Newton's Second Law of Motion: Problem 12-012 from the Handouts

12.12 The two blocks shown are originally at rest. Neglecting the masses of the pulleys and the effect of friction in the pulleys and assuming that the coefficients of friction between block A and the horizontal surface are $\mu_s = 0.25$ and $\mu_k = 0.20$, determine (a) the acceleration of each block, (b) the tension in the cable.
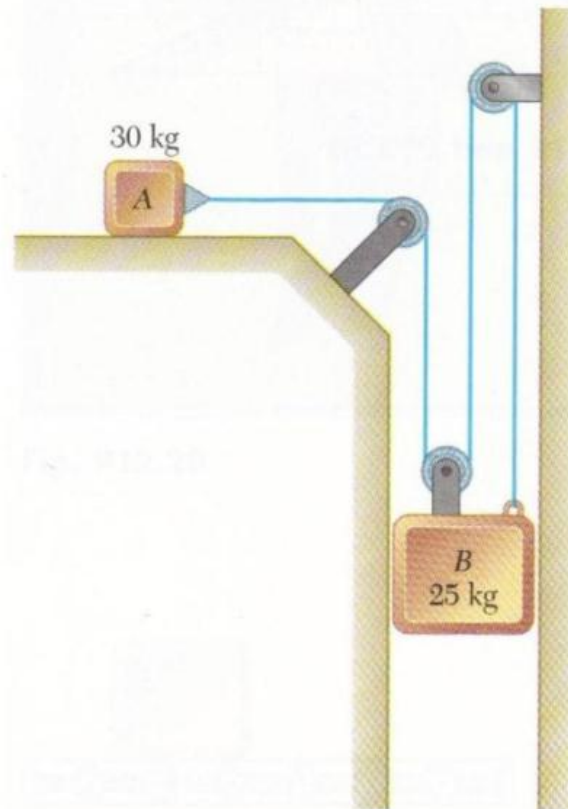
Open Working Model. Use the Rectangle Tool to create a platform for the 30-kg block to rest on. Use the Anchor Tool to anchor the platform in place. Create a square block using the Square Tool. Change the mass and friction coefficients of the