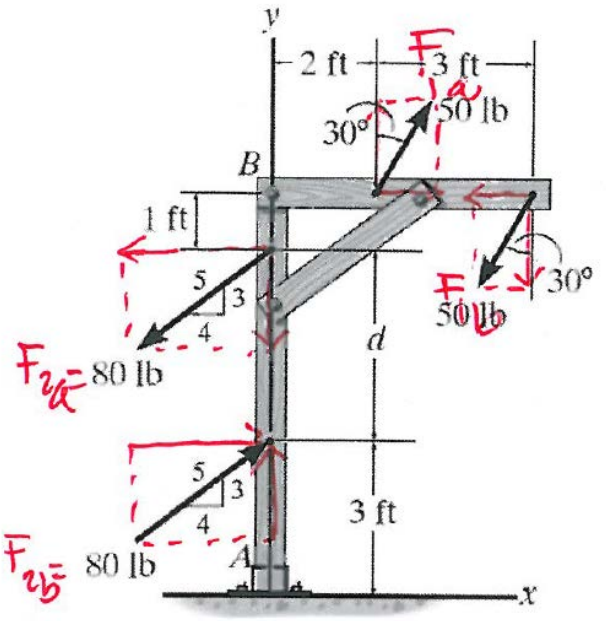
2-D Couples 2

***4–80.**

Two couples act on the frame. If $d = 4$ ft, determine the resultant couple moment. Compute the result by resolving each force into x and y components and (a) finding the moment of each couple (Eq. 4–13) and (b) summing the moments of all the force components about point A.



Magnitude of x & y components for 50 lb & 80 lb forces:

50 lb: $F_{1x} = 50 \sin 30° = 25$ lb ; $F_{1y} = 50 \cos 30° = 43.3$ lb

80 lb: $F_{2x} = \frac{4}{5} 80 = 64$ lb ; $F_{2y} = \frac{3}{5} 80 = 48$ lb

(a)

$$C = \Sigma \vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 0 & 0 \\ -25 & -43 & 0 \end{vmatrix} + \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 4 & 0 \\ -64 & -48 & 0 \end{vmatrix}$$

$C = 126 \hat{k}$ lb.ft Ans.

(b)

$$C \curvearrowright \Sigma M_A = 43.3 \times (2) - 43.3 (5) + 64 (4) - 64 (3) - 25 (8) + 25 (8)$$

$C = 126.1$ lb.ft Ans.