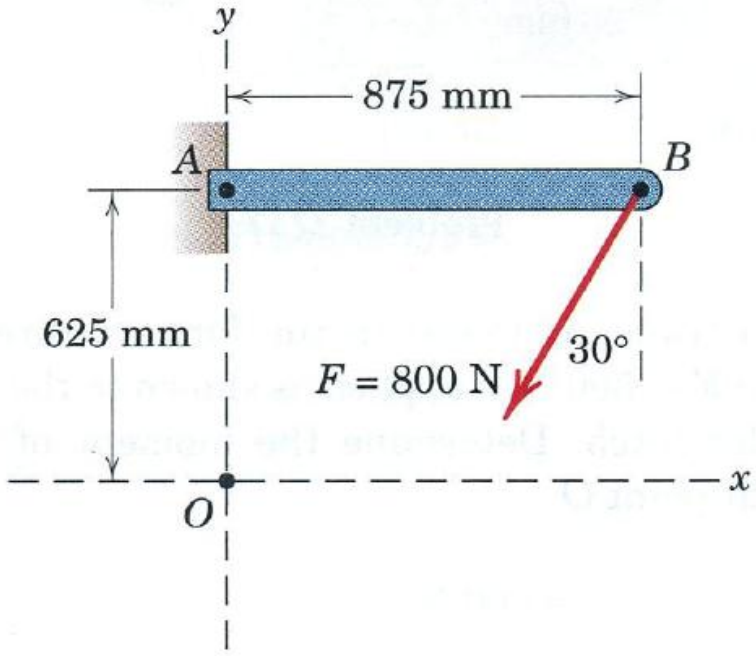
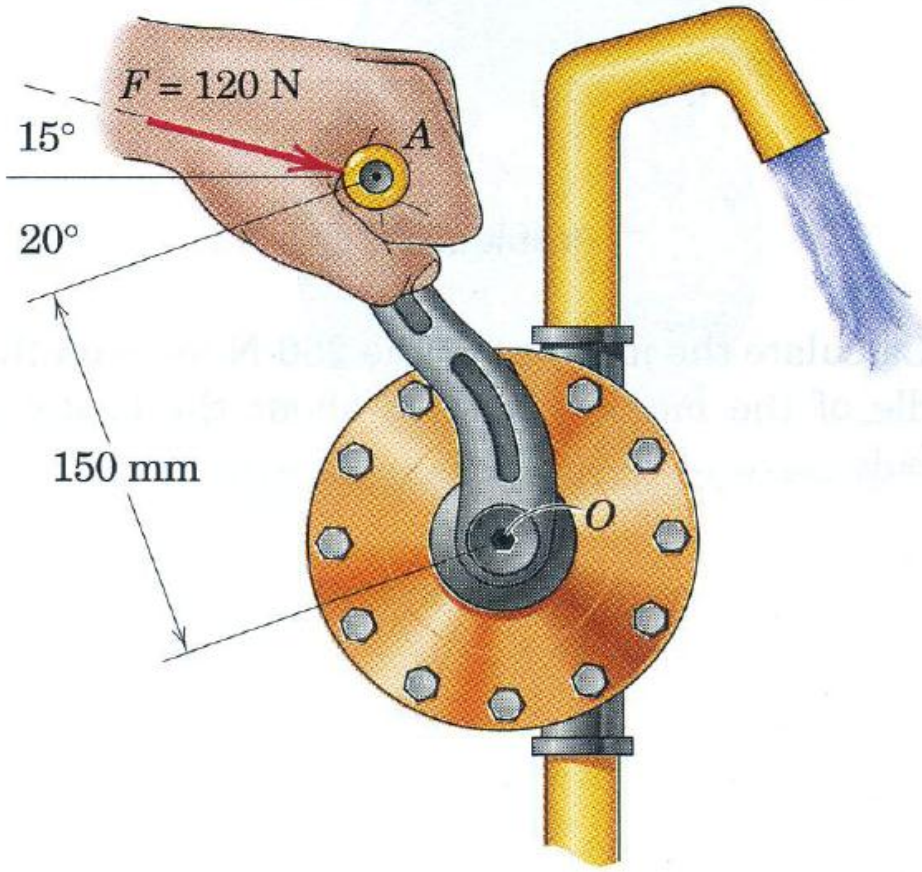
**2/30** Determine the moment of the 800-N force about point $A$ and about point $O$.