square by using the Properties Window. Also change the coefficients of friction of the platform rectangle to match the values of the square block using the Properties Window.
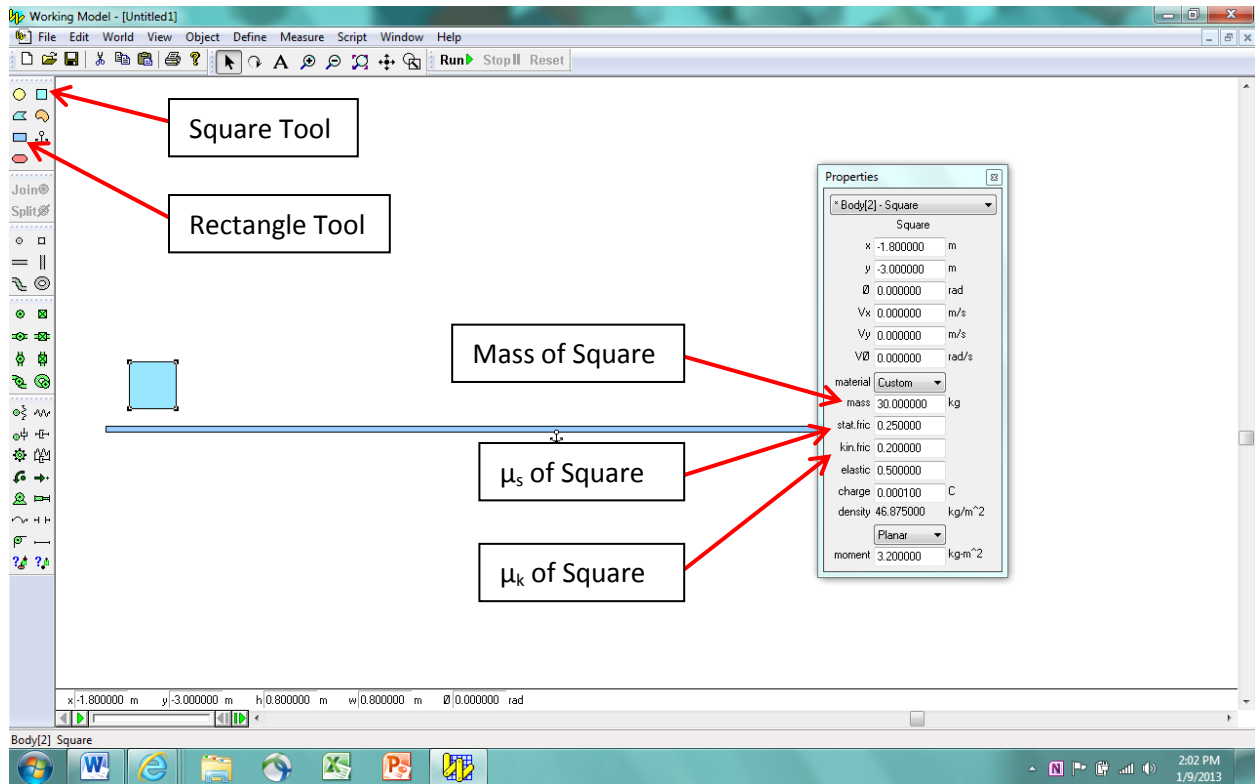
Run the simulation and watch the square drop onto the platform. Stop the simulation using the Stop Button. Go to the World Tab and select Start Here. This makes sure that the square is in direct contact with the platform.
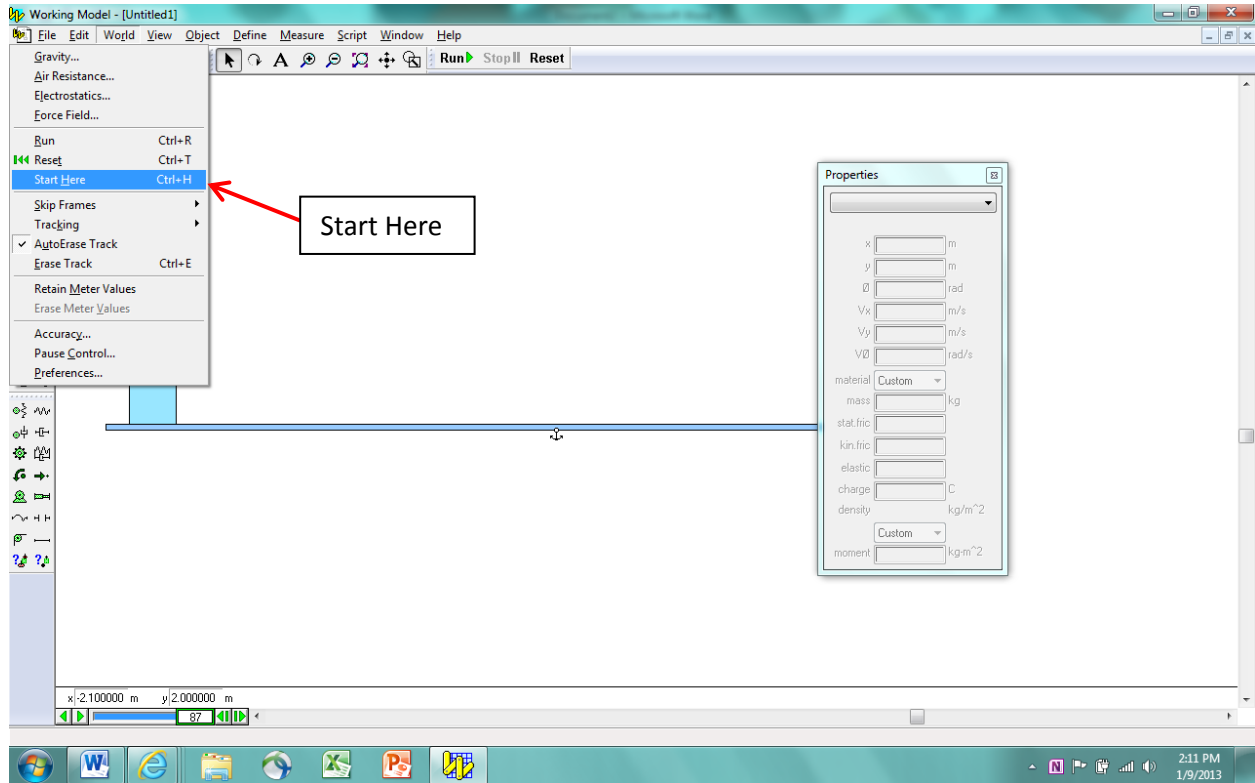
Place a square on the panel, and change its mass to 25 kg. Place a Vertical Keyed Slot Joint onto the new square. This will make sure the square tracks straight down and will not rotate within the slot.
