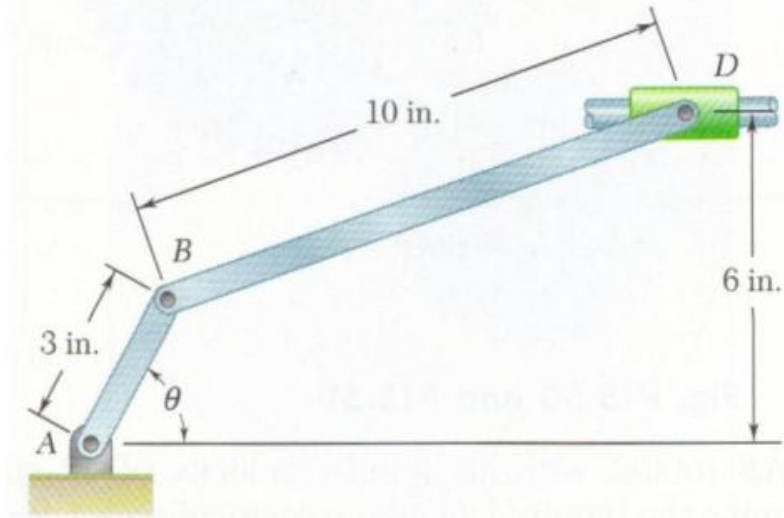


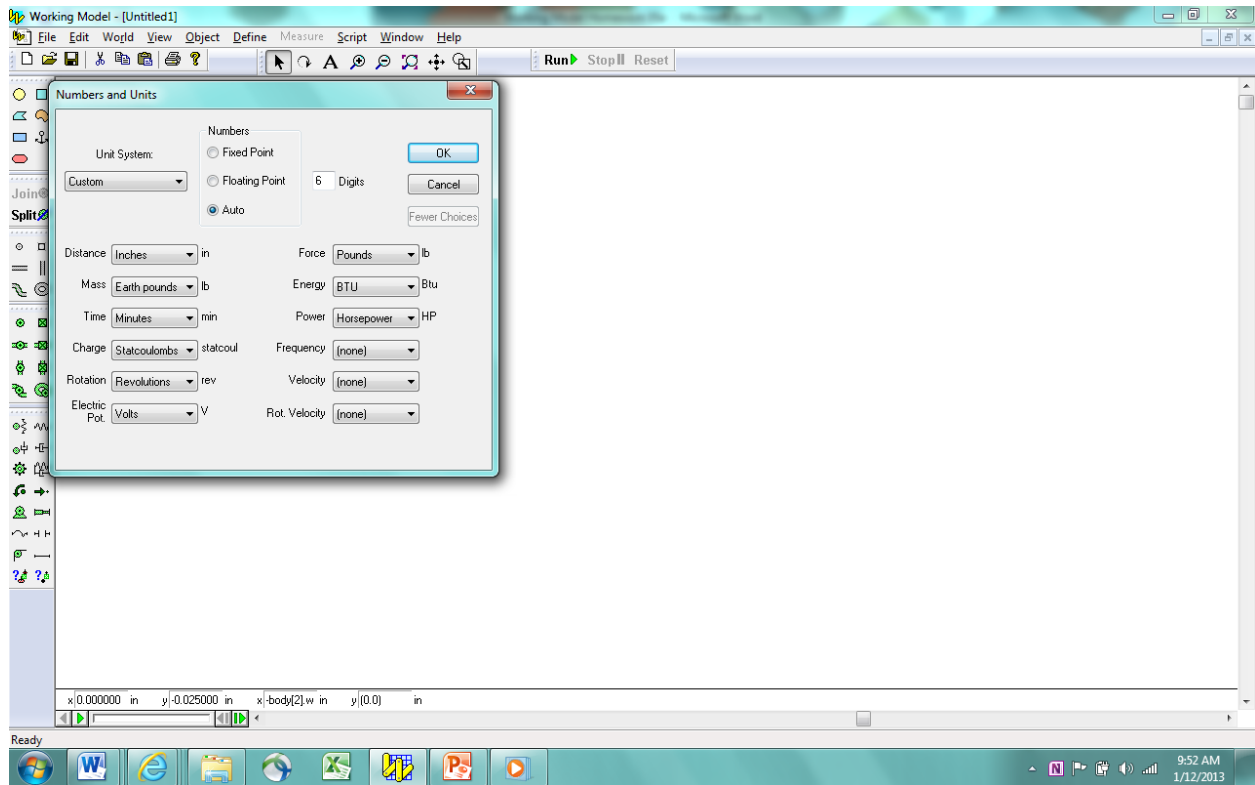
**ME 2210 Dynamics: Working Model Homework 05a**

