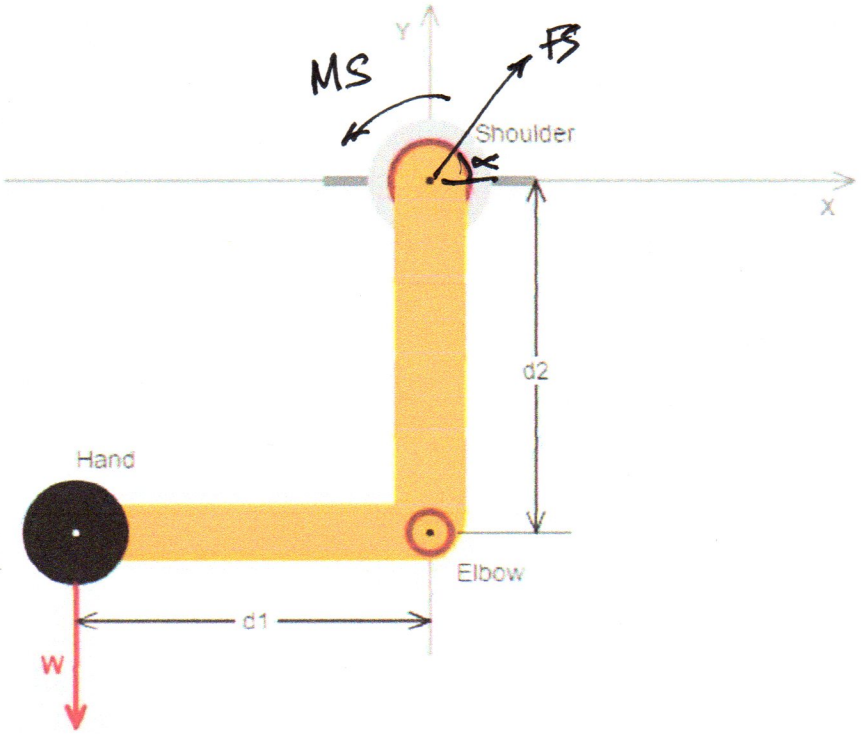
SOLUTION

ip4STATICS Worksheet for U04_P04

A model of a person holding a weight is shown below. At equilibrium the elbow is at a right angle. The shoulder and elbow joints can generate resisting moments as well as forces.

Instance variables: force W in lbs; lengths d1 and d2 in ft.



Setup

$F_{Sx} = |F_S| \cos(\alpha)$

$F_{Sy} = |F_S| \sin(\alpha)$

(1) What is the reaction force FS at the shoulder in equilibrium? ('mag,deg')

(2) What is the reaction moment MS at the shoulder in equilibrium? (Use ccw:+ / cw:-)

(1) $\Sigma F_x = 0$: $F_{Sx} = 0$.
$\Sigma F_y = 0$: $F_{Sy} = W$.

$|F_S| = \text{SQRT}(F_{Sx}^2 + F_{Sy}^2)$

$\angle F_S = \tan^{-1}(F_{Sy}/F_{Sx})$

" $= 90°$

(2) $\Sigma M_{Shoulder} = 0$: $\boxed{MS = -d1 \cdot W}$