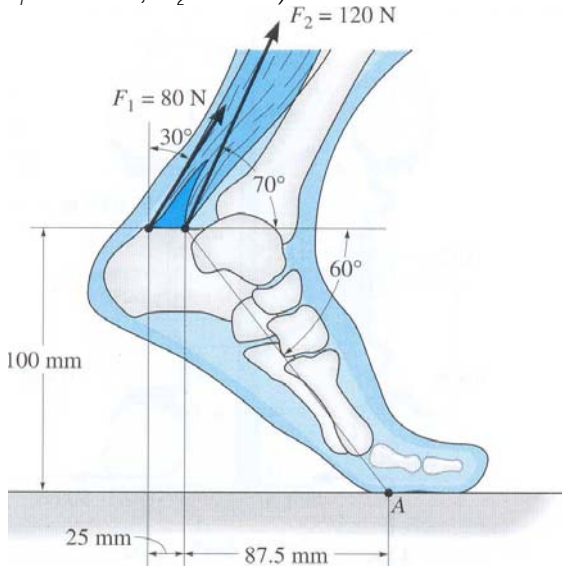
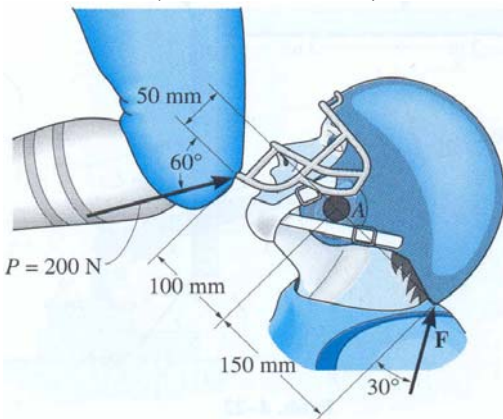


HOMEWORK 2

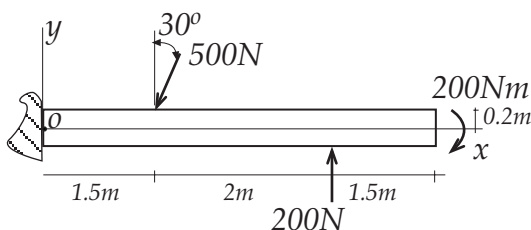
1. The foot segment is subjected to the pull of the two plantarflexor muscles. Determine the moment of each force about the point of contact A on the ground. (Ans. $M_1 = 11.8 \text{ Nm}$, $M_2 = 14 \text{ Nm}$)



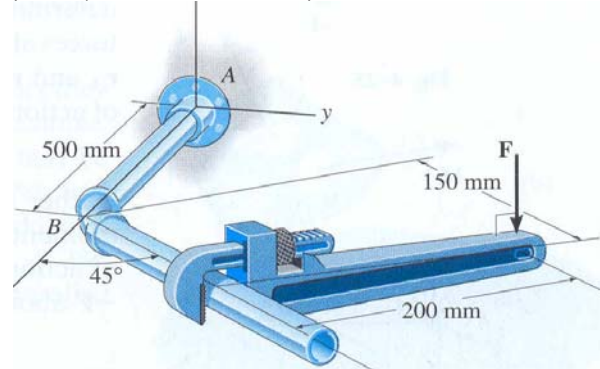
2. Serious neck injuries can occur when a football player is struck in the face guard of his helmet in the manner shown, giving rise to a guillotine mechanism. Determine the moment of the knee force $P = 200 \text{ N}$ about point A. What would be the magnitude of the neck force F so that it gives the counterbalancing moment about A? (Ans. $M_A = 12.32 \text{ Nm}$)



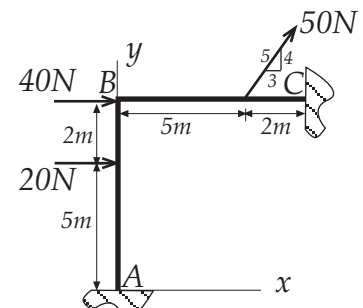
3. Replace the force system acting on the beam by an equivalent force and couple moment at point O. (Ans. $F_R = -250 \text{ N i} - 233 \text{ N j}$, $M_O = -100 \text{ Nm k}$)