**Kinematics of Rigid Bodies: Relative Velocity in Planar Motion  
Problem 15-055 from the Handouts**

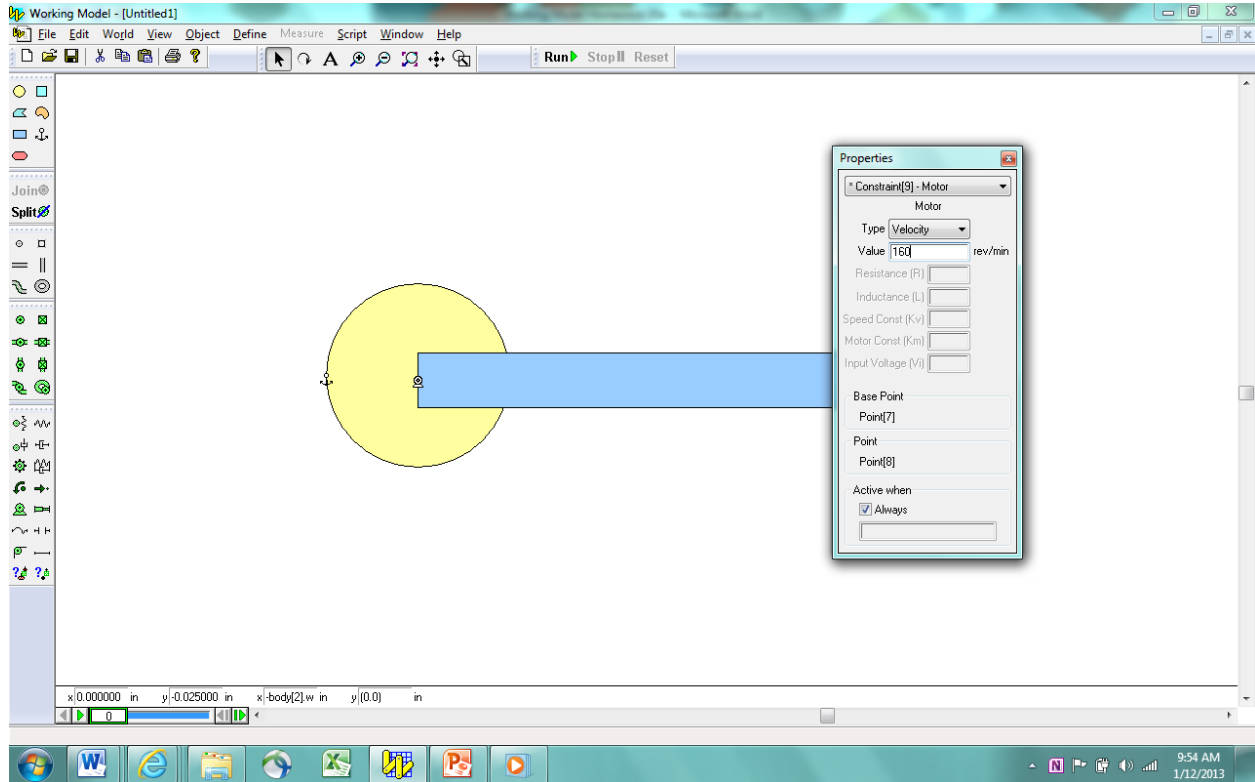
**15.55** Knowing that crank  $AB$  has a constant angular velocity of 160 rpm counterclockwise, determine the angular velocity of rod  $BD$  and the velocity of collar  $D$  when (a)  $\theta = 0$ , (b)  $\theta = 90^\circ$ .



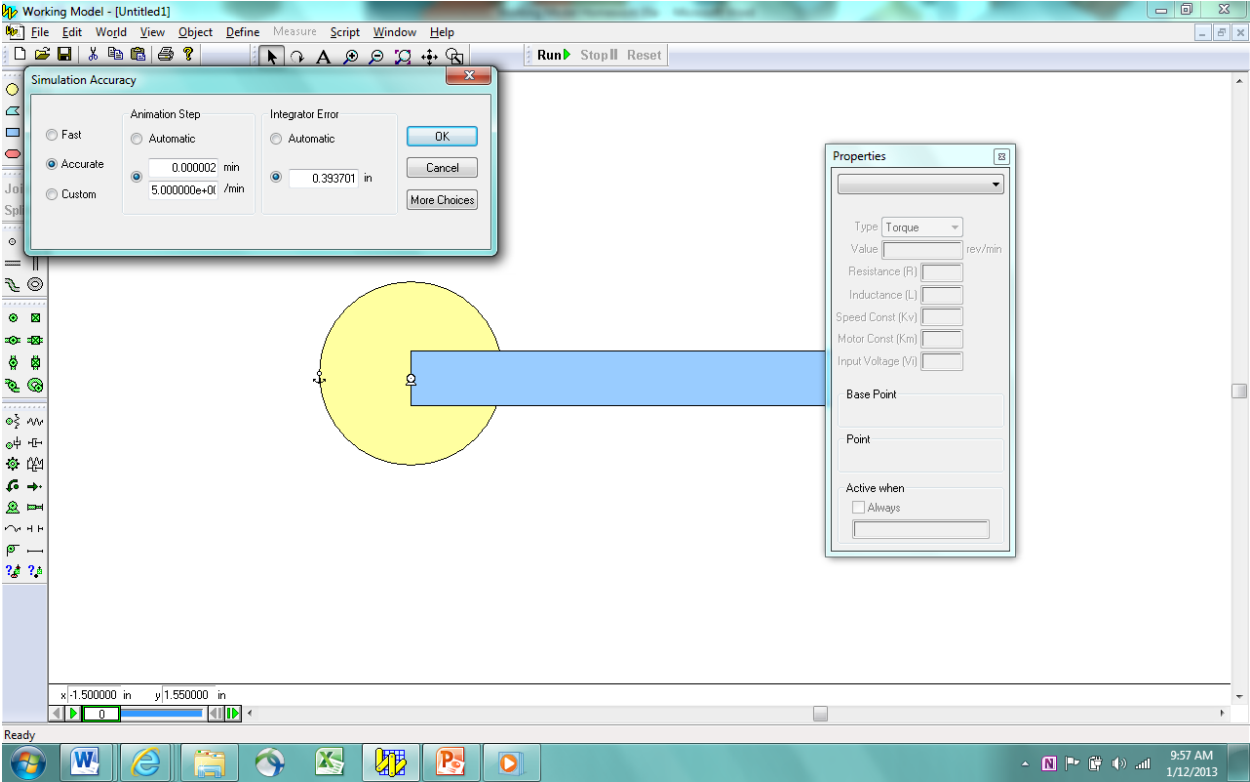
Open Working Model. Change the units to English. Touch the More Choices Button and change the selection for Time to Minutes and Rotation to Revolutions.



