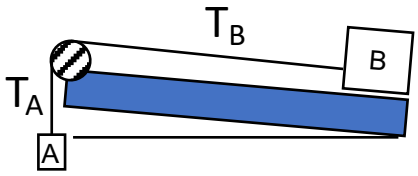
You will be graded on your *COMMUNICATION* of physics understanding

#1 This question proved to be difficult. You devise a way to lift a large block (B) on low friction wheels, up a 4 m incline, increasing height by 50 cm. The string is run over a pulley wheel (The wheel has *considerable mass)* that turns freely on its axel with the rope stretched over it. That is, the rope does not slip over the wheel's surface. I release the system from rest and it moves until one of the masses hits the pulley wheel.



a) Assume we allow this low friction system to go from rest. Knowing what we do about the measurements of the system and the masses of blocks A and B, how would we determine which way it would accelerate Explain briefly and clearly.

b) Let's say that mass A falls and block B slides up, how does T_A compare to the force of gravity on A, *AND*..

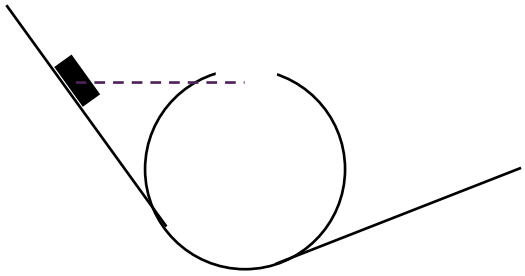
c) How does T_A compare to T_B? Briefly and clearly explain how you know this to be true.

d) You need to calculate everything about the system: the final speed when B hits the pulley wheel, the acceleration of block B, the angular acceleration of the wheel, and T_A. Explain how you would go about this. Be brief but clear, and a diagram is always good.

#2 You step onto the edge of a spinning carousel at the park. Your mass is 50 kg, and the carousel is a flat uniform disk of mass 100 kg and radius 2 m. The carousel is initially rotating at a rate of 1 revolution per second.

a) What is the final rotation rate after I step onto the carousel and hold on?
b) Was kinetic energy conserved in this process? If not, where did it come from/go?
c) Then you walk into the very center of the carousel and stand twirling in the middle. What is the final rotation rate? You may need to make some estimations here.
d) Was kinetic energy conserved as you walked into the center? If not, where did it come from/go?

#3 You are standing in a waiting line for a (radius = 10 m) loop-de-loop carnival ride and you are somewhat concerned when the top chunk of the track drops off. The line thins rapidly and it is your turn to go on the ride. Your 100 kg friend says that there's no problem: He's going to request that they start the cart from the same height as the top of the track so that the cart will clear the track.



a) Is your friend's idea correct? Please explain clearly. What will happen if he goes on the ride as described.

b) Your friend goes on the ride while sitting on a scale. What does the scale read at the very bottom of the loop?

#4 Two identical planets, planet A and planet B orbit two different suns. However, planet B is *twice* as far from the sun as planet A, and the mass of B's sun is *half* the mass as the sun that planet A orbits. ***You must explain your answers to receive credit.***

a) How do the planets' attractions to the sun compare? F_B = __F_A.
b) How do the accelerations of two planets compare? a_B = __a_A.
c) How do the speeds of the two planets compare? v_B = __v_A.
d) What difference (if any) would there be if the masses of the planets were not the same? Explain.
e) We assumed that the $m_{planet} << m_{sun}$. Would it be different if the mass of the planets were *not* much less than that of the suns? Explain.

Name _____