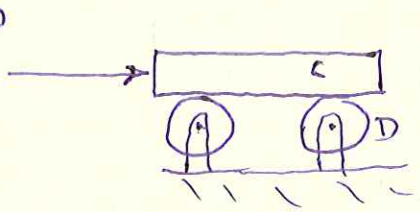
PROB. 17-34

$m_C = 9^{kg}$, $m_D = 6^{kg}$, $r = 0.08^{m}$, $v_0 = 0$, $P = 30^{N}$

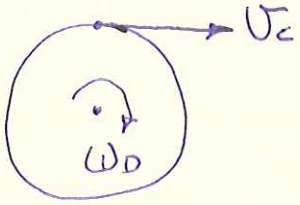
FIND v_C AFTER $x - x_0 = 0.25^{m}$



WORK AND ENERGY:

$T_1 + U_{1-2} = T_2$

$T_1 = 0$, $U_{1-2} = P \cdot \Delta x$



$T_2 = \frac{1}{2} m_C v_C^2 + \frac{1}{2}(2 I_D \omega_D^2)$

$I_D = \frac{1}{2} m_D r^2$, $v_C = r\omega_D$, $\omega_D = \frac{v_C}{r}$

$T_2 = \frac{1}{2} m_C v_C^2 + \left(\frac{1}{2} m_D r^2\right)\left(\frac{v_C}{r}\right)^2$

$T_2 = \frac{v_C^2}{2}(m_C + m_D)$

$0 + P \cdot \Delta x = \frac{v_C^2}{2}(m_C + m_D)$

$$v_C = \sqrt{\frac{2P \cdot \Delta x}{(m_C + m_D)}} = \sqrt{\frac{2(30^{N})(0.25^{m})}{[(9^{kg}) + (6^{kg})]}}$$

$$\boxed{v_C = 1.0 \frac{m}{s} \rightarrow}$$