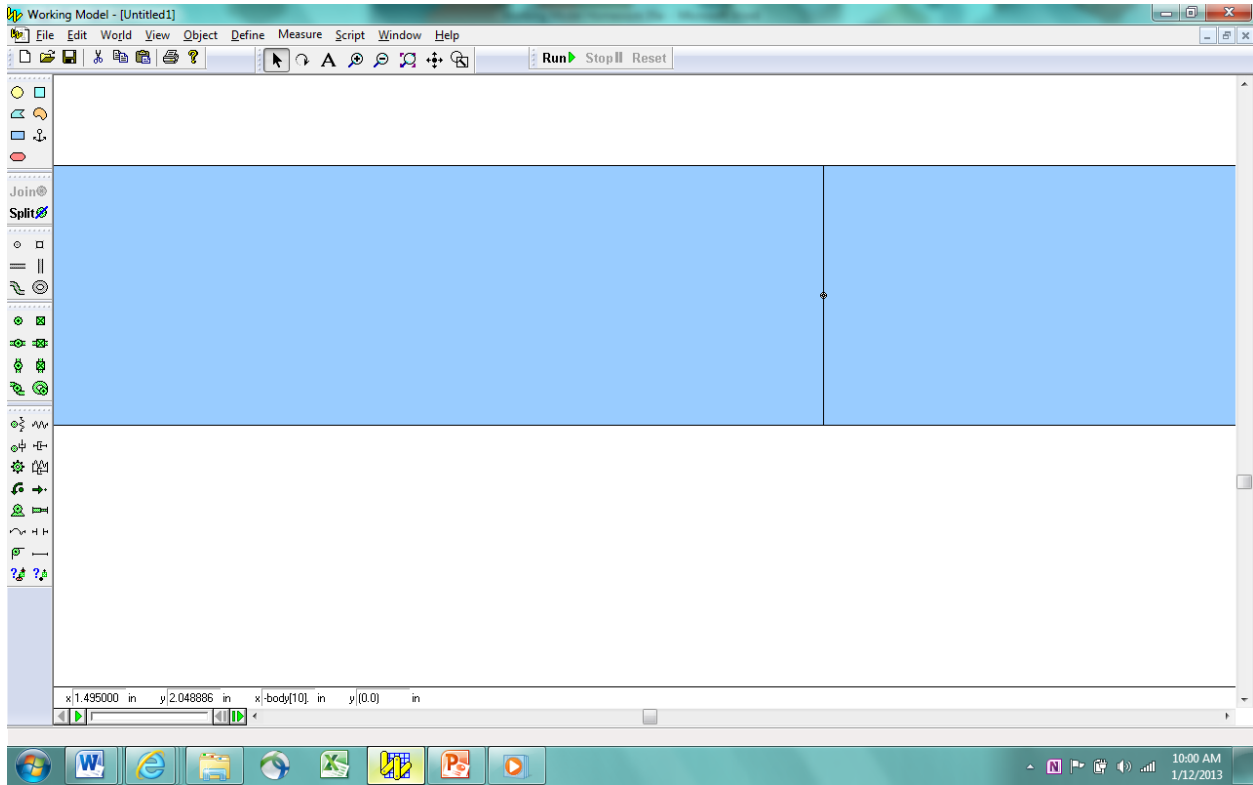
Create a circle at  $x = 0, y = 0$  and anchor it in place. Create a 3-inch long rectangle using the Rectangle Tool. Pin one end of the rectangle to the center of the circle using the Pin Joint Tool. Place a motor on the pin joint using the Motor Tool. Double-click on the motor to bring up the Properties Window. Change the rotational speed to 160 revolutions per minute.