106.32



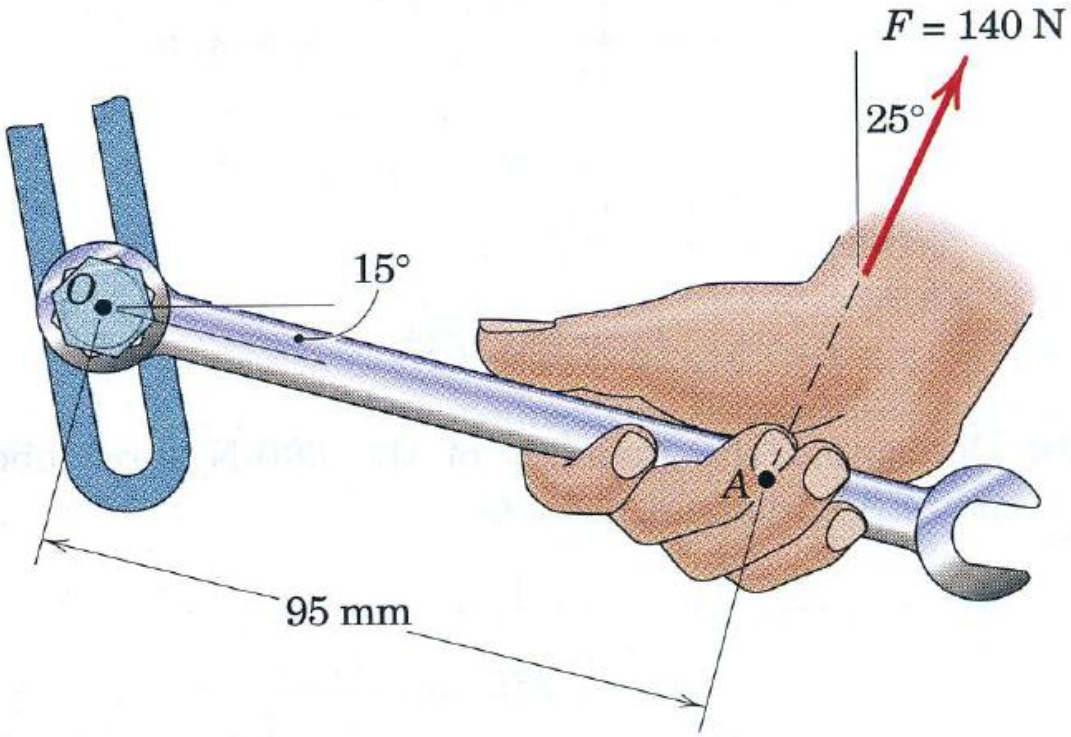
**2/33** In steadily turning the water pump, a person exerts the 120-N force on the handle as shown. Determine the moment of this force about point $O$.

*Ans.* $M_O = 14.74$ N·m CW



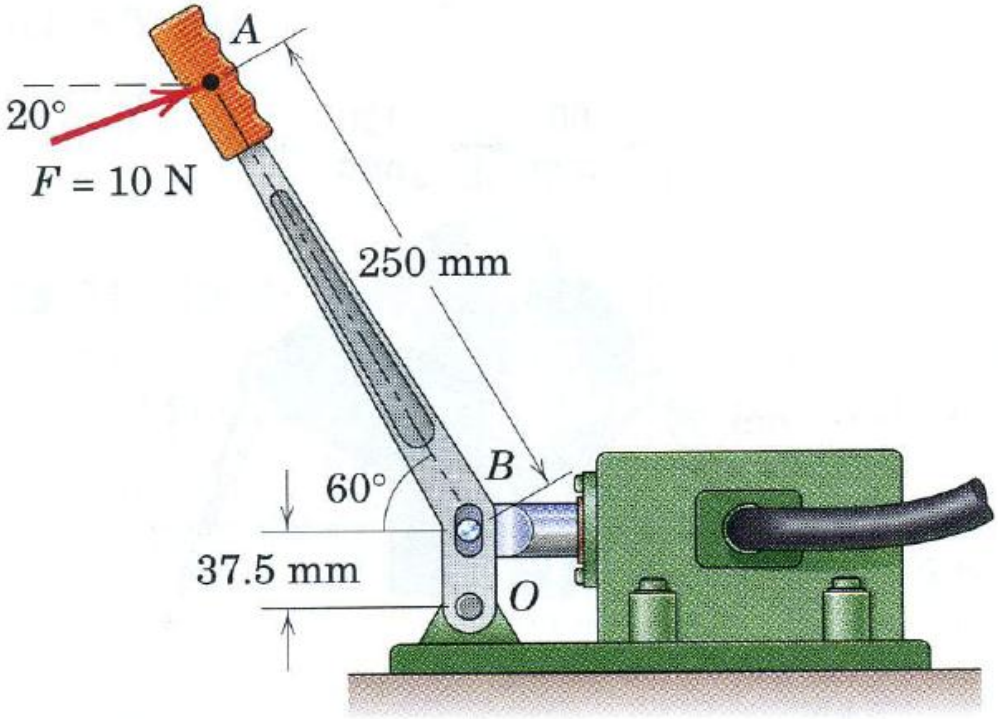
**2/37** A mechanic pulls on the 13-mm combination wrench with the 140-N force shown. Determine the moment of this force about the bolt center $O$.