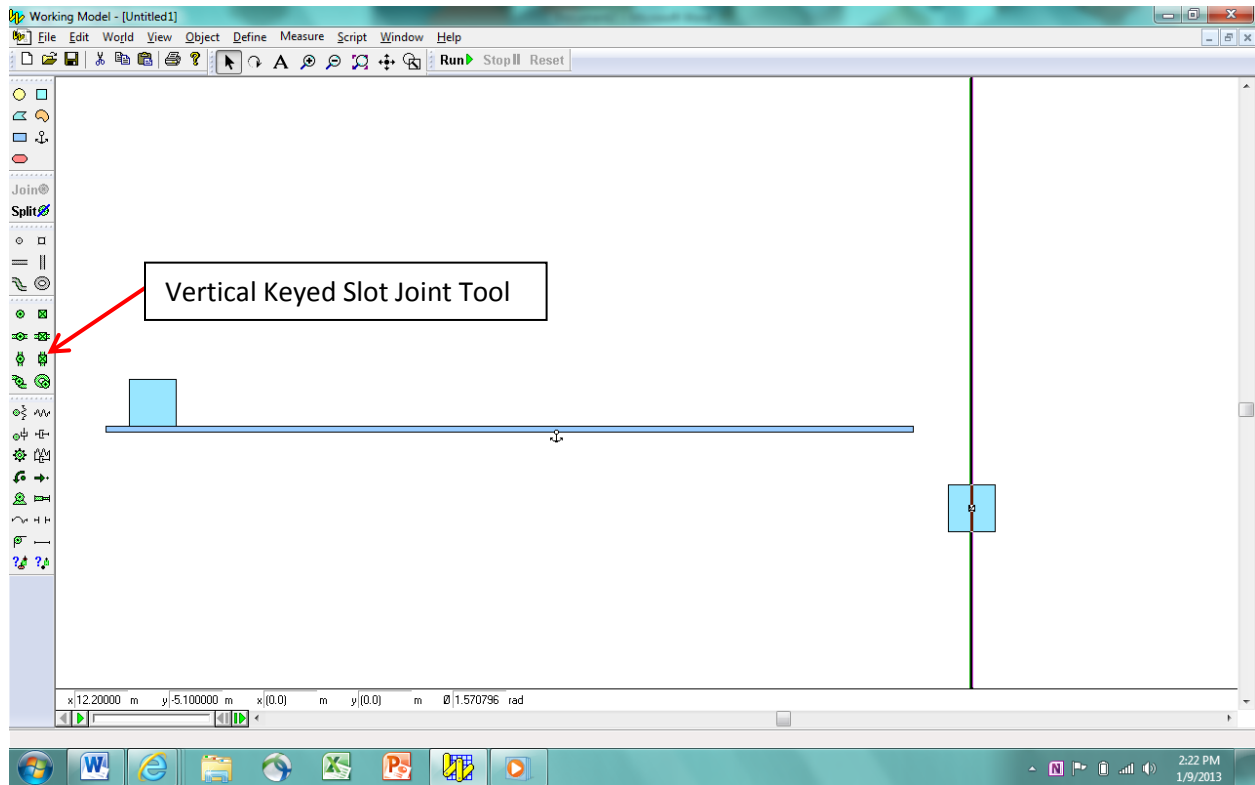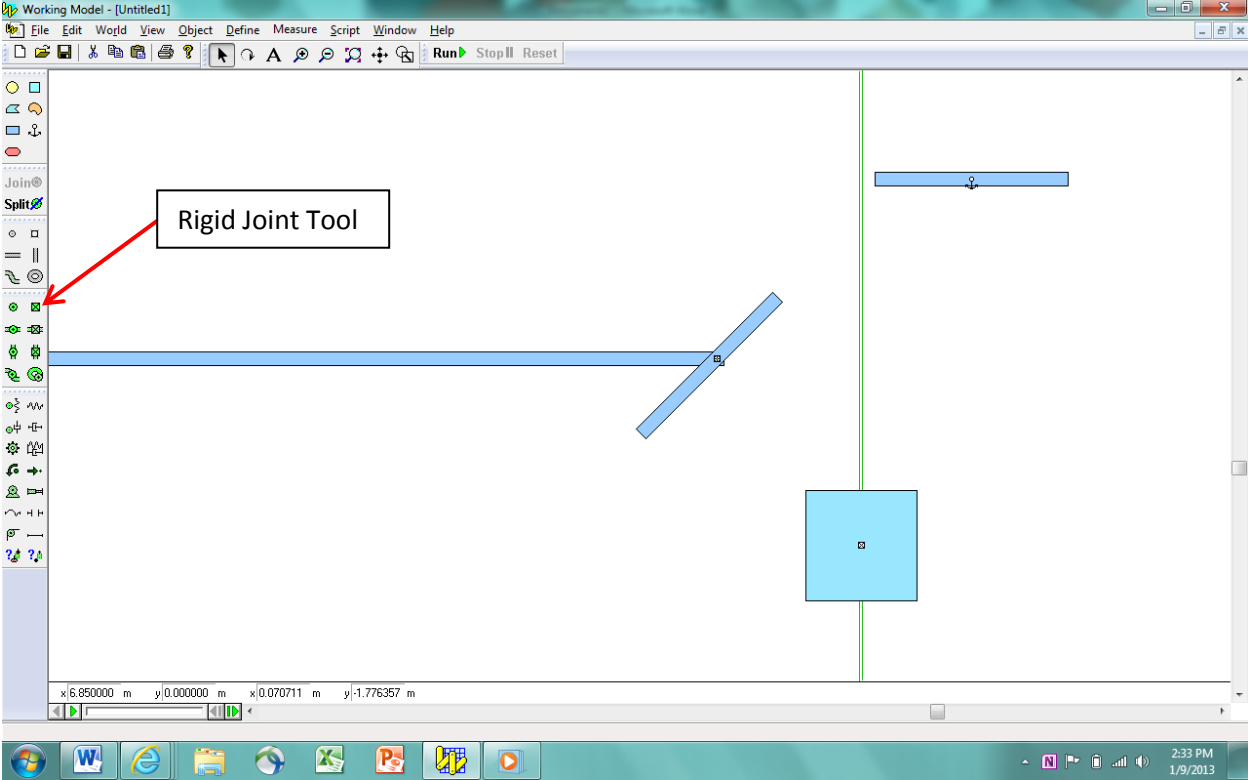
Place a small rectangle as shown below and anchor it in place. Copy and paste this rectangle. Use the View Tab/Number-and-Units/SI-Degrees to change the angle units.