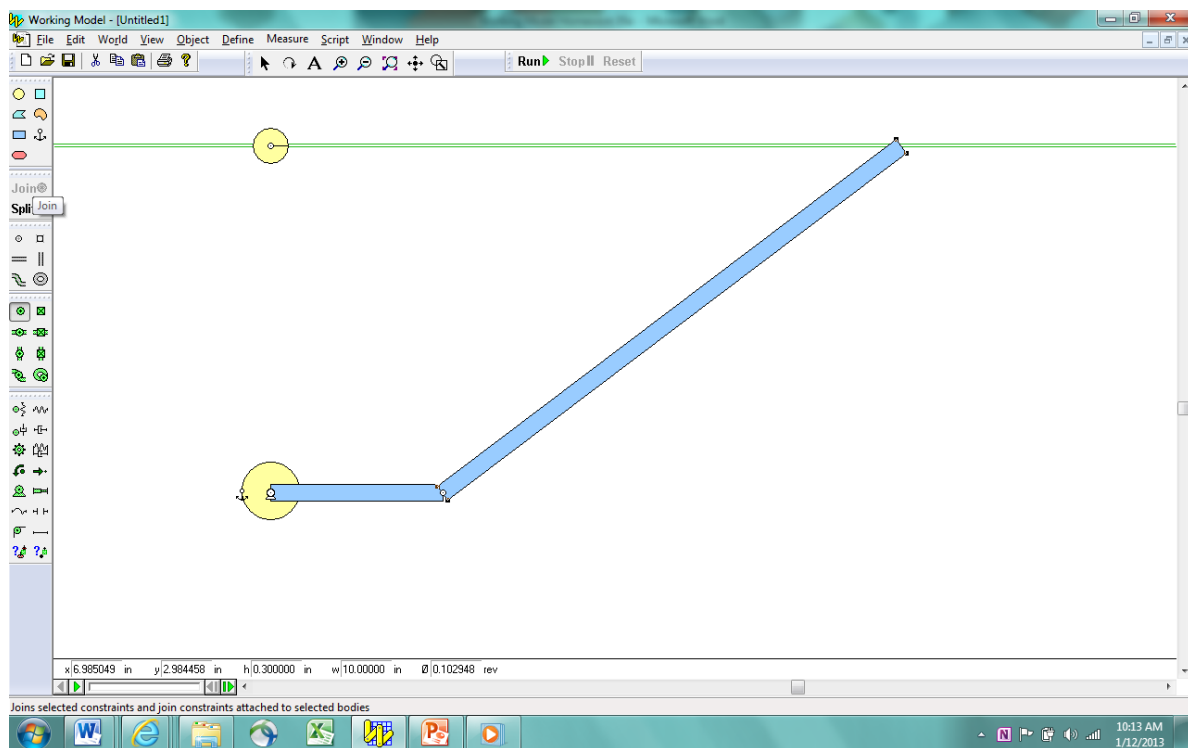
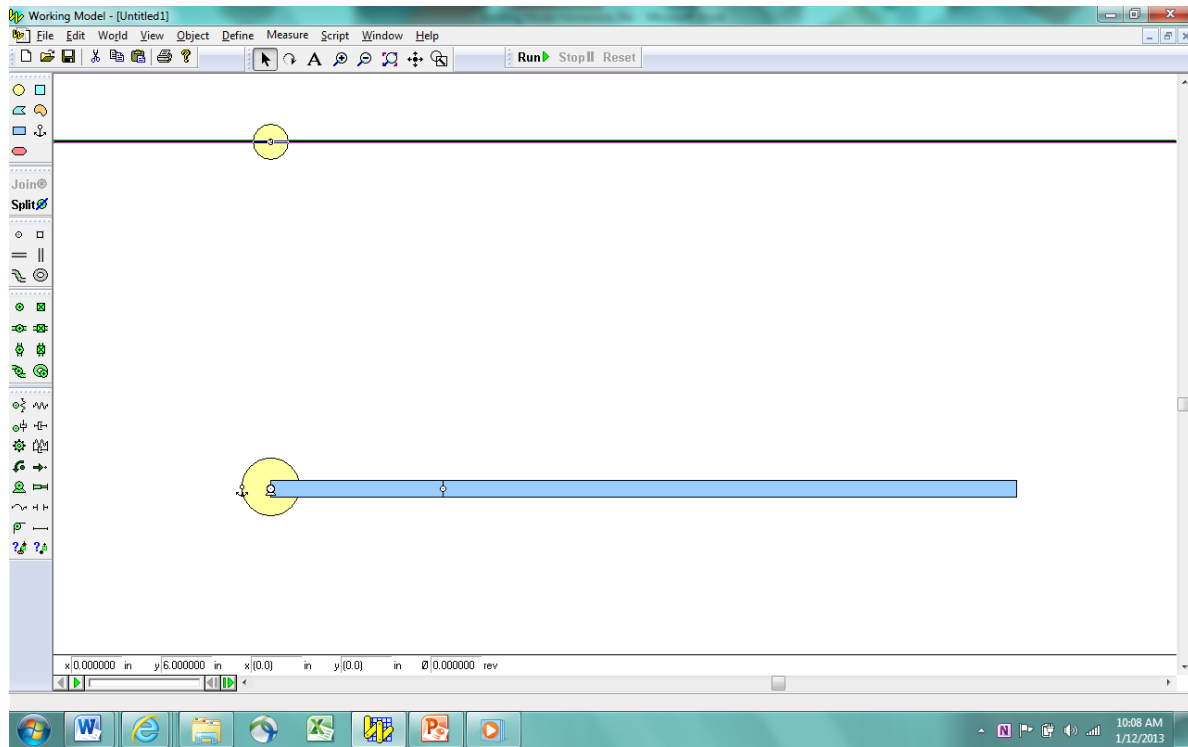
Run the simulation. Slow down the simulation by changing the Animation Step.