*Ans.* $M_O = 13.10$ N·m CCW



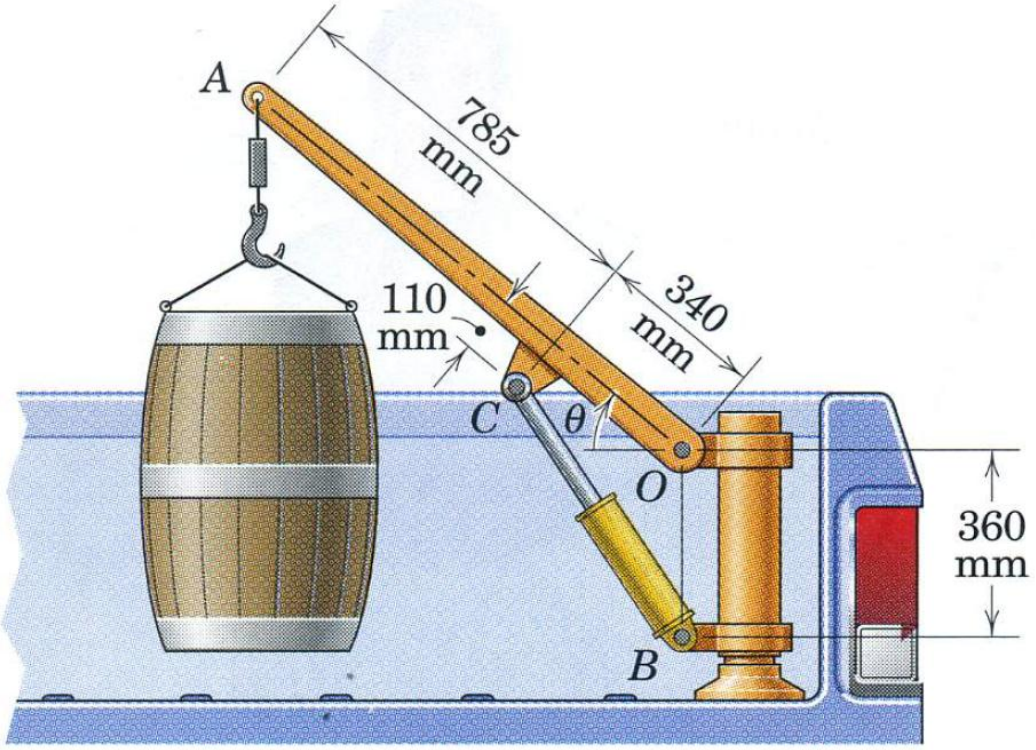
**2/47** The 10-N force is applied to the handle of the hydraulic control valve as shown. Calculate the moment of this force about point $O$.

*Ans.* $M_O = 2.81$ N·m CW



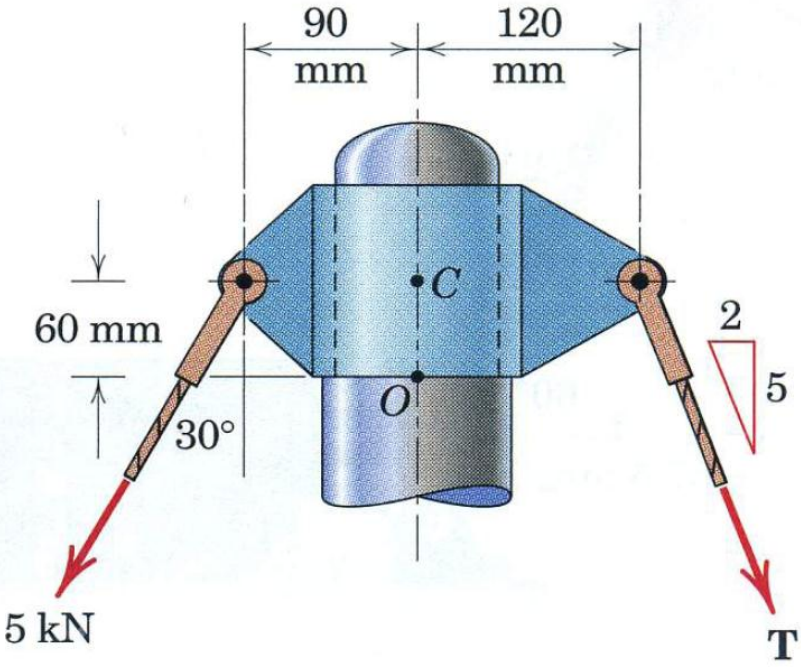
**2/51** The small crane is mounted along the side of a pickup bed and facilitates the handling of heavy loads. When the boom elevation angle is $\theta = 40°$, the force in the hydraulic cylinder $BC$ is 4.5 kN, and this force applied at point $C$ is in the direction from $B$ to $C$ (the cylinder is in compression). Determine the moment of this 4.5-kN force about the boom pivot point $O$.

*Ans.* $M_O = 0.902$ kN·m CW



**2/53** The masthead fitting supports the two forces shown. Determine the magnitude of **T** which will cause no bending of the mast (zero moment) at point $O$.

