

Name: _____

Group members: _____

TAM 210/211 - Worksheet 5

Objectives:

- Evaluate moments in 2D and 3D problems
- Obtain resultant forces and moments for equivalent systems.

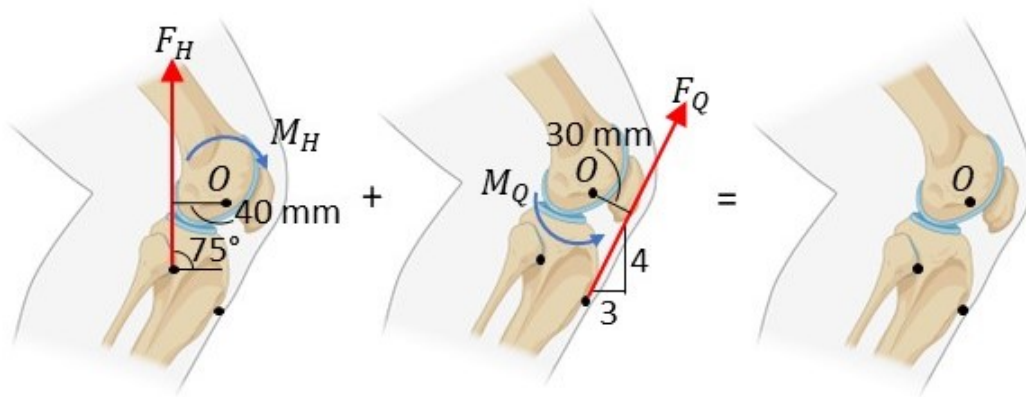
1) Draw the forces and resulting moment that acts on a wrench when unfastening a nut.



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



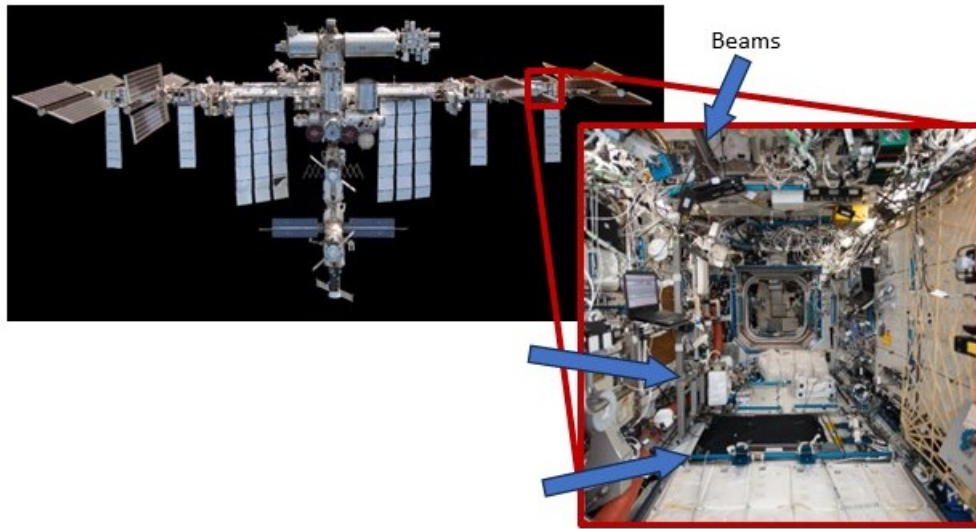
3.i) A rotational moment in the knee is generated by the force from the hamstrings (F_H) and the force from the quadriceps (F_Q). The diagram for each muscle is given separately. On the blank knee diagram, draw the forces and resulting moment that acts on the knee when it is in a flexed position.



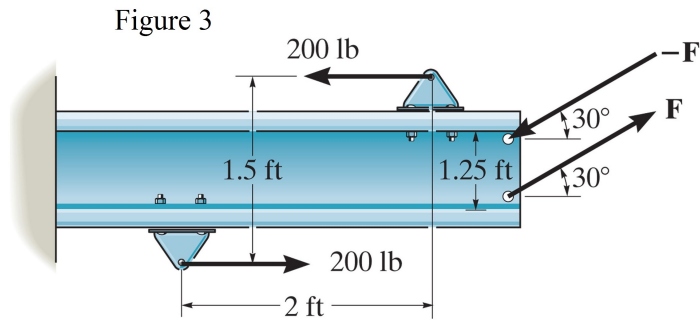
3.ii) The force generated by the hamstrings and the quadriceps are 845 N and 1500 N, respectively. Using Figure in problem 3.i, determine the moment of the force about point O using the scalar formulation.

3.iii) Using Figure in problem 3.i, determine (a) the $\langle i, j, k \rangle$ components of F_H and F_Q , (b) the moment of the force about point O using the vector formulation, and (c) the moment of the same force about the x-axis. (d) Is the knee flexing or extending?

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 (Fig. below), 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?



5) Replace the force system acting on the beam in Figure 4 (Fig. below) 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.

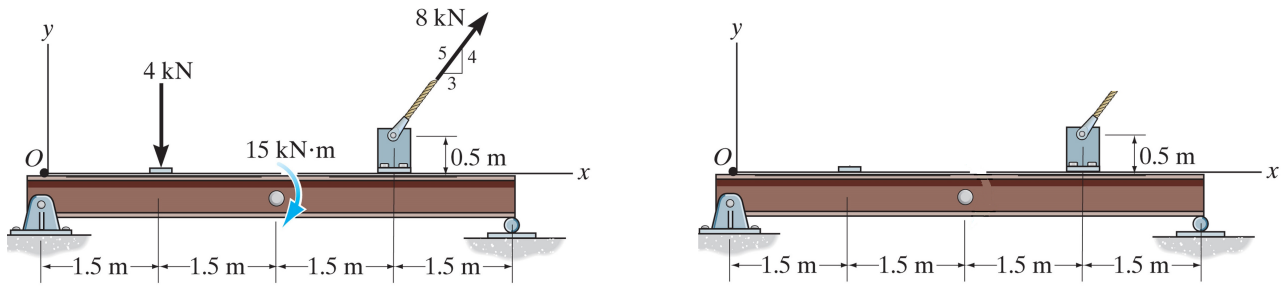


Figure 4