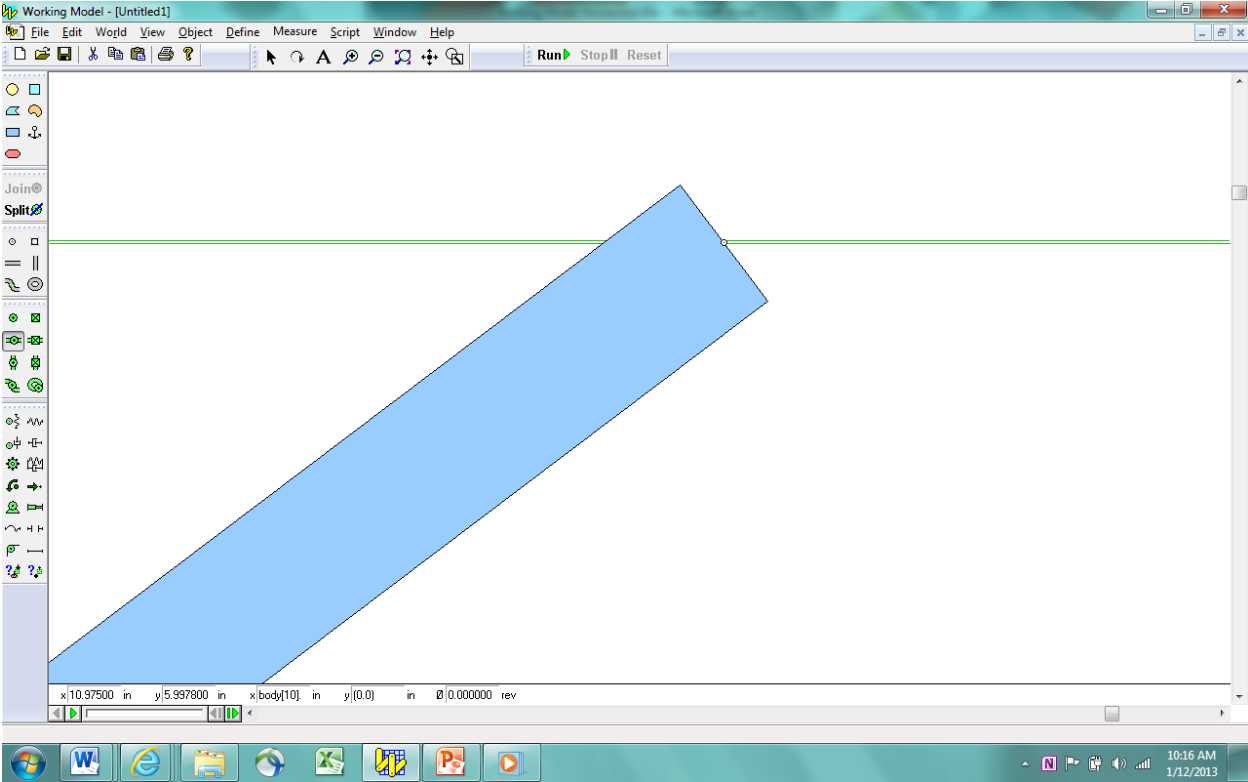
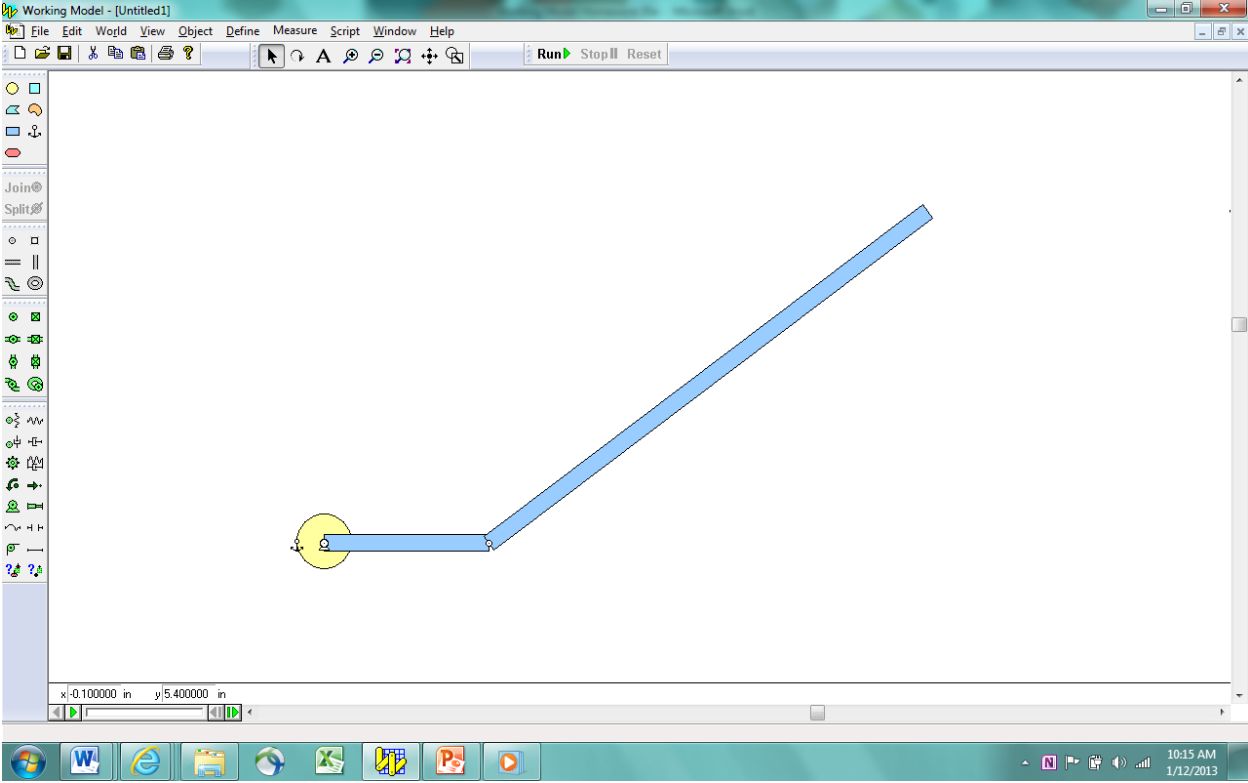
Create the 10-inch-long rectangle. Attach it to the end of the 3-inch-long rectangle using a pin joint.



