A = (.1, .07, .15)
B = (-.1, .1, .09)
F2 = (-125i - 200j - 250k)N
rAB = B - A = (-.2i + .03j - .06k)m
MA = (rAB x F2)
MA = [-19.5, -42.5, 43.8] Nm

The magnitude of the moment = 64.0 Nm

The magnitude of the force = 343.7 N

The perpendicular distance = M/F = 0.186 m
A bracket is loaded with a system of forces as shown in Fig. P4-85. Express the resultant of the force system in Cartesian vector form.

SOLUTION

An examination of Fig. P4-85 indicates that the force system consists of a system of three couples in a plane. A scalar analysis yields:

**With counterclockwise moments positive:**

For forces $D_y$ and $E_y$:

$$M_1 = -F_{Dy}d_1 = -300(30) = -9000 \text{ in} \cdot \text{lb}$$

For forces $C_x$ and $B_x$:

$$M_2 = -F_{Cx}d_2 = -250(14) = -3500 \text{ in} \cdot \text{lb}$$

For forces $A_x$ and $E_x$:

$$M_3 = F_{Ax}d_3 = 500(30) = 15,000 \text{ in} \cdot \text{lb}$$

$$C = \Sigma M = M_1 + M_2 + M_3$$

$$= -9000 - 3500 + 15,000 = 2500 \text{ in} \cdot \text{lb} = 2.50 \text{ in} \cdot \text{kip}$$

$$C = 2.50 \text{ in} \cdot \text{kip} \quad \text{Ans.}$$
4-107 Replace the 300-lb force shown in Fig. P4-107 by a force at point A and a couple. Express your answer in Cartesian vector form.

**SOLUTION**

\[
\mathbf{F}_A = \mathbf{F} = 300(\cos 30^\circ \mathbf{i} + \sin 30^\circ \mathbf{j}) \\
= 259.8 \mathbf{i} + 150.0 \mathbf{j} \text{ lb} \approx 260 \mathbf{i} + 150.0 \mathbf{j} \text{ lb} \quad \text{Ans.}
\]

\[
\mathbf{r} = (20 - 10 \tan 30^\circ) \mathbf{i} - 10 \mathbf{j} \text{ in.} = 14.226 \mathbf{i} - 10 \mathbf{j} \text{ in.}
\]

\[
\mathbf{C}_A = \mathbf{r} \times \mathbf{F} = (14.226 \mathbf{i} - 10 \mathbf{j}) \times (259.8 \mathbf{i} + 150.0 \mathbf{j}) \\
= 4732 \text{ k in.} \cdot \text{lb} \approx 4.73 \text{ k in.} \cdot \text{kip} \quad \text{Ans.}
\]