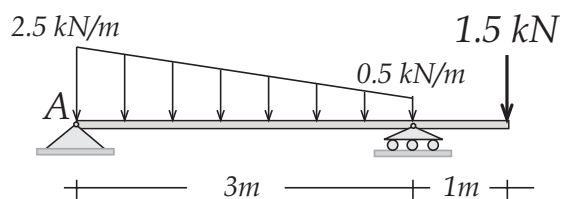
4. A vertical force of $F = 60 \text{ N}$ is applied to the handle of the pipe wrench. Determine the moment that this force exerts along the axis AB (x axis) of the pipe assembly. Both the wrench and pipe assembly ABC lie in the x-y plane. (Ans. $M_{AB} = 14.84 \text{ Nm}$)



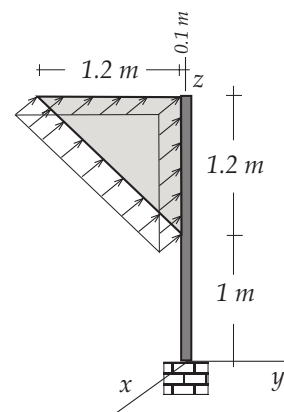
5. Replace the force system acting on the frame by an equivalent single force and specify where this single resultant's line of action intersects member BC measured from point B. (Ans. $F_R = 90 \text{ N i} + 40 \text{ N j}$, $d = 6 \text{ m}$)



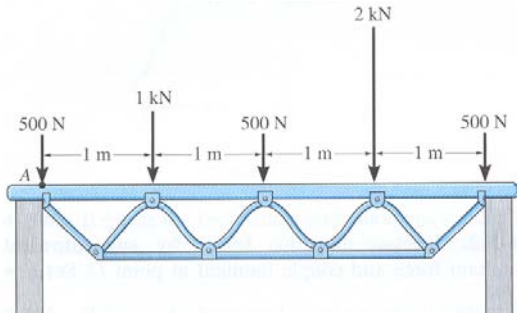
6. Replace the loading on the beam by an equivalent single force and specify its location, measured from point A. (Ans. $F = 6 \text{ kN } \downarrow$, $d = 1.88 \text{ m}$)



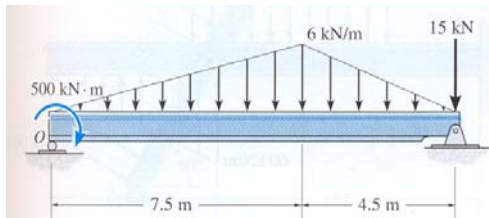
7. The wind pressure acting on a triangular sign is uniform and has magnitude 150 Pa. Replace this loading by an equivalent resultant force and couple at the base of the pole (origin of the axes). (Ans. $F_R = -108 \text{ N i}$, $M = 194.4 \text{ Nm j} - 54 \text{ Nm k}$)



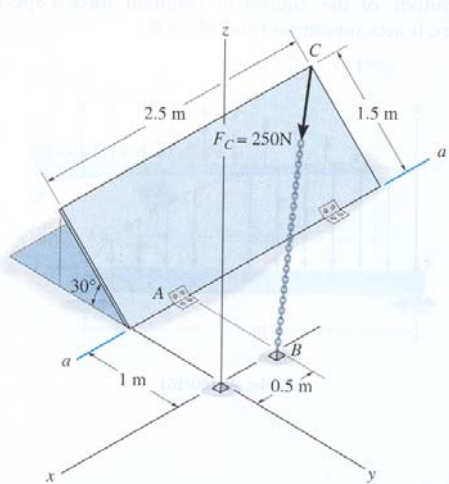
8. The system of parallel forces acts on the top of the *Warren truss*. Determine the equivalent resultant force of the system and specify its location measured from point A. (Ans. $F=4.5\text{ kN} \downarrow$, $d=2.22\text{ m}$)



9. Replace the loading by a single resultant force, and specify the location of the force on the beam measured from point O. (Ans. $F=51\text{ kN} \downarrow$, $d=17.9\text{ m}$)



10. Determine the magnitude of the moment of the force F_C about the hinged axis $a-a$ of the door. (Ans. $M_{a-a}=59.7\text{ Nm}$)



11. Wet concrete exerts a pressure distribution along the wall of the form. Determine the resultant force of this distribution and specify the height h where the bracing strut should be placed so that it lies through the line of action of the resultant force. The wall has a width (out of plane) of 5 m.