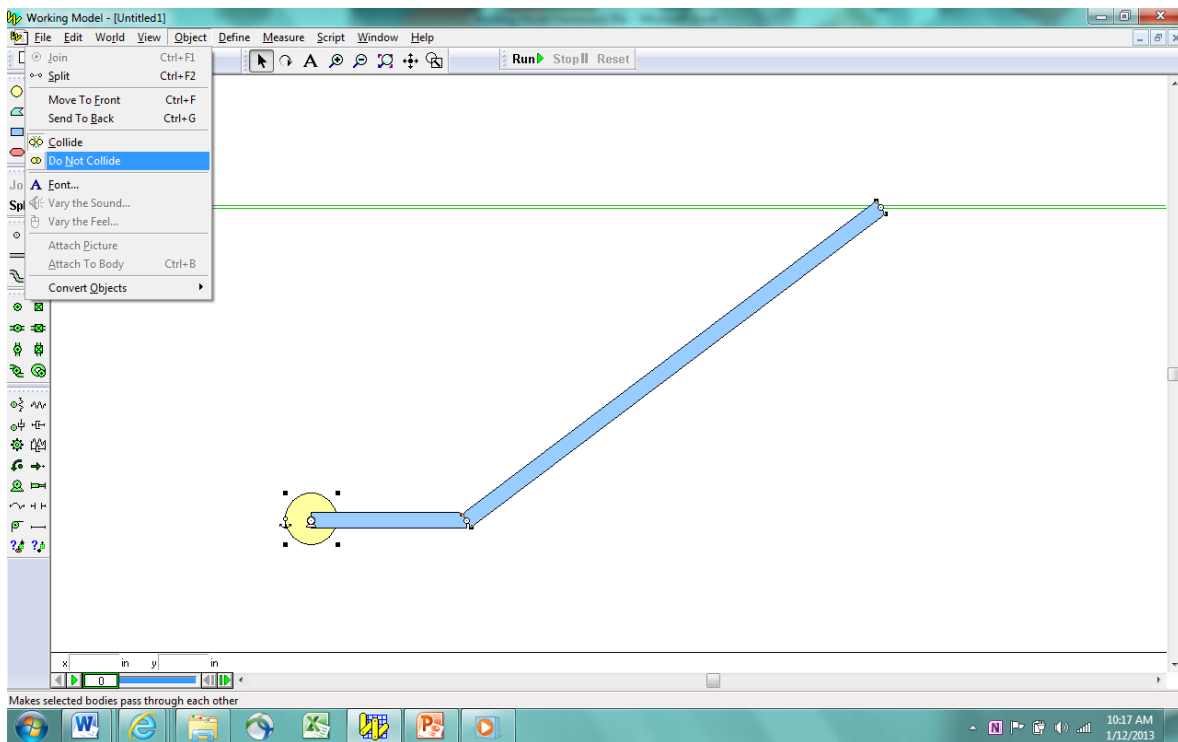
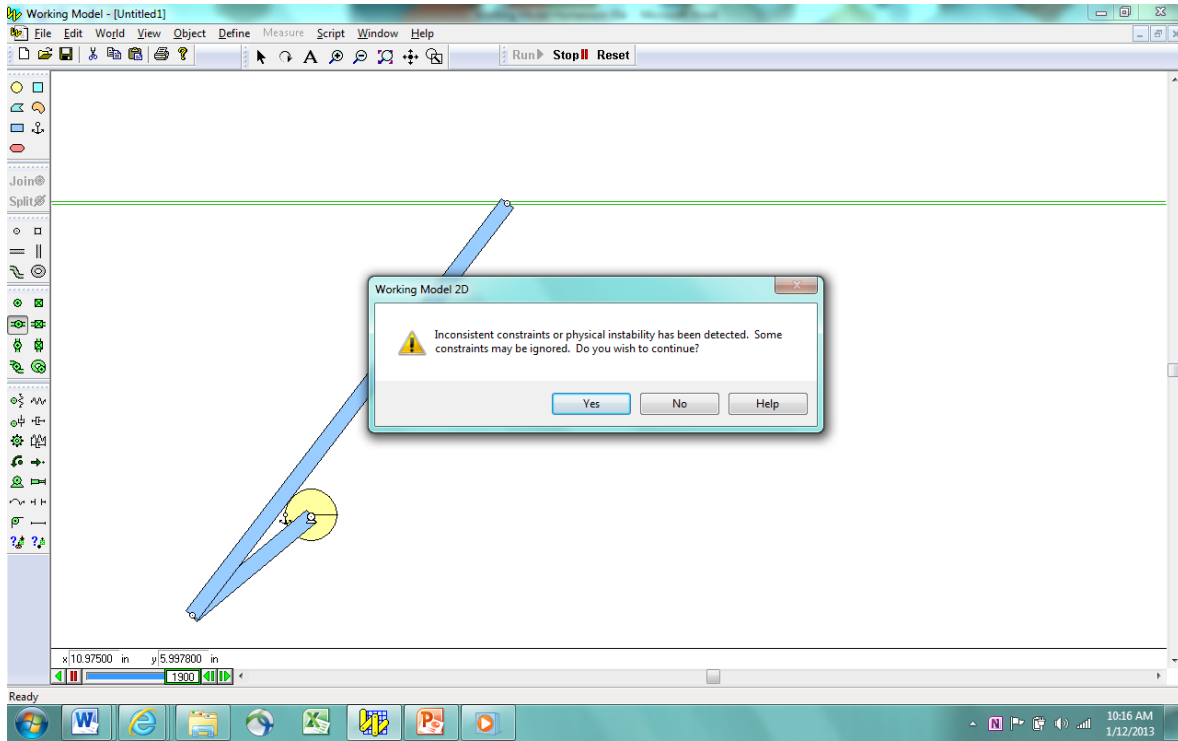
Place a circle on the panel at  $x = 0$ ,  $y = 6$  inches. Place a slot on the circle. This will be used to locate the end of the 10-inch rectangle. Use the Selection Tool to place the end of the long rectangle to overlap the slot.



