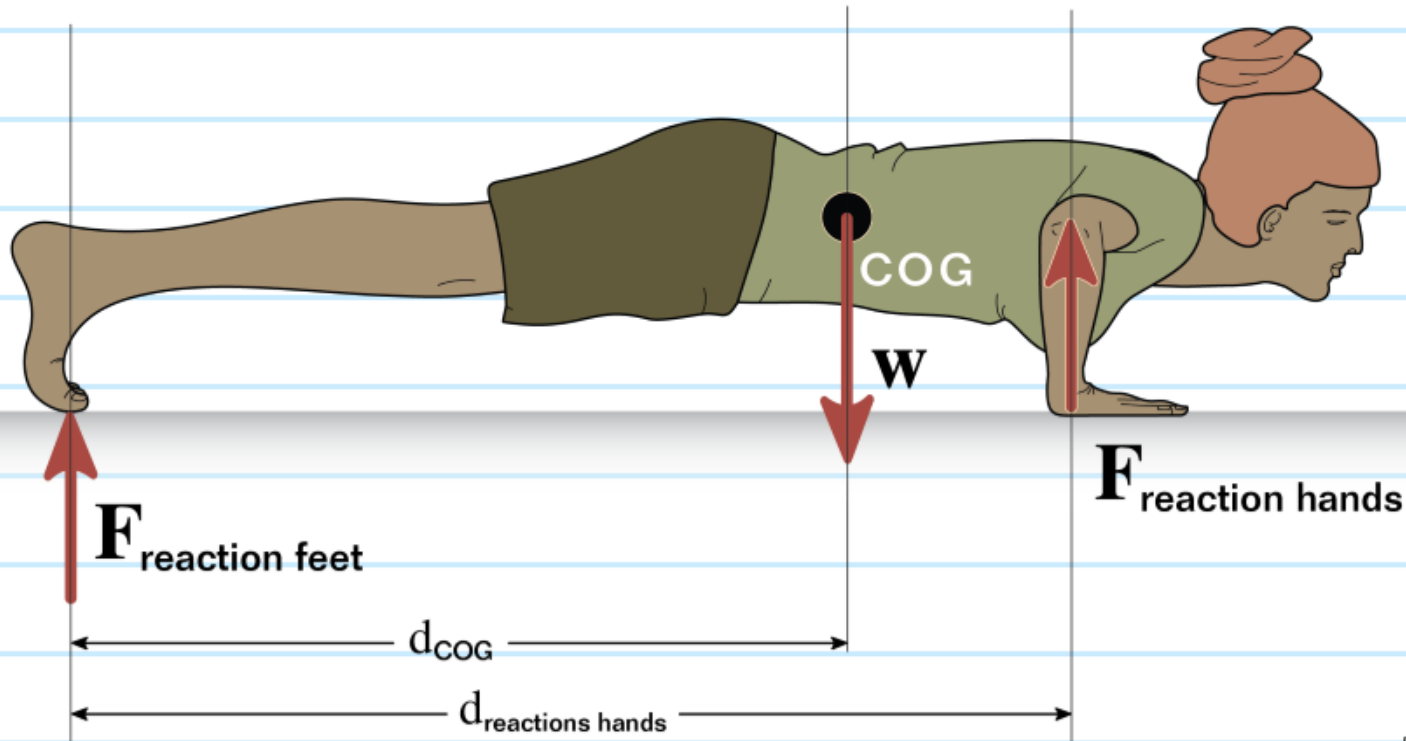


21-S-4-1-GD-003



An athlete is warming up before practice by doing some push-ups. If the athlete has a mass of m kg and they are in equilibrium, what are the reaction forces at their hands and feet?

(Assume $g = 9.81 \text{ m/s}^2$, $d_{\text{COG}} = \underline{\underline{d_{\text{COG}}}}$ m and $d_{\text{reaction hands}} = \underline{\underline{d_{\text{rh}}}}$ m)

given

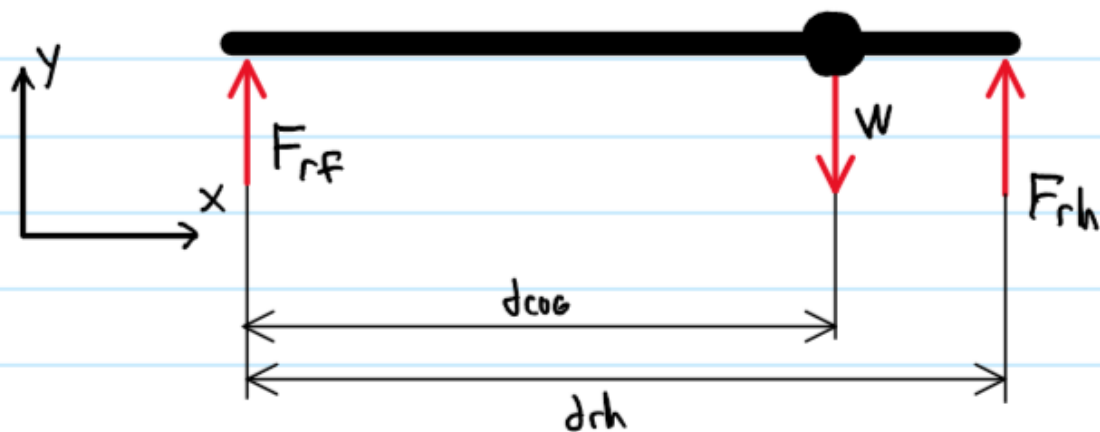
$m, g, d_{\text{cog}}, d_{\text{rh}}$

find

F

$$W = mg$$

FBD



Equation of Equilibrium

$$\sum F_x = 0$$

$$\sum F_y = 0 = \underset{\times}{F_{rf}} + \underset{\times}{F_{rh}} - \underset{\checkmark}{W} \quad \textcircled{1}$$

Moments

$$\textcircled{+} \sum M_{\text{pivot}} = 0 = (F_{rh})(d_{rh}) - W(d_{\text{cog}}) \quad \textcircled{2}$$

$$\underline{F_{rh} = \frac{W d_{\text{cog}}}{d_{rh}}}$$

solve ①

$$\underline{F_{rf} = W - F_{rh}}$$