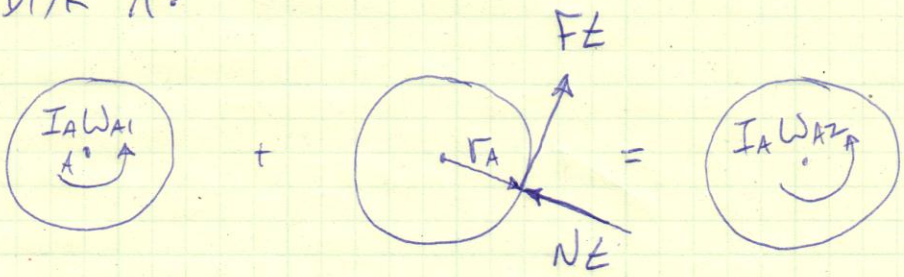
$W_A = 7.5^{LB}$, $r_A = \frac{6}{12} = \frac{1}{2}$ ft, $\omega_{A1} = 0$

$W_B = 10^{LB}$, $r_B = \frac{8}{12} = \frac{2}{3}$ ft, $\omega_{B1} = \left(900 \frac{REV}{MIN}\right)\left(\frac{MIN}{60\ S}\right)\left(\frac{2\pi}{REV}\right) = 30\pi \frac{RAD}{S}$

FIND ω_{B2}, TOTAL IMPULSE OF FRICTION ON A

PRINCIPLE OF IMPULSE AND MOMENTUM:

DISK A:



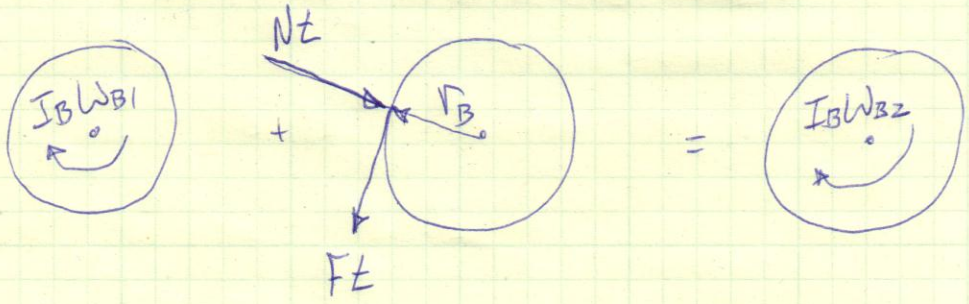
ANG. MOM. ABOUT A $\circlearrowleft$:

$I_A\omega_{A1}^{\,0} + Ft \cdot r = I_A\omega_{A2}$

$Ft = \frac{I_A\omega_{A2}}{r_A} = \frac{1}{r_A} \cdot \left(\frac{1}{2} m_A r_A^2\right)\omega_{A2}$

$$\boxed{Ft = \frac{1}{2} m_A r_A \omega_{A2}} \quad (1)$$

DISK B:



ANG. MOM. ABOUT B ↻:

$$-I_B \omega_{B1} + Ft \cdot r_B = -I_B \omega_{B2}$$

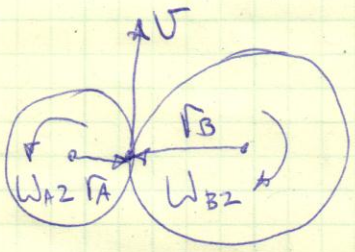
$$Ft = \frac{I_B}{r_B}\cdot(\omega_{B1} - \omega_{B2}) = \frac{\frac{1}{2} m_B r_B^2}{r_B}\cdot(\omega_{B1} - \omega_{B2})$$

$$\boxed{Ft = \tfrac{1}{2} m_B r_B (\omega_{B1} - \omega_{B2})} \quad (2)$$

SET (1) = (2)

$$\tfrac{1}{2} m_A r_A \omega_{A2} = \tfrac{1}{2} m_B r_B (\omega_{B1} - \omega_{B2})$$

KINEMATICS: FOR NO SLIPPING,



$$v = r_B \omega_{B2}$$

$$v = r_A \omega_{A2}$$

$$r_A \omega_{A2} = r_B \omega_{B2}$$

$$\omega_{A2} = \left(\frac{r_B}{r_A}\right)\omega_{B2}$$

$$m_A r_A \left[\left(\frac{r_B}{r_A}\right)\omega_{B2}\right] = m_B r_B (\omega_{B1} - \omega_{B2})$$

$$m_A \omega_{B2} = m_B \omega_{B1} - m_B \omega_{B2}$$

$$\omega_{B2}(m_A + m_B) = m_B \omega_{B1}$$

$$\omega_{B2} = \left(\frac{m_B}{m_A + m_B}\right) \cdot \omega_{B1}$$

$$W = mg \;, \quad m = \frac{W}{g}$$

$$\omega_{B2} = \left(\frac{W_B}{W_A + W_B}\right) \cdot \omega_{B1}$$

$$\boxed{\omega_{B2} = \left(\frac{10}{7.5 + 10}\right)\left(30\pi \frac{RAD}{s}\right) = 17.14\pi \frac{RAD}{s} = 514.3\ RPM}$$

$$F_t = \frac{1}{2} m_A r_A \omega_{A2} = \frac{1}{2} m_A r_A \left(\frac{r_B}{r_A}\right) \omega_{B2} = \frac{1}{2} m_A r_B \omega_{B2}$$

$$F_t = \frac{1}{2}\left(\frac{W_A}{g}\right) r_B \omega_{B2}$$

$$\boxed{F_t = \frac{1}{2} \cdot \left(\frac{7.5\ LB}{32.2 \frac{ft}{s^2}}\right)\left(\frac{2}{3} ft\right)\left(17.14\pi \frac{RAD}{s}\right) = 4.181\ LB\text{-}s}$$