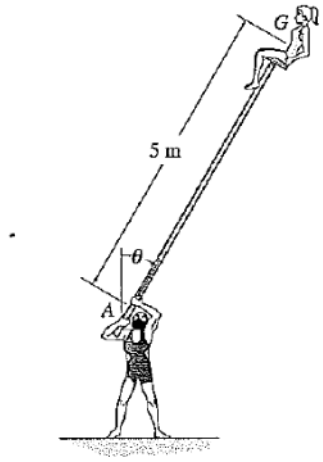
Moments (Solution)

February 22, 2020 1:00 PM

3-23. As part of an acrobatic stunt, a man supports a girl who has a weight of 500 N (≈ 50 kg) and is seated on a chair on top of the pole. If her center of gravity is at G, and if the maximum counterclockwise moment the man can exert on the pole at A is 350 N · m, determine the maximum angle of tilt, θ, which will not allow the girl to fall, i.e., so her clockwise moment about A does not exceed 350 N · m.



Prob. 3–23

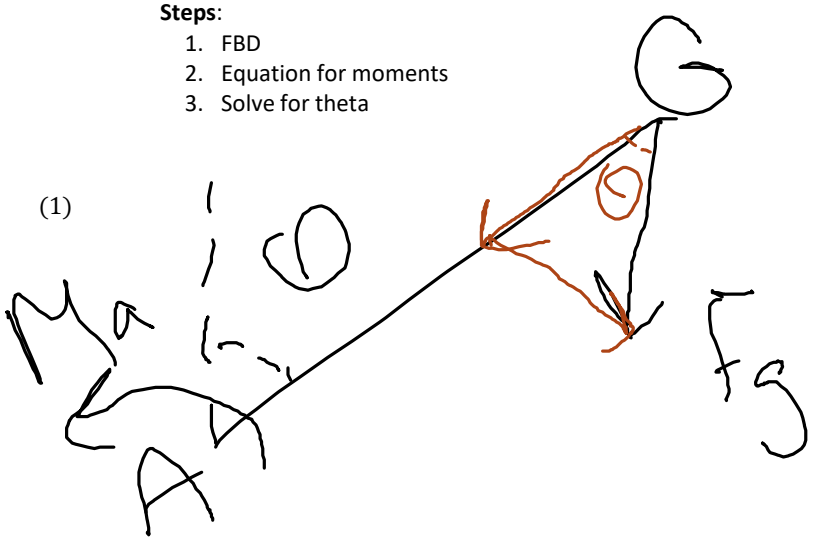
Q3-23 from Statics & Mechanics of Materials 2e by Hibbeler

Why: Need to find the angle to allow the gymnasts to safety perform the stunt.

Steps:

1. FBD
2. Equation for moments
3. Solve for theta

(1)



(2) $\sum M_A = 0 = 350 - (500\sin(\theta))(5)$

(3) $\sin(\theta) = \dfrac{350}{5 * 500}$

$\theta = \sin^{-1}\left(\dfrac{350}{5x500}\right) = 8.05°$

$\theta < 8.05°$