Review Problems

4.152 Beam AD carries the two 40-lb loads shown. The beam is held by a fixed support at D and by the cable BE which is attached to the counter weight W. Determine the reaction at D when (a) $W = 100$ lb, (b) $W = 90$ lb.

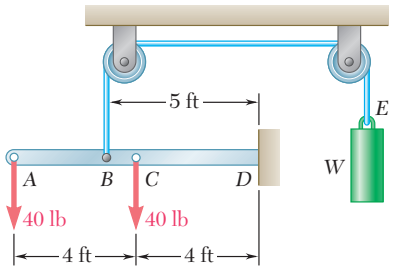

Fig. P4.152 and *P4.153*

4.153 For the beam and loading shown, determine the range of values of W for which the magnitude of the couple at D does not exceed 40 lb · ft.

4.154 Determine the reactions at A and D when $\beta = 30°$.

4.155 Determine the reactions at A and D when $\beta = 60°$.

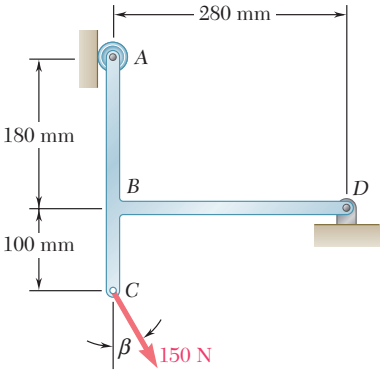

Fig. P4.154 and *P4.155*

4.156 A 2100-lb tractor is used to lift 900 lb of gravel. Determine the reaction at each of the two (a) rear wheels A, (b) front wheels B.

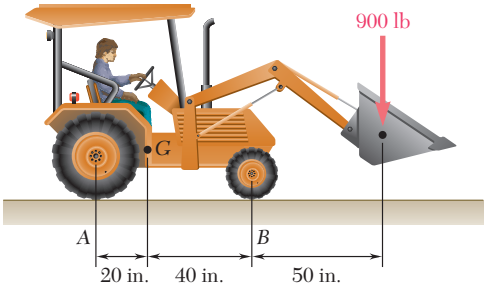

Fig. P4.156

4.157 A tension of 5 lb is maintained in a tape as it passes the support system shown. Knowing that the radius of each pulley is 0.4 in., determine the reaction at C.

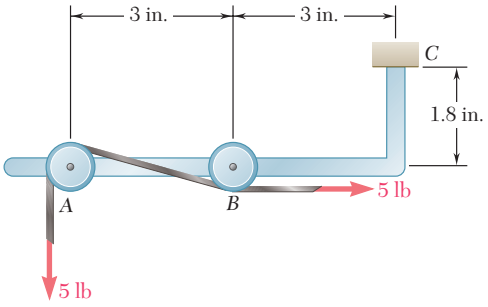

Fig. P4.157

4.158 Solve Prob. 4.157 assuming that 0.6-in.-radius pulleys are used.

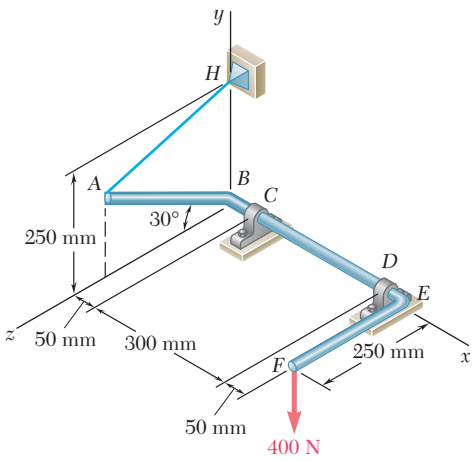

Fig. P4.159

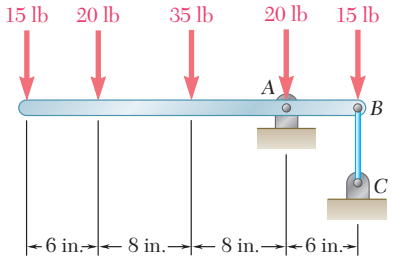

Fig. *P4.160*

4.159 The bent rod *ABEF* is supported by bearings at *C* and *D* and by wire *AH*. Knowing that portion *AB* of the rod is 250 mm long, determine (*a*) the tension in wire *AH*, (*b*) the reactions at *C* and *D*. Assume that the bearing at *D* does not exert any axial thrust.

4.160 For the beam and loading shown, determine (*a*) the reaction at *A*, (*b*) the tension in cable *BC*.

4.161 Frame *ABCD* is supported by a ball-and-socket joint at *A* and by three cables. For $a = 150$ mm, determine the tension in each cable and the reaction at *A*.

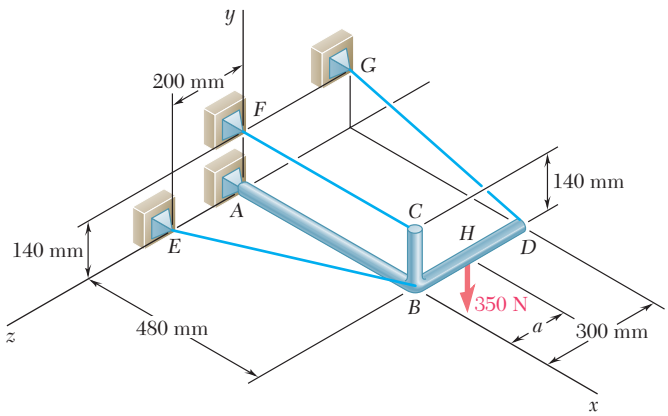

Fig. P4.161 and *P4.162*

4.162 Frame *ABCD* is supported by a ball-and-socket joint at *A* and by three cables. Knowing that the 350-N load is applied at *D* ($a = 300$ mm), determine the tension in each cable and the reaction at *A*.

***4.163** In the problems listed below, the rigid bodies considered were completely constrained and the reactions were statically determinate. For each of these rigid bodies it is possible to create an improper set of constraints by changing a dimension of the body. In each of the following problems determine the value of *a* which results in improper constraints. (*a*) Prob. 4.81, (*b*) Prob. 4.82.