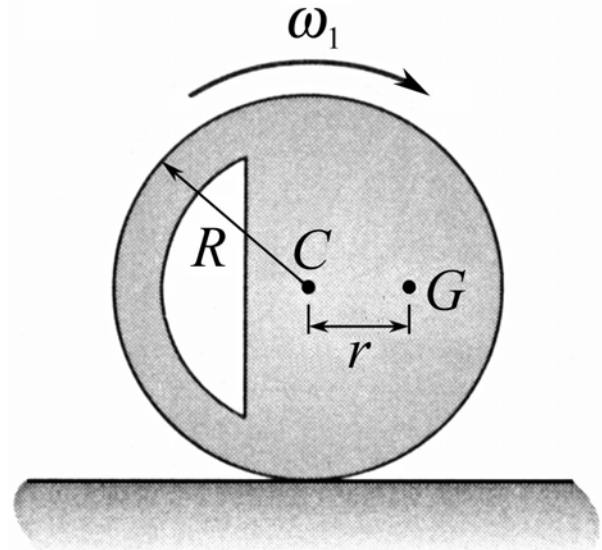


MEEG 2013 [Quiz #7.m23.072](#)

1. (4 points) Define (a) *work of a moment* on a body, (b) *kinetic energy* of a rigid body in plane motion.

2. (6 points) A 16.1-lb wheel rolls without slipping with  $\omega_1 = 5 \text{ rad/s}$   $\curvearrowright$  in the position shown, where  $G$  is its mass center,  $R = 15 \text{ in.}$ ,  $r = 8 \text{ in.}$ , and central radius of gyration  $\bar{k} = 9 \text{ in.}$  Determine its angular velocity  $\omega_2$  in the next position where  $G$  is directly below its center  $C$ .



1. (a) *Work of a moment* on a body is equal to the moment on the body times the angular displacement of the body in the direction of the moment. (b) *Kinetic energy of a rigid body* in plane motion is equal to one half of the mass moment of inertia of the body about the velocity center of the body times the square of the angular speed of the body.

2.

$$T_1 + U_{1 \rightarrow 2} = T_2$$

$$\begin{aligned} & \frac{1}{2} \left[ \frac{16.1}{32.2} \left( \frac{9}{12} \right)^2 + \frac{16.1}{32.2} \left( \frac{17}{12} \right)^2 \right] (5)^2 + 16.1 \left( \frac{8}{12} \right) \\ &= \frac{1}{2} \left[ \frac{16.1}{32.2} \left( \frac{9}{12} \right)^2 + \frac{16.1}{32.2} \left( \frac{7}{12} \right)^2 \right] \omega_2^2 \end{aligned}$$

$$\omega_2 = 10.8954$$

$$\omega_2 = 10.90 \text{ rad/s } \curvearrowright$$