Delete the circle and the slot. Then use the Horizontal Slot Joint Tool to constrain the end of the long rectangle to travel horizontally.

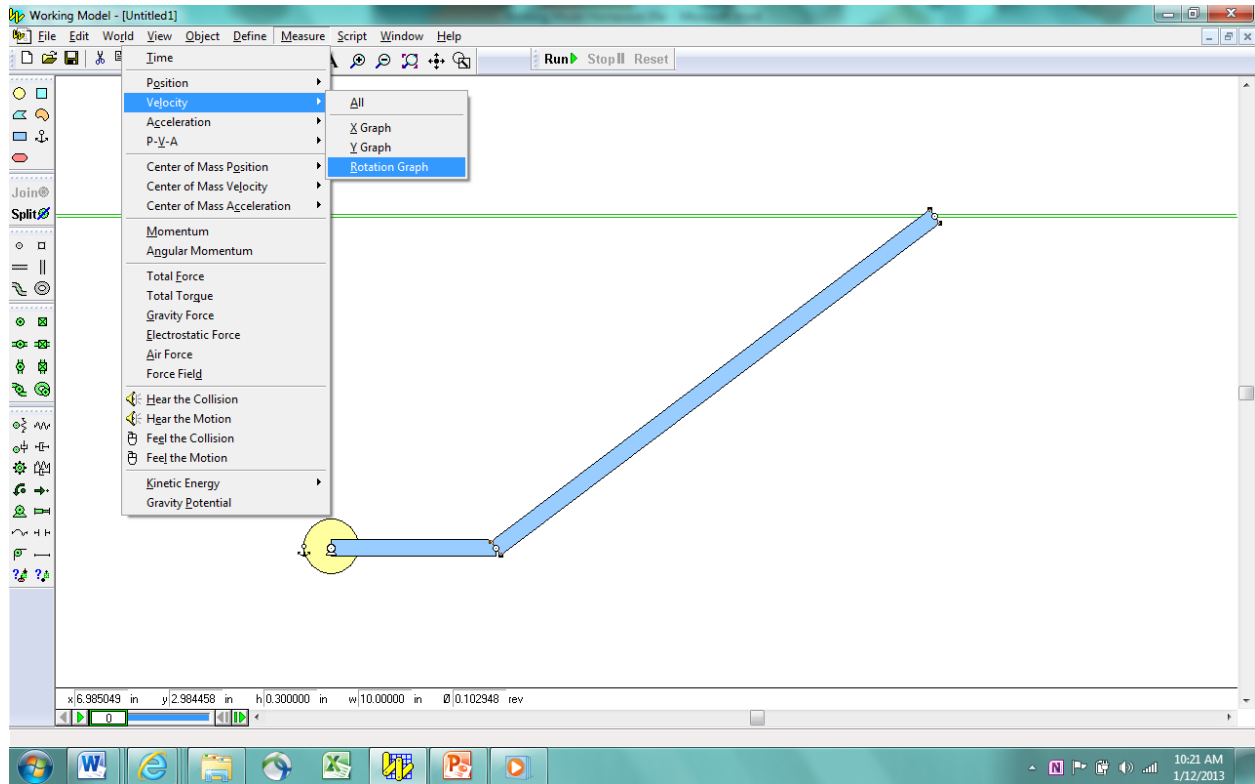


Run the simulation. As you can see, the long rectangle strikes the circle. Reset the simulation and select the rectangle and the circle using the Shift key. Select the Object Tab to set these two objects to not collide.

