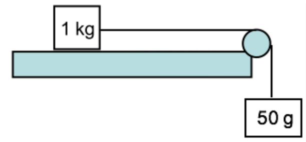
Letting the cart drop in class.
Hi everybody,
I apologize for moving through the calculations so quickly in class today. I'm writing now so you can repeat the calculations to make sure you understand everything.



If I let the system go from rest, please find the resulting acceleration. Please use the energy lens as indicated in the video for today's class… If you don't know where to start, let the system move 1 m.

Then calculate the angle necessary for a single frictionless mass to have the same acceleration.

If you let this fall 1 m, please observe that you can conserve energy and see that the potential energy of the falling mass is converted to the kinetic energy *of both masses (the* *system mass)* of mass 1.05 kg. Make sure you can do this with your calculator and get 0.976 m/s. I estimated this to be 1 m/s. Knowing this falls 1 m, I can calculate the average speed and the time it takes to fall. Then I calculate a fall time of 2.05 s and an acceleration of 0.48 m/s^2. This I approximated to be about *g* divided by 20. You'll be able to show that the actual acceleration is *g* divided by 21 after you see the videos tonight by solving this as a system dynamics problem. Please try it.

The second half of this was to show that I needed to put 7.5 cm under one of the legs 150 cm apart in order to get the same acceleration. This is a straight dynamics inclined plane problem. Please use the inclined plane and show that if the acceleration is *g* divided by 21, then the parallel component of the force is 1/21 the force of gravity. This means that the sine of the angle of inclination is 1/21. You could find the actual angle of ~ 2.73 degrees if you like, but you don't have to. You know that the length of track is 150 cm between the supports, so you would need to raise the track by 150 cm/21 to get the same angle, and the same acceleration of *g*/21.

After some thought, I realize that a much easier way to create the same acceleration with an inclined plane is to use the energy lens. Using conservation of energy, you should be able to show that in order to achieve a speed of ~ 1m/s, an object needs to fall 5 cm. That means we just need to raise the track 5 cm for 1 meter of length. Because the supports were 1.5 m apart, we have to raise one of them 7.5 cm. I find this way easier than the dynamics route. How about you?

Again, I apologize for buzzing through this in class so quickly. I hope that you'll be able to review the calculations.

Thanks
Pete