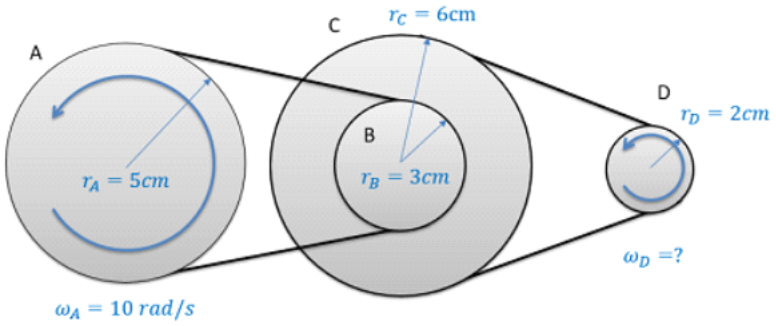
Problem 1

If the input pulley A as shown below is rotating at a rate of 10 rad/s, what is the speed of the output pulley at D? How many rotations does D go through in the time it takes for A to make one full rotation?



$$r_A \omega_A = r_B \omega_B \rightarrow (5\,cm)(10\,rad/s) = (3\,cm)(\omega_B)$$

$$\omega_B = 16.67\,rad/s$$

$$\omega_B = \omega_C = 16.67\,rad/s$$

$$r_C \omega_C = r_D \omega_D \rightarrow (6\,cm)(16.67\,rad/s) = (2\,cm)(\omega_D)$$

$$\boxed{\omega_D = 50\,rad/s}$$

$$\theta_A(t) = 10(t) = 2\pi\,rad \rightarrow t = \frac{2\pi}{10}$$

$$\theta_D(t) = 50(t) = \boxed{31.415\,rad = 5\,rotations}$$