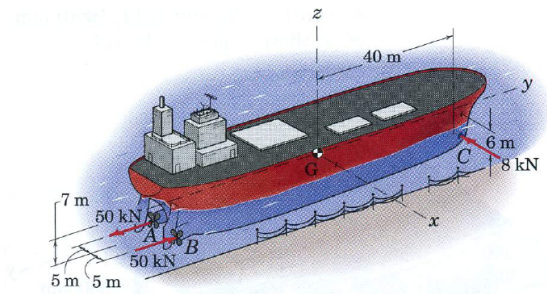


四造一甲靜力學 HW5

- 2/147** An oil tanker moves away from its docked position under the action of reverse thrust from screw A , forward thrust from screw B , and side thrust from the bow thruster C . Determine the equivalent force-couple system at the mass center G .

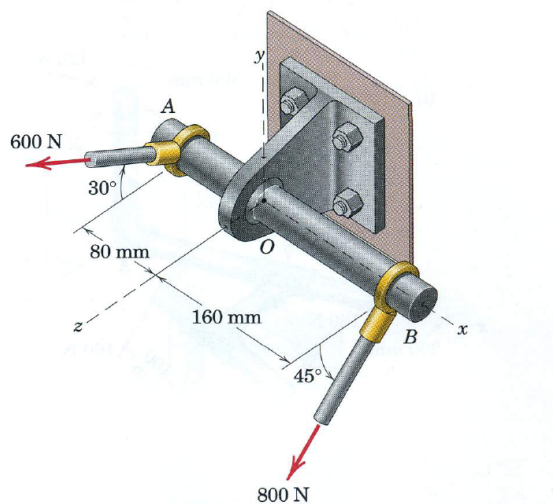
Ans. $\mathbf{R} = -8\mathbf{i} \text{ kN}$, $\mathbf{M}_G = 48\mathbf{j} + 820\mathbf{k} \text{ kN}\cdot\text{m}$



- 2/149** Determine the force-couple system at O which is equivalent to the two forces applied to the shaft AOB . Is \mathbf{R} perpendicular to \mathbf{M}_O ?

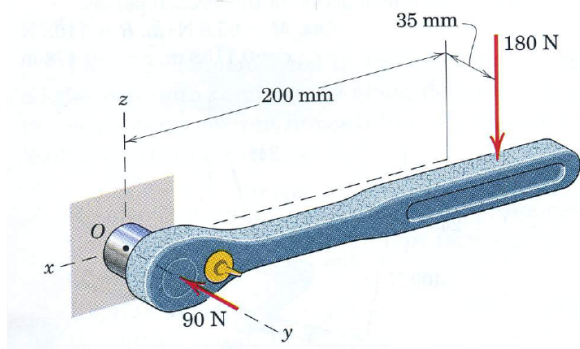
Ans. $\mathbf{R} = -266\mathbf{j} + 1085\mathbf{k} \text{ N}$

$\mathbf{M}_O = -48.9\mathbf{j} - 114.5\mathbf{k} \text{ N}\cdot\text{m}$



2/155 In tightening a bolt whose center is at point O , a person exerts a 180-N force on the ratchet handle with his right hand. In addition, with his left hand he exerts a 90-N force as shown in order to secure the socket onto the bolt head. Determine the equivalent force-couple system at O . Then find the point in the x - y plane through which the line of action of the resultant force of the wrench passes.

Ans. $\mathbf{R} = -90\mathbf{j} - 180\mathbf{k}$ N, $\mathbf{M}_O = -6.3\mathbf{i} - 36\mathbf{j}$ N·m
 $x = -160$ mm, $y = 35$ mm



2/157 Replace the two forces acting on the frame by a wrench. Write the moment associated with the wrench as a vector and specify the coordinates of the point P in the y - z plane through which the line of action of the wrench passes. Note that the force of magnitude F is parallel to the x -axis.

Ans. $\mathbf{R} = F(\mathbf{i} - 3\mathbf{k})$, $\mathbf{M} = \frac{3aF}{10}(\mathbf{i} - 3\mathbf{k})$
 $y = \frac{a}{10}$, $z = 2a$

