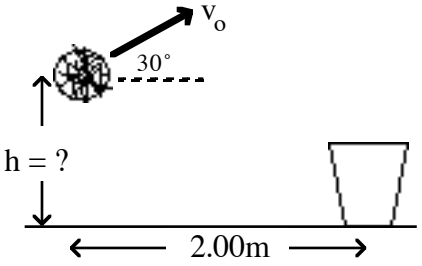
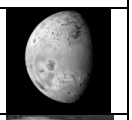
Name:_____

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.

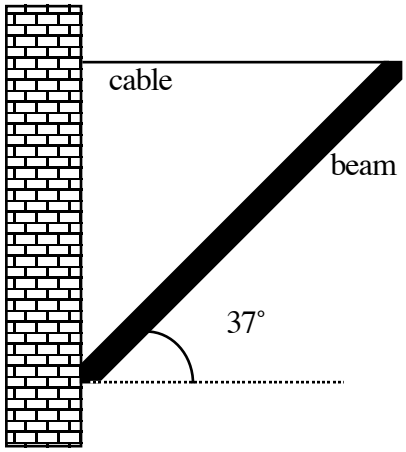
1. A wad of paper is tossed into a wastebasket 2.00m away. It is released with an initial speed of 4.00m/s at an angle of 30.0°. Assume that it lands in the center of the bottom and that air resistance is negligible. Find (a)the time the wad is in the air and (b)the height from which it was released.



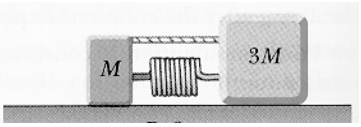
2. Below is a table of some data about four moons of Jupiter discovered by Galileo. Rank these moons in order of the magnitude of their acceleration. That is, rank first the one with the highest acceleration and rank last the one with the smallest acceleration. Explain your reasoning.

Moon	Orbital Radius ($x10^6$m)	Orbital Speed ($x10^3$m/s)	
Io	422	17.3	
Callisto	1883	8.20	
Ganymede	1070	10.9	
Europa	671	13.7	

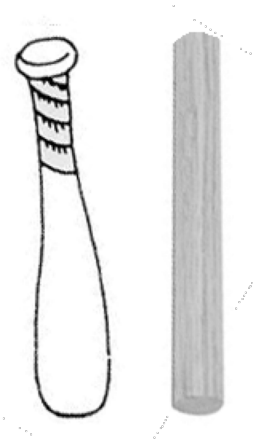
3. A 5.00kg beam 2.00m long is hinged at one end and held at a 37° angle above the horizontal by a horizontal cable. Find the tension in the cable and the horizontal and vertical components of the force that the hinge exerts on the beam.



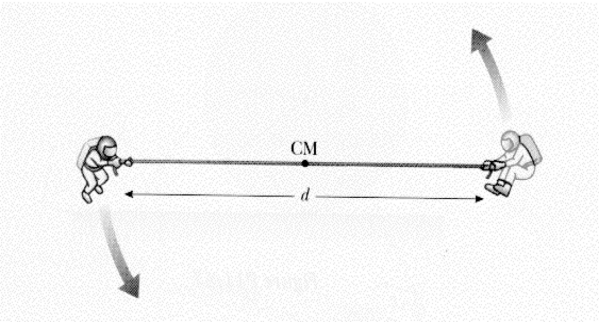
4. Two blocks of masses 100g and 300g are placed on a horizontal, frictionless surface. A light spring of spring constant 8.00N/m is attached to one of them and the blocks as pushed together compressing the spring 5.00cm. A cord initially holding the blocks together is burned. Find the speed of the blocks assuming the energy stored in the spring is completely transferred to the blocks motion.



5. A baseball bat and a uniform stick of wood both have the same mass and length. Explain which one has the higher rotational inertia about the top end shown in the sketch at the right.



6. Two astronauts each have a mass of 75.0kg are connected by a 10.0m long rope of negligible mass. They are isolated in space and orbit their center of mass with a speed of 5.00m/s. They then begin to work their way toward each other along the rope until they are only 5.00m apart. Find (a)their combined angular momentum about their CM initially and (b)their combined kinetic energy initially. (c)Explain which should stay constant as they decrease their separation and why. Find (d)their combined angular momentum about their CM afterward and (e)their combined kinetic energy afterward.



7. A bowling ball rolls along a flat surface at 5.00m/s when it comes to a ramp. Find the minimum height of the ramp needed to stop the bowling ball.

8. Use the data from problem 2 to find the mass of Jupiter.

9. A fisherman hangs his trophy catch of mass 65.0kg from a spring that is stretched 12.0cm when it comes to rest. Find (a)the spring constant of the spring and (b)the frequency of the oscillations in the spring before it came to rest.

10. At the right is a picture of a levee before a flood. During flood conditions the water rises. Levees tend to give out at the bottom instead of the top. Explain this in terms of the principles of physics.