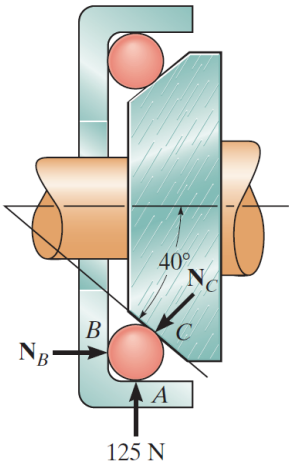
Problem 3-4

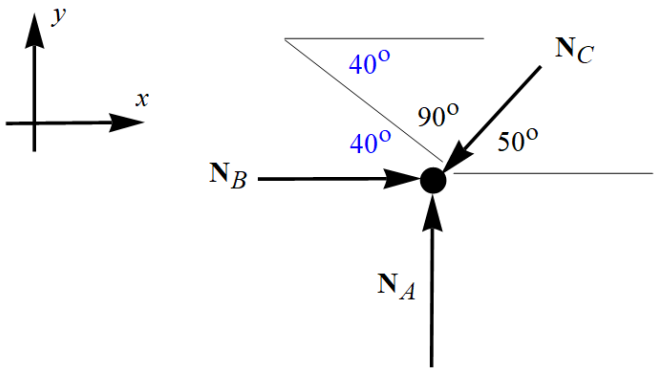
The bearing consists of rollers, symmetrically confined within the housing. The bottom one is subjected to a 125-N force at its contact A due to the load on the shaft. Determine the normal reactions N_B and N_C on the bearing at its contact points B and C for equilibrium.



Prob. 3–4

Solution

Draw a free-body diagram for the red ball on the bottom.



In order for the ball to be in equilibrium, the sum of the forces in each direction must be zero.

$$\sum F_x = 0: \qquad N_B - N_C \cos 50° = 0$$

$$\sum F_y = 0: \qquad N_A - N_C \sin 50° = 0$$

Since $N_A = 125$ N, N_B and N_C can be found. The second equation becomes

$$125 \text{ N} - N_C \sin 50° = 0 \quad \rightarrow \quad N_C = \frac{125 \text{ N}}{\sin 50°} \approx 163 \text{ N}.$$

Substitute this value for N_C into the first equation to get N_B.

$$N_B = N_C \cos 50° \approx 105 \text{ N}$$