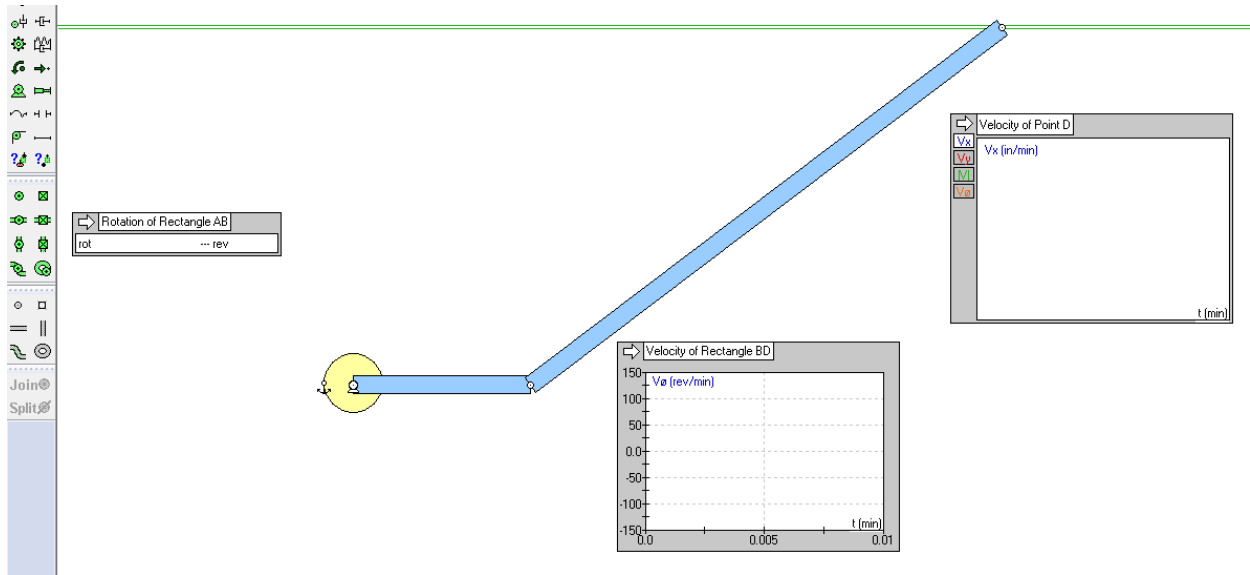




Place a graph on the panel to measure the rotational velocity of the long rectangle.



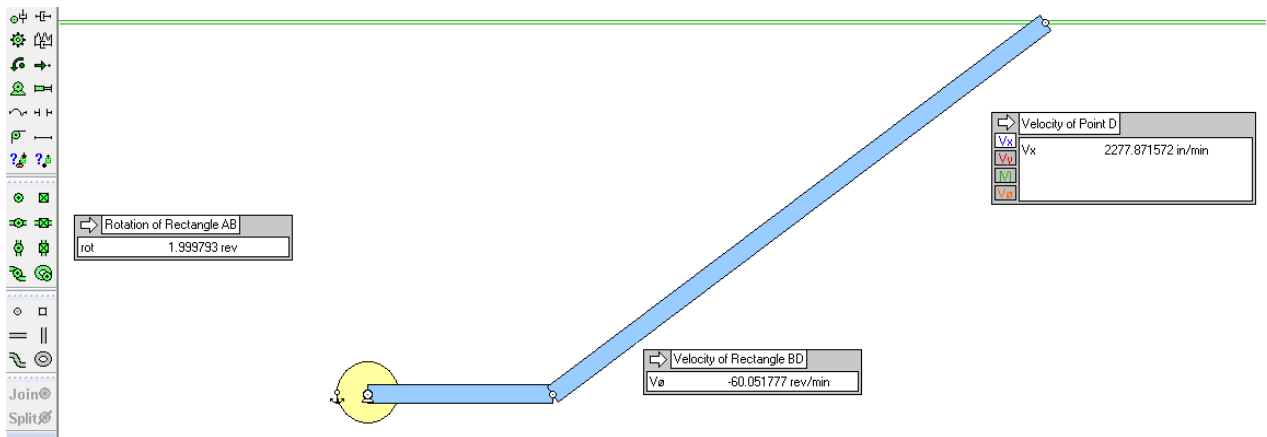
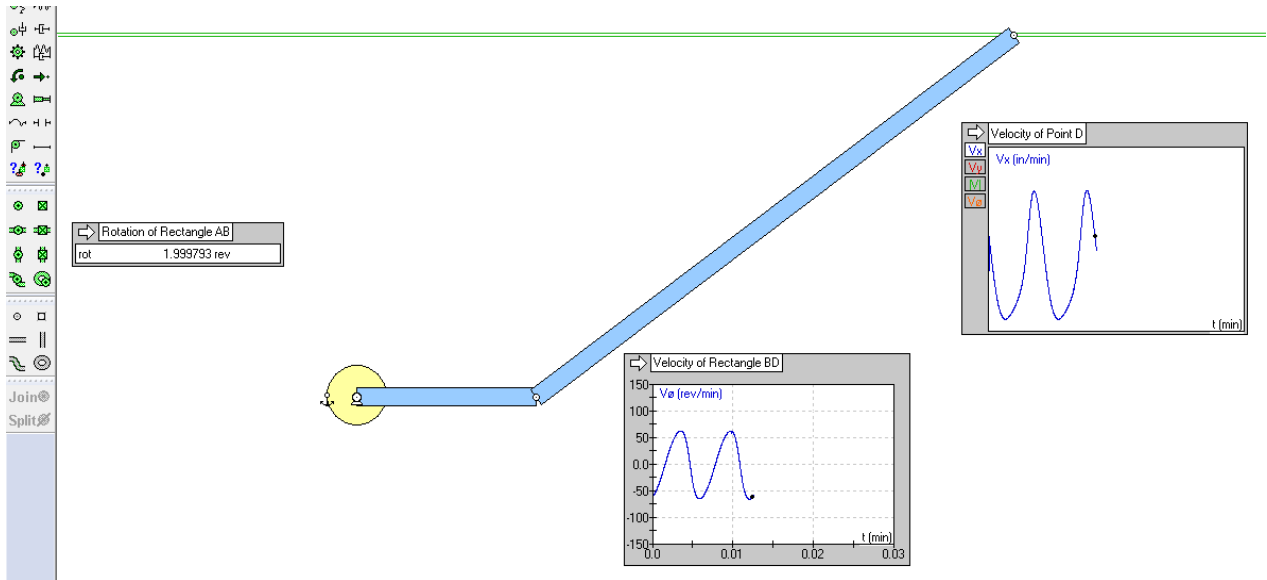
Place a graph on the panel to measure the velocity of the pin joint at Point D.



Run the simulation and note the values. 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 05a. Save your simulation for your records.

Answers:

Theta = 0:



Theta = 90:

