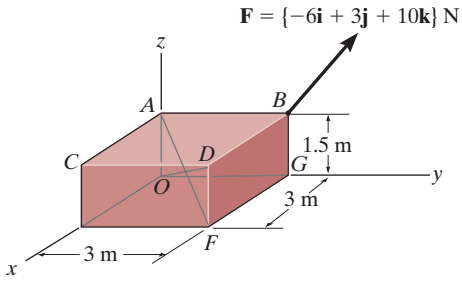
PROBLEMS

*4–52. Determine the moment of the force **F** about the diagonal *AF* of the rectangular block. Express the result as a Cartesian vector.

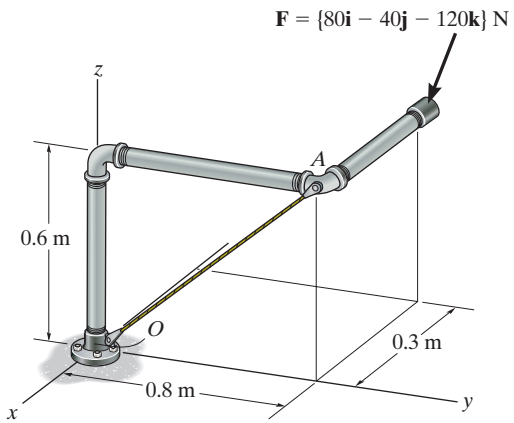
4–53. Determine the moment of the force **F** about the diagonal *OD* of the rectangular block. Express the result as a Cartesian vector.



Probs. 4–52/53

4–54. Determine the moment of force **F** about the *x*, *y*, and *z* axes. Solve the problem (a) using a Cartesian vector approach and (b) using a scalar approach.

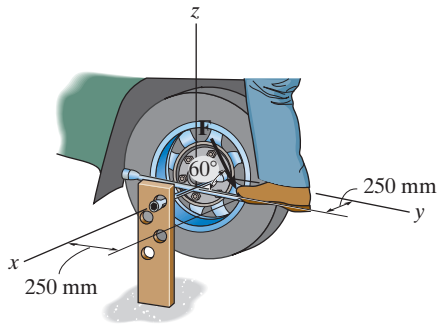
4–55. Determine the moment of force **F** about an axis extending between *O* and *A*. Express the result as a Cartesian vector.



Probs. 4–54/55

*4–56. The board is used to hold the end of the cross lug wrench in the position shown when the man applies a force of $F = 100$ N. Determine the magnitude of the moment produced by this force about the *x* axis. Force **F** lies in a vertical plane.

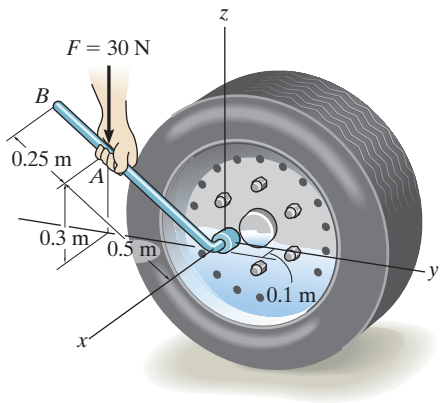
4–57. The board is used to hold the end of the cross lug wrench in the position shown. If a torque of 30 N · m about the *x* axis is required to tighten the nut, determine the required magnitude of the force **F** needed to turn the wrench. Force **F** lies in a vertical plane.



Probs. 4–56/57

4–58. The lug nut on the wheel of the automobile is to be removed using the wrench and applying the vertical force of $F = 30$ N at *A*. Determine if this force is adequate, provided 14 N · m of torque about the *x* axis is initially required to turn the nut. If the 30-N force can be applied at *A* in any other direction, will it be possible to turn the nut?

4–59. Solve Prob. 4–58 if the cheater pipe *AB* is slipped over the handle of the wrench and the 30-N force can be applied at any point and in any direction on the assembly.

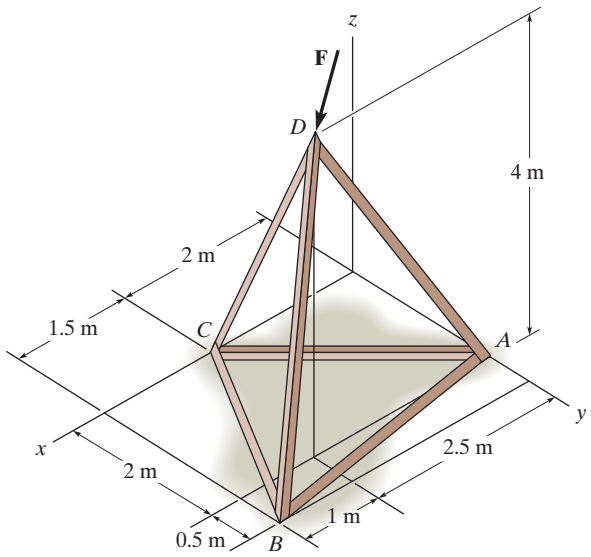


Probs. 4–58/59

***4–60.** Determine the magnitude of the moment of the force $\mathbf{F} = \{50\mathbf{i} - 20\mathbf{j} - 80\mathbf{k}\}$ N about member AB of the tripod.

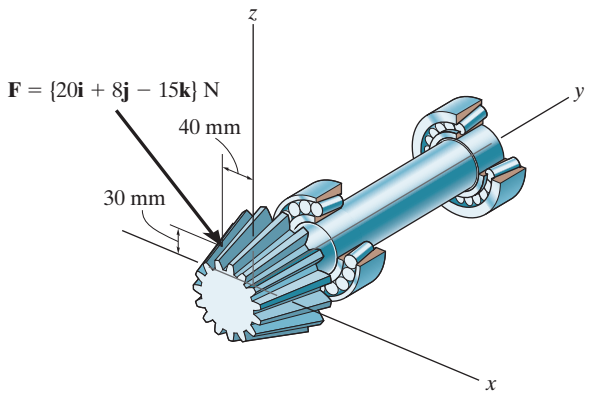
4–61. Determine the magnitude of the moment of the force $\mathbf{F} = \{50\mathbf{i} - 20\mathbf{j} - 80\mathbf{k}\}$ N about member BC of the tripod.

4–62. Determine the magnitude of the moment of the force $\mathbf{F} = \{50\mathbf{i} - 20\mathbf{j} - 80\mathbf{k}\}$ N about member CA of the tripod.



Probs. 4–60/61/62

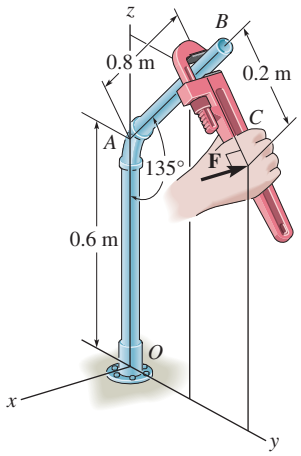
4–63. The bevel gear is subjected to the force $\mathbf{F}$ which is caused from contact with another gear. Determine the moment of this force about the y axis of the gear shaft.



Prob. 4–63

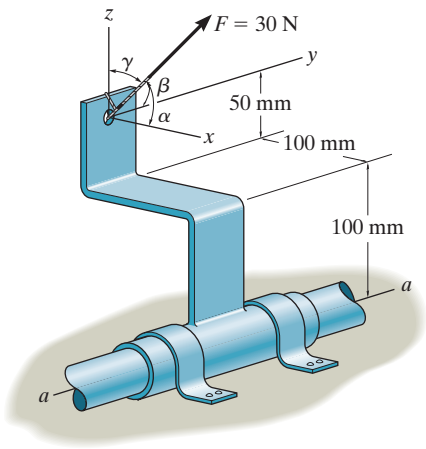
***4–64.** A horizontal force of $\mathbf{F} = \{-50\mathbf{i}\}$ N is applied perpendicular to the handle of the pipe wrench. Determine the moment that this force exerts along the axis OA (z axis) of the pipe assembly. Both the wrench and pipe assembly, $OABC$, lie in the y-z plane. *Suggestion:* Use a scalar analysis.

4–65. Determine the magnitude of the horizontal force $\mathbf{F} = -F\mathbf{i}$ acting on the handle of the wrench so that this force produces a component of the moment along the OA axis (z axis) of the pipe assembly of $\mathbf{M}_z = \{4\mathbf{k}\}$ N · m. Both the wrench and the pipe assembly, $OABC$, lie in the y-z plane. *Suggestion:* Use a scalar analysis.



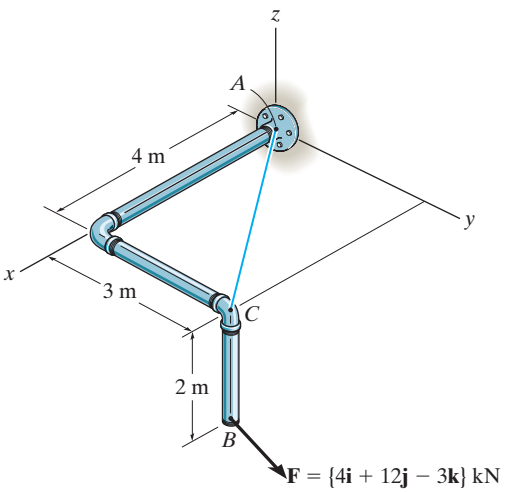
Probs. 4–64/65

4–66. The force of $F = 30$ N acts on the bracket as shown. Determine the moment of the force about the a–a axis of the pipe if $\alpha = 60°$, $\beta = 60°$, and $\gamma = 45°$. Also, determine the coordinate direction angles of F in order to produce the maximum moment about the a–a axis. What is this moment?



Prob. 4–66

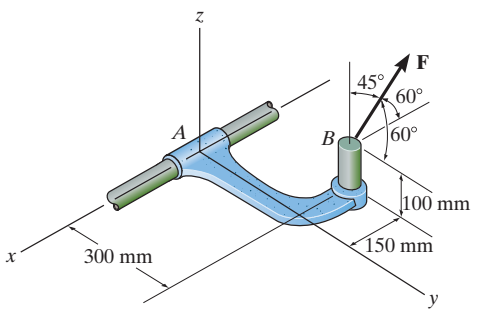
4–67. Determine the moment of this force **F** about an axis extending between *A* and *C*. Express the result as a Cartesian vector.



Prob. 4–67

*4–68. If F = 450 N, determine the magnitude of the moment produced by this force about the *x* axis.

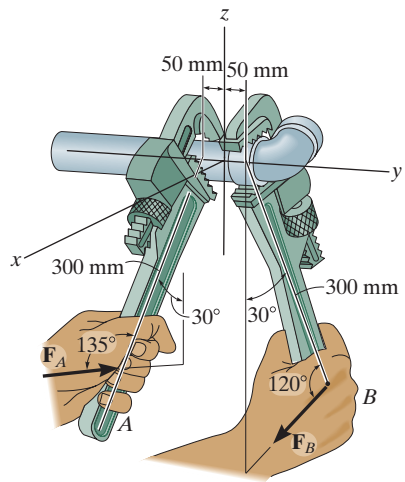
4–69. The friction at sleeve *A* can provide a maximum resisting moment of 125 N · m about the *x* axis. Determine the largest magnitude of force **F** that can be applied to the bracket so that the bracket will not turn.



Probs. 4–68/69

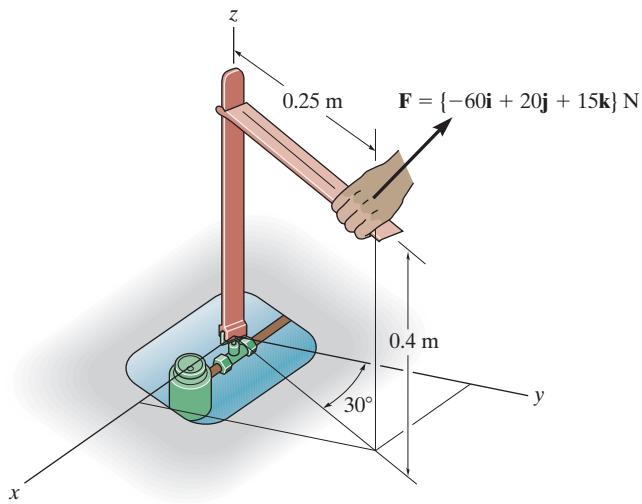
4–70. The wrench *A* is used to hold the pipe in a stationary position while wrench *B* is used to tighten the elbow fitting. If F_B = 150 N, determine the magnitude of the moment produced by this force about the *y* axis. Also, what is the magnitude of force $\mathbf{F}_A$ in order to counteract this moment?

4–71. The wrench *A* is used to hold the pipe in a stationary position while wrench *B* is used to tighten the elbow fitting. Determine the magnitude of force F_B in order to develop a moment of 50 N · m about the *y* axis. Also, what is the required magnitude of force $\mathbf{F}_A$ in order to counteract this moment?



Probs. 4–70/71

*4–72. The tool is used to shut off gas valves that are difficult to access. If the force **F** is applied to the handle, determine the component of the moment created about the *z* axis of the valve.



Prob. 4–72