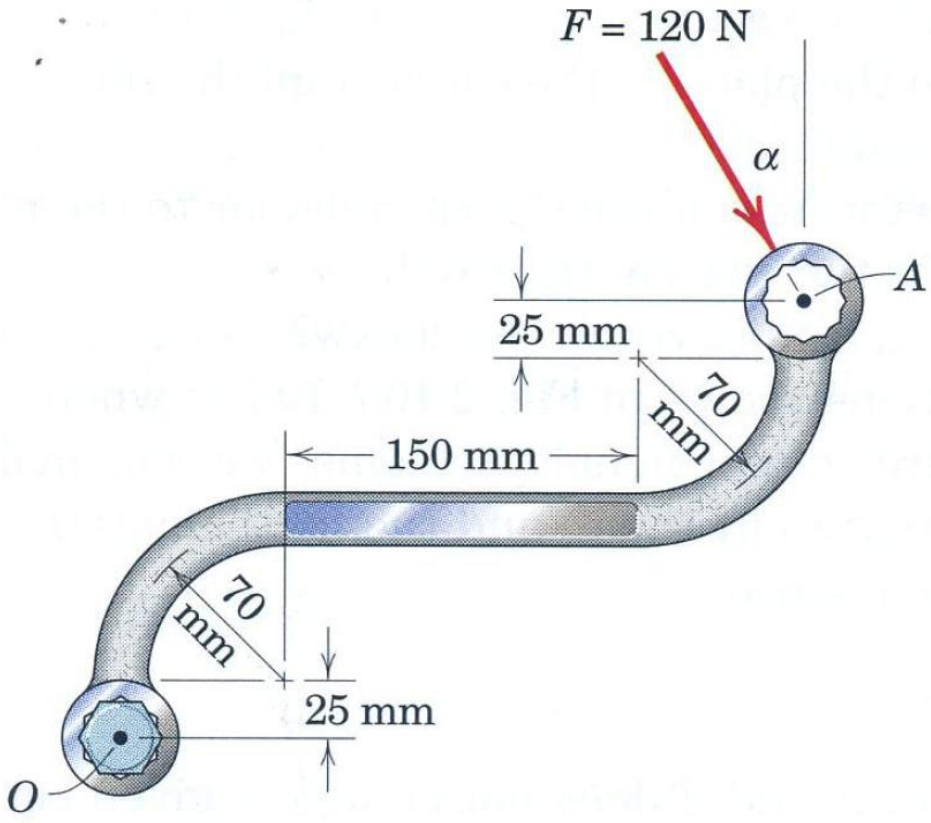
*Ans.* $T = 4.04$ kN



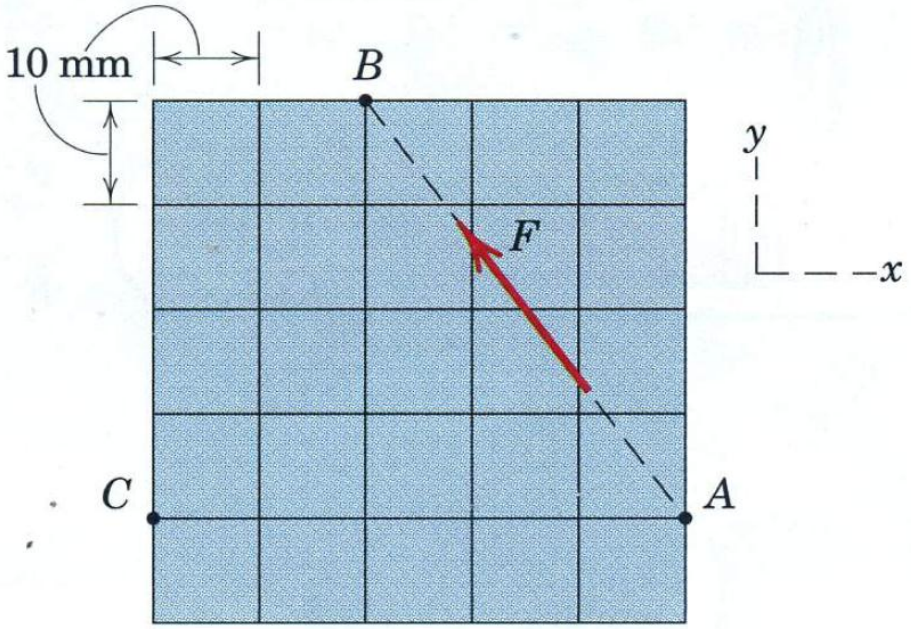
**2/55** The 120-N force is applied as shown to one end of the curved wrench. If $\alpha = 30°$, calculate the moment of $F$ about the center $O$ of the bolt. Determine the value of $\alpha$ which would maximize the moment about $O$; state the value of this maximum moment.

