Name: _____
Group members: _____   _____   _____

TAM 210/211 - Worksheet 5

Objectives:

- Evaluate moments in 2D and 3D problems

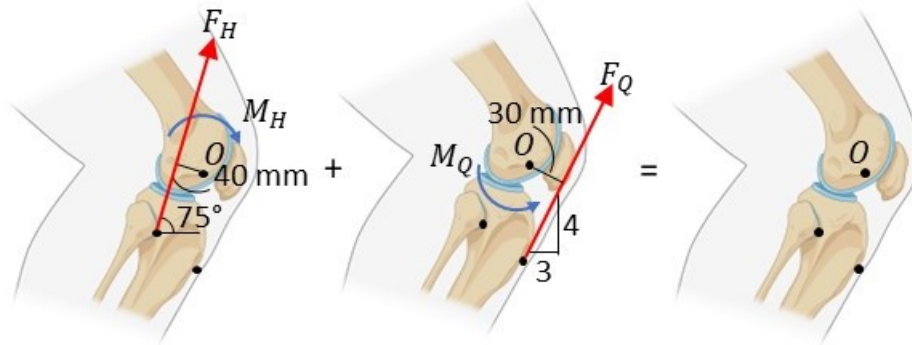- Obtain resultant forces and moments for equivalent systems.

1) Draw the forces and resulting moment that acts on a wrench when unfastening a nut.

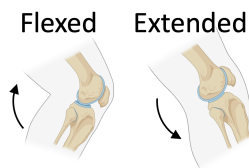2) Sketch a diagram of the forces and moments acting on the bottle opener?

3) A rotational moment in the knee is generated by the force from the hamstrings (F_H) and the force from the quadriceps (F_Q). The diagram for each muscle is given separately. a) On the blank knee diagram, draw the forces and resulting moment that acts on the knee when it is in a flexed position.
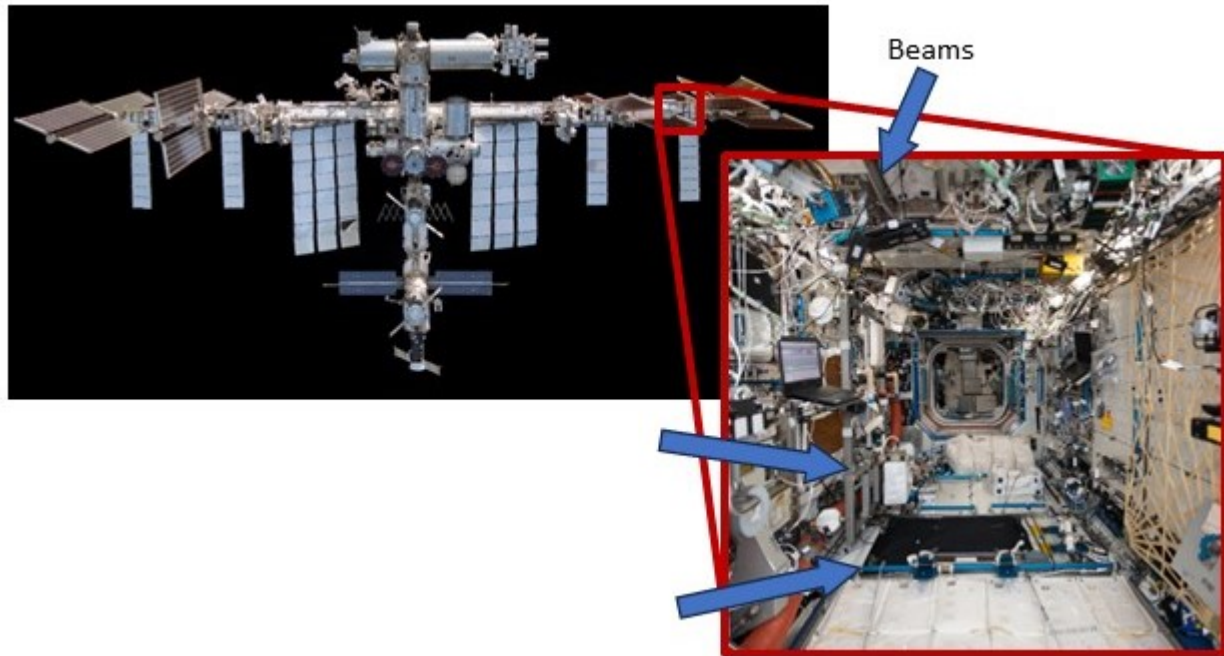

b) The force generated by the hamstrings and the quadriceps are 845 N and 1500 N, respectively. Using Figure in part a, determine the moment of the force about point O using the scalar formulation.
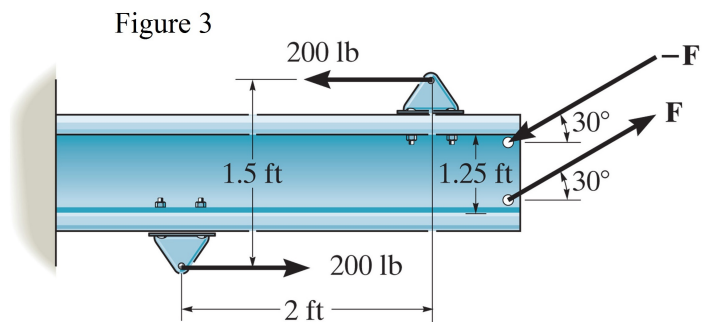
c) Using Figure in problem 3.i, determine (i) the $< i, j, k >$ components of F_H and F_Q, (ii) the moment of the force about point O using the vector formulation, and (iii) the moment of the same force about the x-axis. (iv) Is the knee flexing or extending?

Flexed   Extended

Rotational moments are often seen in beam applications. The following examples are of beams that could be found on a space station!

4) Using Figure 3, determine the magnitude of F so that the resultant couple moment is 600 lb.ft counterclockwise. Where on the beam does the resultant couple moment act?

Figure 3

5) Replace the force system acting on the beam in Figure 4 by: (a) an equivalent force and couple moment at point O, and (b) an equivalent force distance x to the right of O. Sketch your equivalent system on the right side of Figure 4.
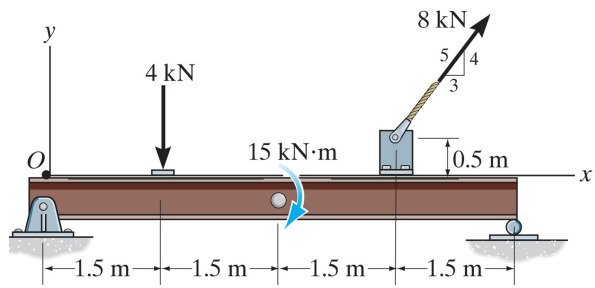

Figure 4