The board is used to hold the end of a four-way lug wrench in position. A torque \( T = -25 \, \text{i N.m} \) is required to tighten the nut (note that the system of coordinates has the origin placed in the center of the wrench and the nut is located at position \(-100,0,0\) mm). You decided to step at the end of the wrench in order to turn it. Assume that the force provided by your foot can be modeled as a concentrated force at point A with magnitude \( F \). We also assume that the force vector \( \mathbf{F} \) lies in the vertical plane \( y-z \) and makes an angle \( \theta \) with the \( y \)-axis.

a) Determine the moment \( \mathbf{M}_o \) of the force \( \mathbf{F} \) about a point located at the nut. Write your answer as a function of \( F \) (force magnitude) and \( \theta \).

b) Does all of \( \mathbf{M}_o \) act to turn the nut? Explain.

c) Determine the magnitude of the force required to tighten the nut if \( \theta = 30^\circ \).

d) Which angle would require the least amount of force? What would be the corresponding magnitude of the force?

e) What is/are the benefit(s) from using a board to hold the end of a four-way lug wrench?

f) Suppose the goal was to now loosen one of the other nuts with a torque of \( T = T \, \text{i N.m} \) while the max achieved by stepping on the wrench is \( \pi \, \text{i N.m} \). What might you do in order to achieve the desired torque? Is there a term for the strategy you came up with? (Note: \( T = 2\pi \))