*Ans.* $M_O = 41.5$ N·m CW

$\alpha = 33.2°$, $(M_O)_{max} = 41.6$ N·m CW

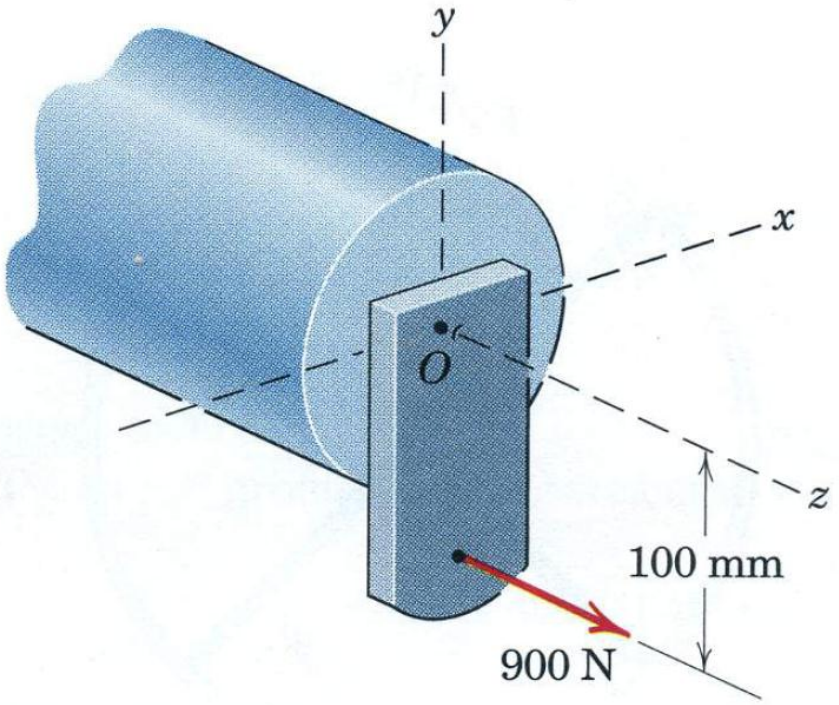


**2/58** A force $F = 60$ N acts along the line $AB$. Determine the equivalent force–couple system at point $C$.



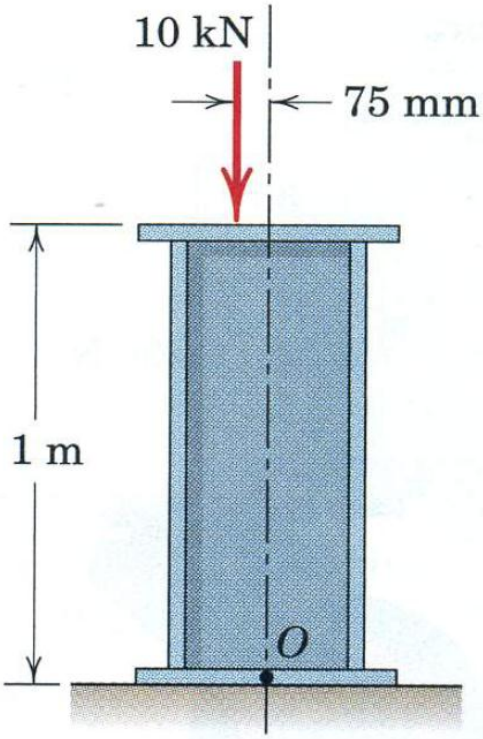
**2/61** *The bracket is spot welded to the end of the shaft at point O. To show the effect of the 900-N force on the weld, replace the force by its equivalent of a force and couple* **M** *at O. Express* **M** *in vector notation.*

*Ans.* $\mathbf{M} = -90\mathbf{i}$ N·m



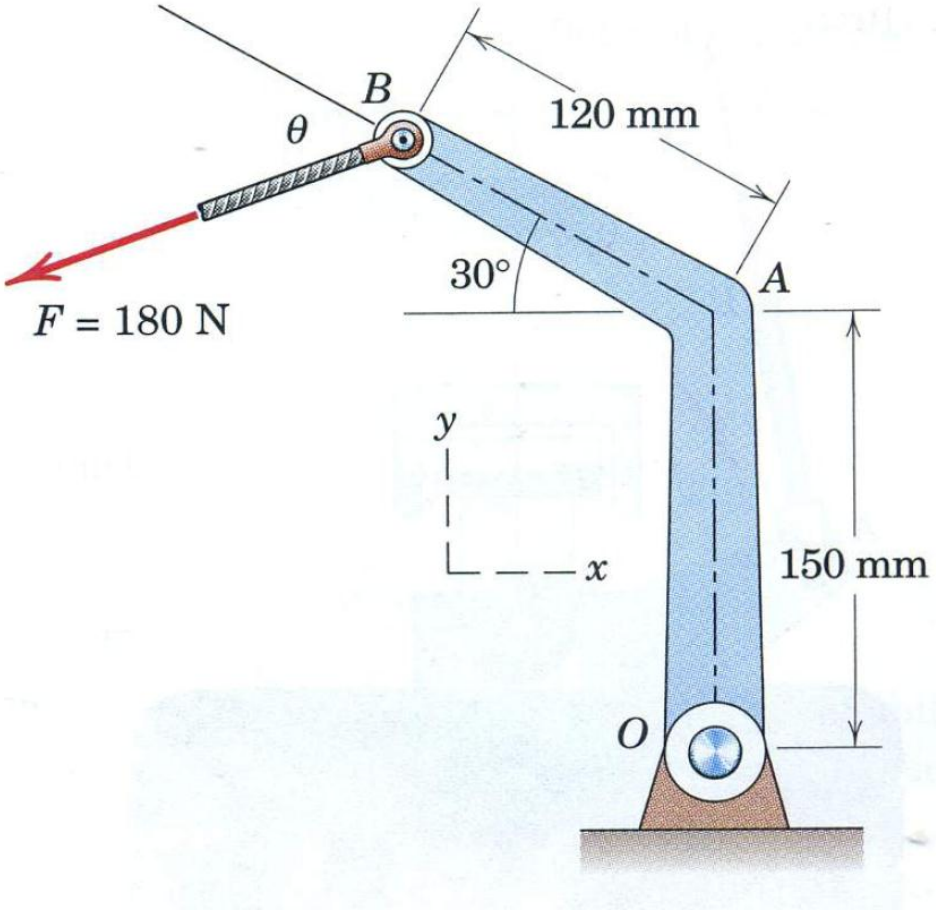
**2/63** Replace the 10-kN force acting on the steel column by an equivalent force–couple system at point $O$. This replacement is frequently done in the design of structures.

*Ans.* $R = 10$ kN, $M_O = 0.75$ kN·m CCW



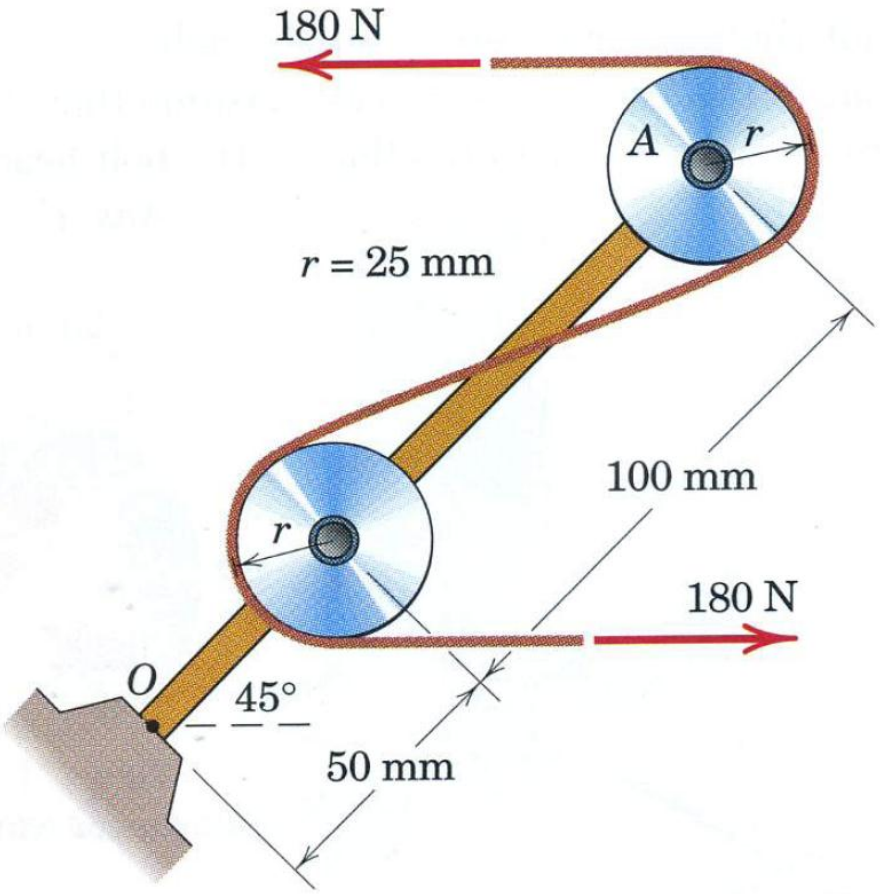
**2/67** The 180-N force is applied to the end of body $OAB$. If $\theta = 50°$, determine the equivalent force–couple system at the shaft axis $O$.

*Ans.* $\mathbf{F} = -169.1\mathbf{i} - 61.6\mathbf{j}$ N, $M_O = 41.9$ N·m CCW



**2/71** The system consisting of the bar $OA$, two identical pulleys, and a section of thin tape is subjected to the two 180-N tensile forces shown in the figure. Determine the equivalent force–couple system at point $O$.

*Ans.* $M = 21.7$ N·m CCW



**2/73** The bracket is fastened to the girder by means of the two rivets $A$ and $B$ and supports the 2-kN force. Replace this force by a force acting along the centerline between the rivets and a couple. Then redistribute this force and couple by replacing it by two forces, one at $A$ and the other at $B$, and ascertain the forces supported by the rivets.

*Ans.* $F_A = 0.8$ kN
$F_B = 2.8$ kN