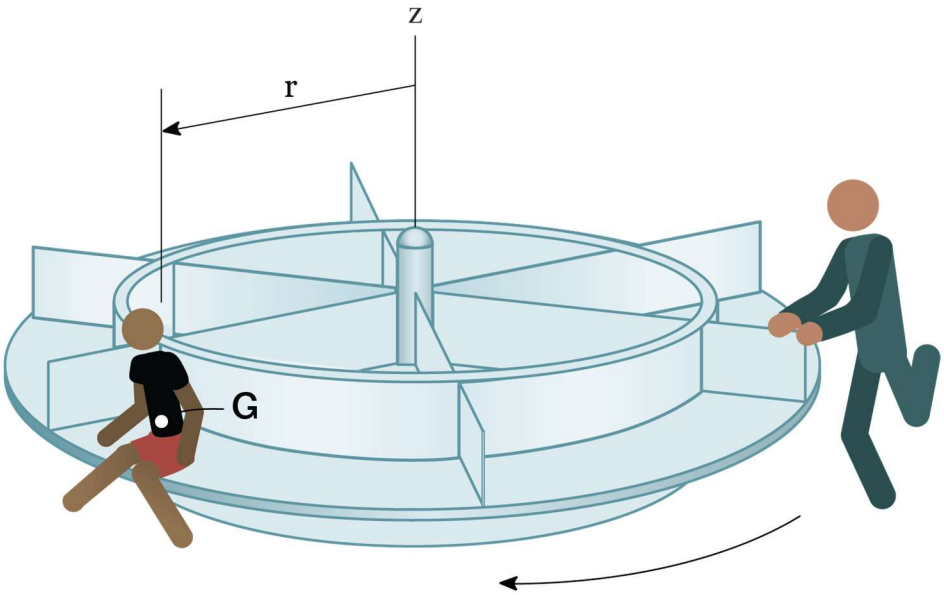
**21-P-FA-AG-008**






A person with mass *m* is sitting on a turntable of radius *r*. The person's friend pushes the turntable clockwise from rest with a force of *F* for *t* seconds. When the friend stops pushing, what is the person's angular velocity (assuming they don't slip)? (Neglect the mass of the turntable.) If the coefficient of static friction between the person and the turntable is $\mu_s$, at what angular velocity would the person start to slip?

ANSWER:

First we find the angular velocity by using finding the tangential velocity.

$$F = ma \rightarrow a_{tangential} = \frac{F}{m}$$

$$v = v_0 + at \rightarrow v_{tangential} = 0 + \frac{F}{m} \cdot t$$

$$\dot{\theta} = \frac{v_{tangential}}{r}$$

Then, we find the maximum angular velocity before the person starts to slip by balancing the radial forces.

$$\sum F_r = 0 = F_{centripetal} - F_f = m \cdot a_{centripetal} - F_N \cdot \mu_s = m\left(\dot{\theta}^2 \cdot r - g \cdot \mu_s\right)$$

$$\dot{\theta} = \sqrt{\frac{g \cdot \mu_s}{r}}$$