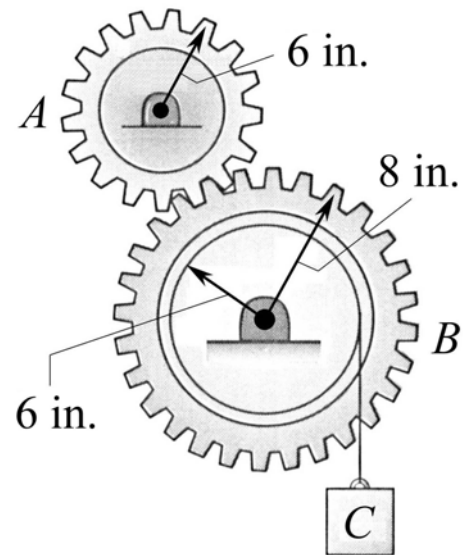


MEEG 2013 Quiz #6.m21.072

1. (2 points) Including a *sketch*, define the *vectors* to be shown on the effective-force diagram of a rigid body in plane motion.

2. (8 points) The central radii of gyration of the 100-lb gear A and 200-lb gear B, as shown, are 4.5 in. and 6.5 in., respectively. If block C weighs 16.1 lb and the system is released from rest, determine (a) α_A of gear A, (b) the magnitude F of the force exerted on gear A by gear B.



2. $FBD = EFD$ for gear A: ①

$$\frac{6}{12}F = \frac{100}{32.2} \left(\frac{4.5}{12} \right)^2 \alpha_A \quad ①$$

$FBD = EFD$ for gear B and block C ①

$$\frac{8}{12}F - \frac{6}{12}(16.1) = -\frac{200}{32.2} \left(\frac{6.5}{12} \right)^2 \alpha_B - \frac{6}{12} \left[\frac{16.1}{32.2} \left(\frac{6}{12} \alpha_B \right) \right] \quad ②$$

Kinematics: $6\alpha_A = 8\alpha_B$ ①

$$\alpha_A = 3.9406 \quad \alpha_B = 2.9555 \quad F = 3.4419$$

$$\alpha_A = 3.94 \text{ rad/s}^2 \curvearrowright \quad ① \quad F = 3.44 \text{ lb} \quad ①$$