ME 481 – H09 **Name ________________________**

1) Modify your Working Model (WM) slider crank simulation as detailed below.
   a) Change the motor that drives the crank to apply constant torque of 20 ft-lbf.
   b) Place a large block so that the piston cannot move all the way to TDC.
   c) Select World then Accuracy and set Animation Step to 0.0001 sec. You may also need to select World then Accuracy then More Choices and set Overlap Error smaller.
   d) Left-click on the piston to highlight it. Hold down the Shift Key and left-click on the block to highlight it also. Select Object then Collide to enable collision between the two objects. Select Measure then Contact Force to measure piston force.
   e) Move the block to three different positions and record piston force in the table below.
   f) Validate your simulation with the closed-form force-torque equation derived in class.
   g) Attach a screen shot of your WM mechanism.

Crank angle [deg]	**Conn-rod angle [deg]**	**Crank torque [in.lbf]**	**WM piston force [lbf]**	**Equation piston force [lbf]**

EXTRA CREDIT
Develop a WM simulation to slowly move the block back and forth. Export WM data and read into MATLAB. Provide validation plots of WM piston force and closed-form equation piston force on the same MATLAB graph as a function of crank angle. Attach a screen shot of your WM mechanism.

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2) Determine motor torque T_{12} required to push needle link 6 down with 0.5 N at the position shown below. The mechanism is drawn to scale full size. Neglect friction and dynamic effects. Show your work.

T_{12} ____