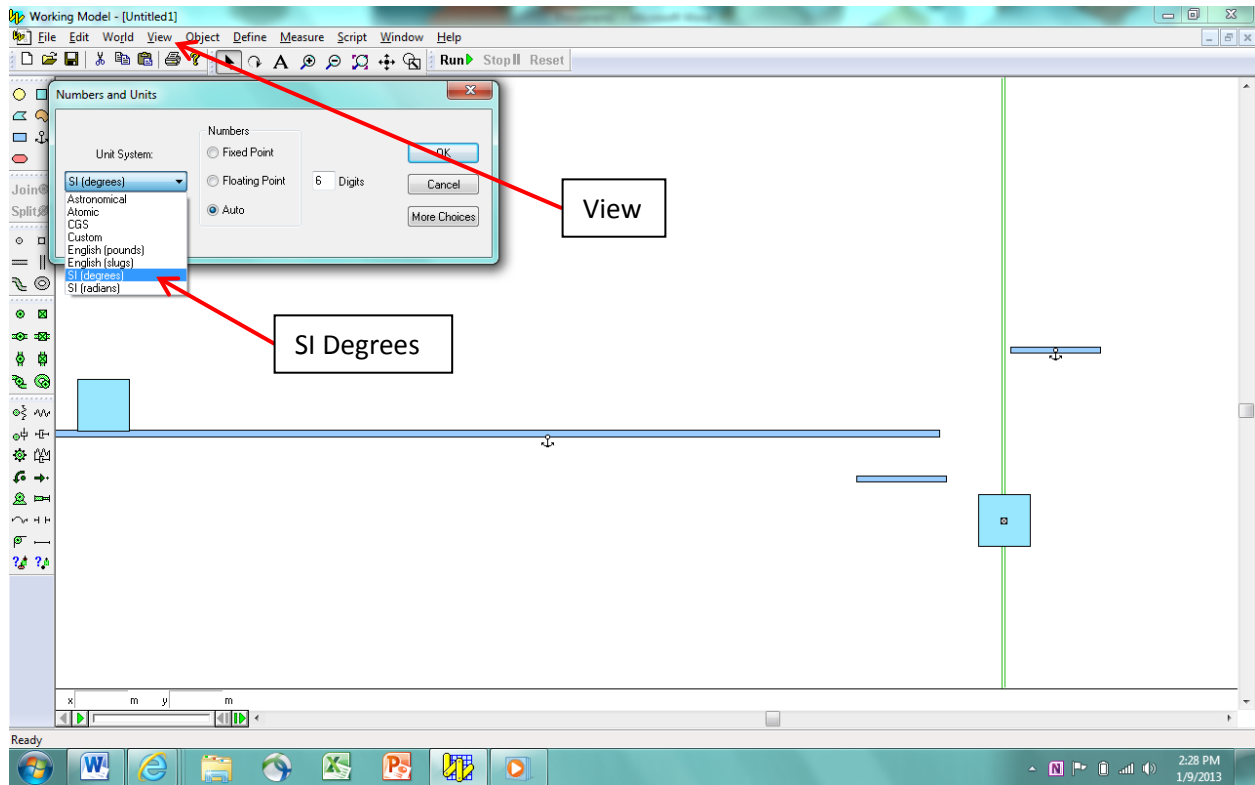
Click on the new rectangle and type in an angle of 45 degrees in the angle box.
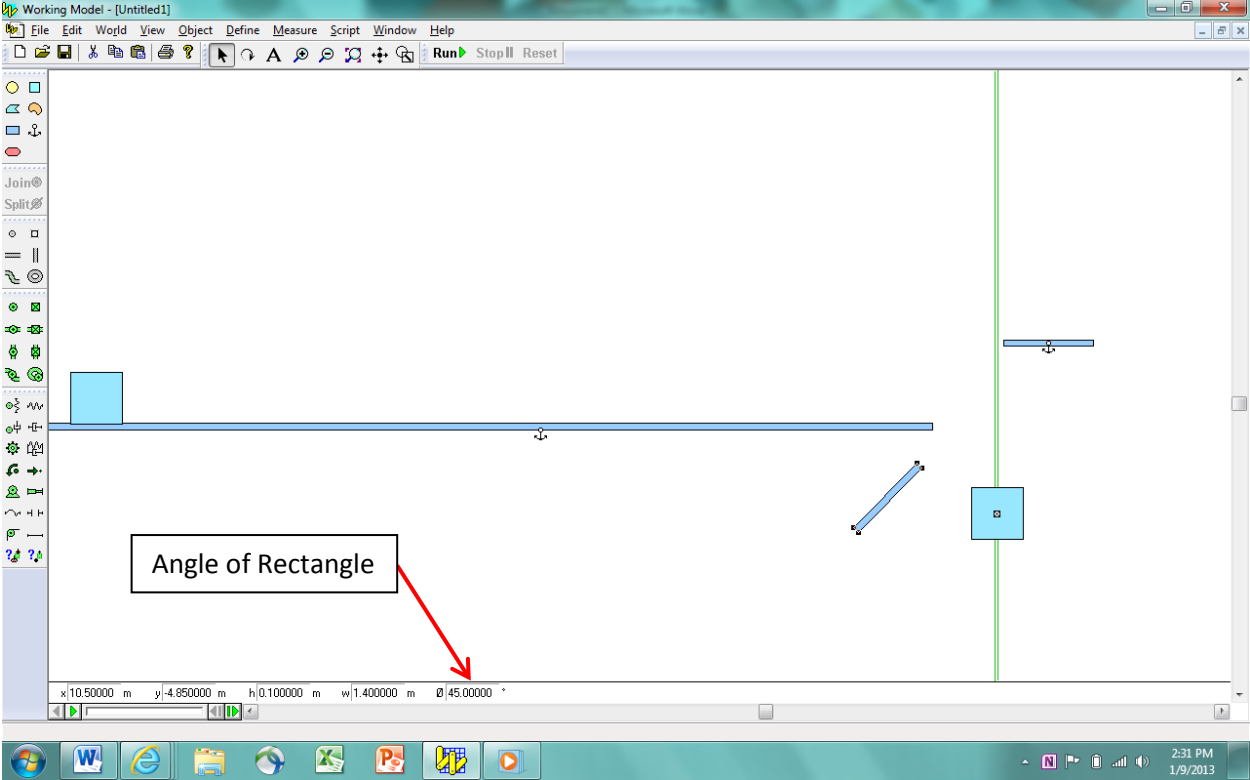
Attach the angled rectangle to the platform using the Rigid Joint Tool.


Rigid Joint Tool

I moved the first block and platform nearer to the keyed slot by highlighting all of them and moving them with the Arrow Tool. Use the Pulley Tool to string the blocks together. Double-click on the last point to finish the pulley.
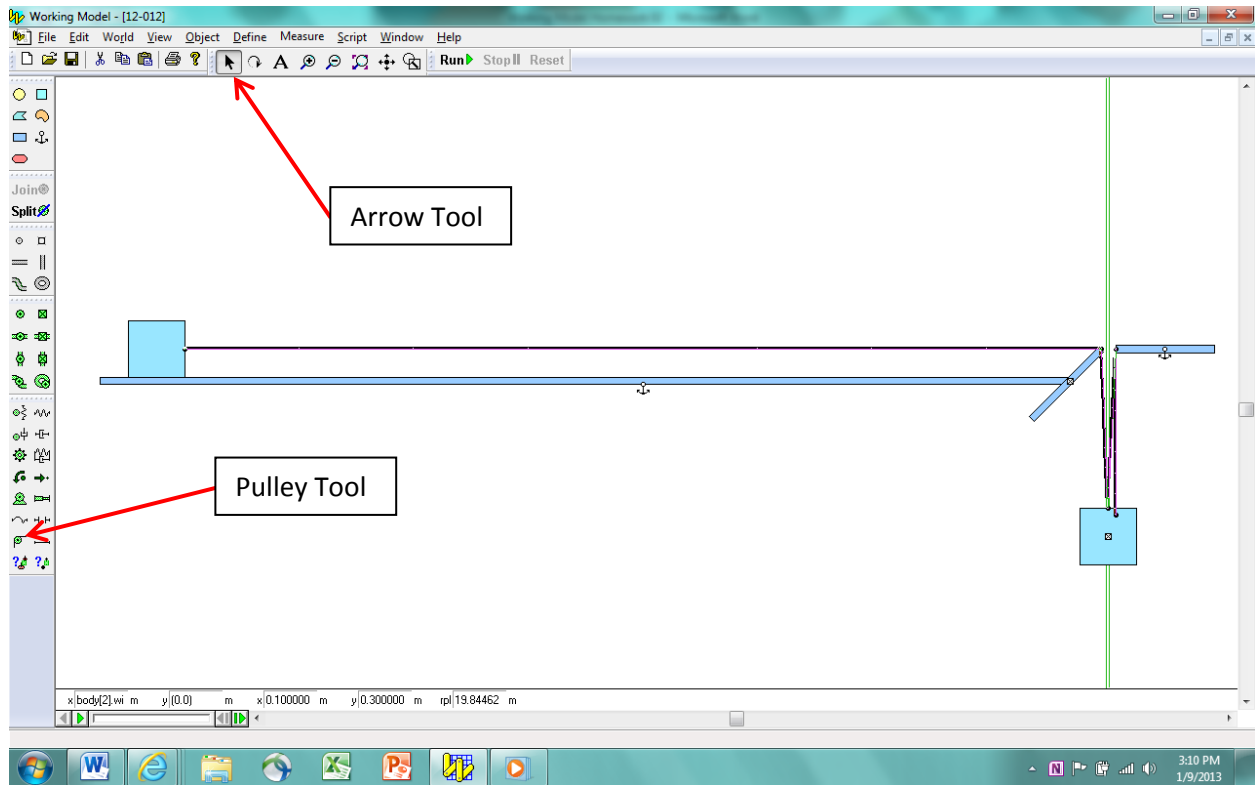
Place graphs for the x-direction acceleration of the first block and the y-direction acceleration of the second block onto the panel. Measure the tension in the rope by clicking on the rope, go to the Measure Tab and select Tension.
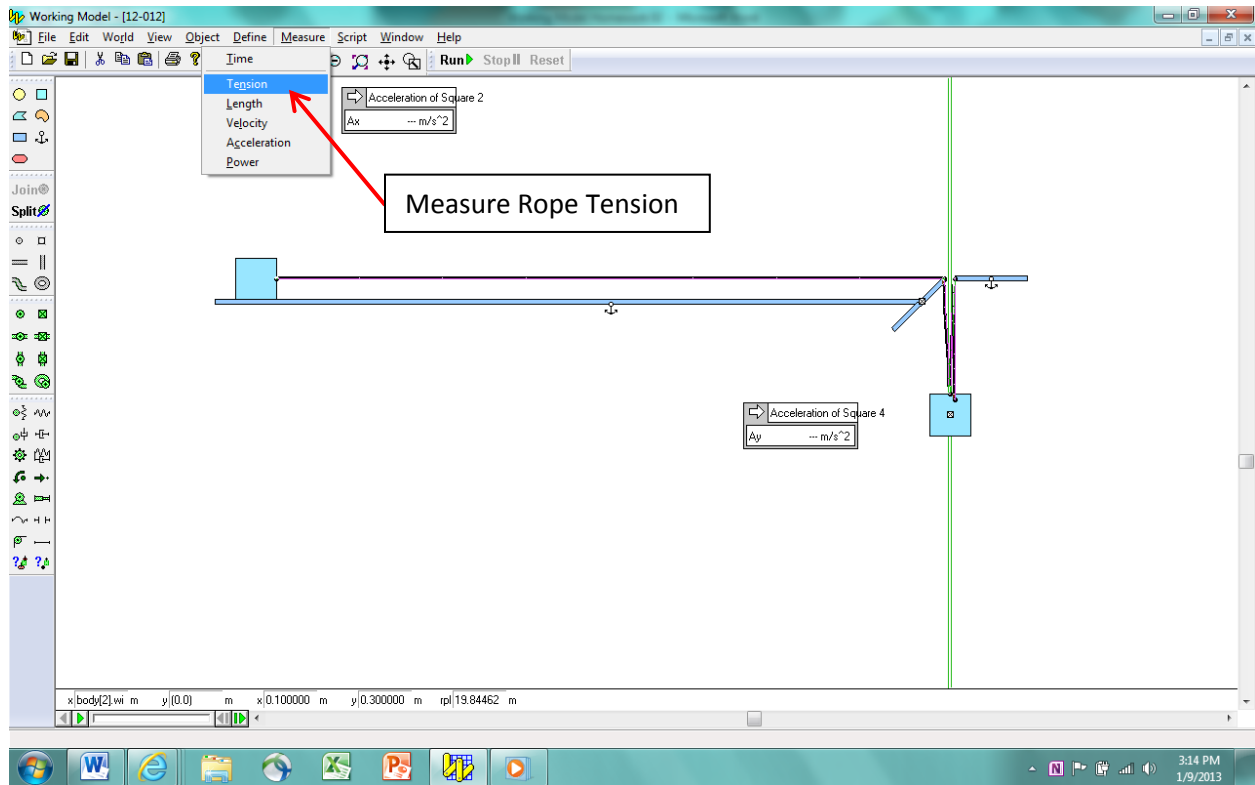
Run the simulation and record the values. If the simulation runs too quickly, go to the World Tab/Accuracy and change the Animation Step to 0.0005 sec.
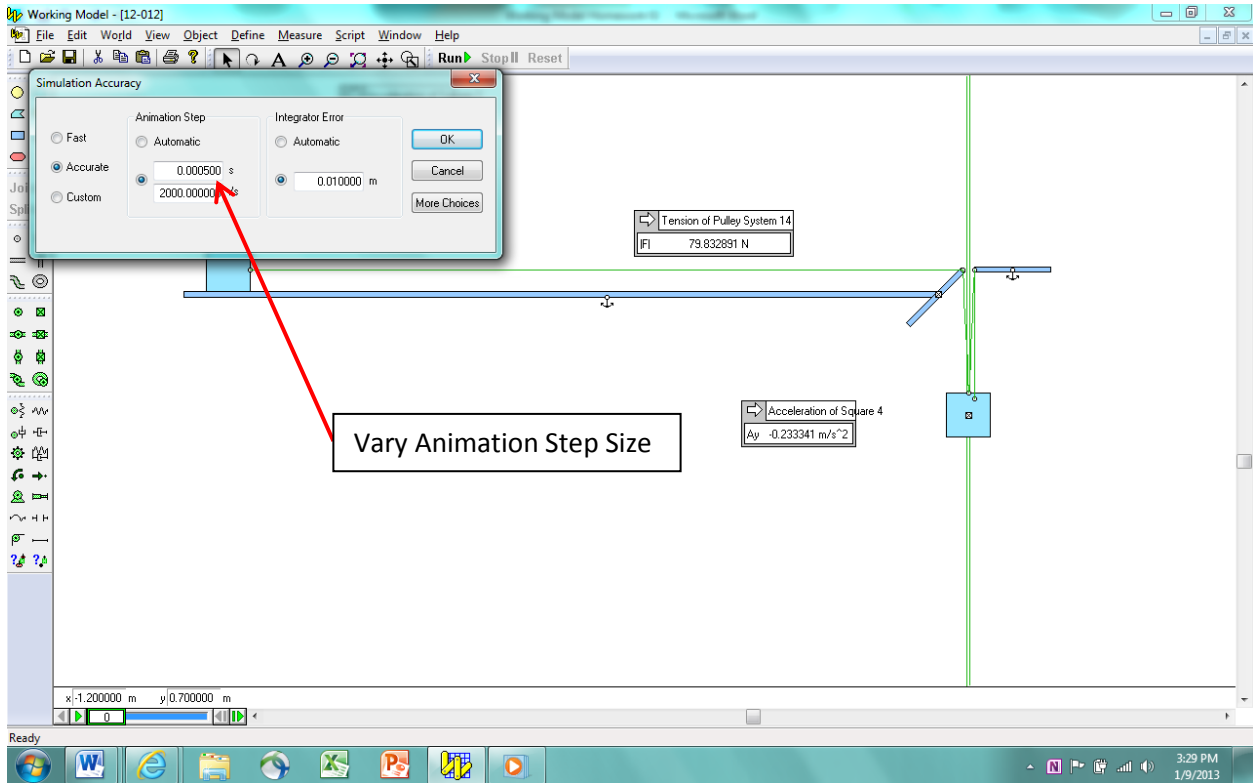
Place your name onto the panel using the Text Tool. Take a screenshot of your simulation and place it in the Dropbox Folder entitled, "myname WM Homework 02". Save your simulation for your records.

Answer: