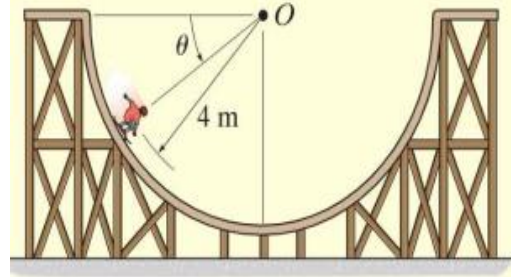
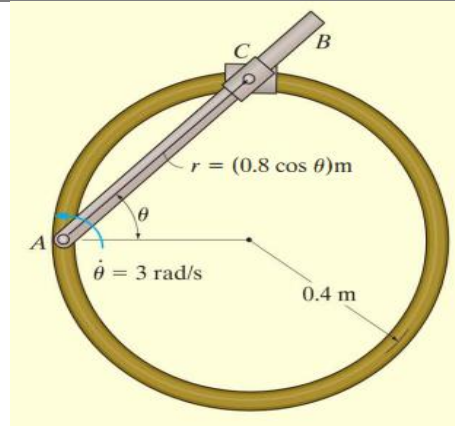


Examples on Force, Mass, and Acceleration (Curvilinear Motion)

1. The 60-kg skateboarder in Fig. a coasts down the circular track. If he starts from rest when $\theta = 0^\circ$, determine the magnitude of the normal reaction the track exerts on him when $\theta = 60^\circ$. Neglect his size for the calculation.



2. The smooth 0.5-kg double-collar in Fig. b can freely slide on arm AB and the circular guide rod. If the arm rotates with a constant angular velocity of $\dot{\theta} = 3 \text{ rad/s}$, determine the force the arm exerts on the collar at the instant $\theta = 45^\circ$. Motion is in the horizontal plane.



3. Beginning from rest when $\theta = 20^\circ$, a 35-kg child slides with negligible friction down the sliding board which is in the shape of a 2.5-m circular arc as shown in fig 3. Determine the tangential acceleration and speed of the child, and the normal force exerted on her (a) when $\theta = 30^\circ$ and (b) when $\theta = 90^\circ$.
4. The robot arm is elevating and extending simultaneously as shown in fig 4. At a given instant, $\theta = 30^\circ$, $\dot{\theta} = 40 \text{ deg/s}$, $\ddot{\theta} = 120 \text{ deg/s}^2$, $l = 0.5 \text{ m}$, $\dot{l} = 0.4 \text{ m/s}$, and $\ddot{l} = -0.3 \text{ m/s}^2$. Compute the radial and transverse forces F_r and F_θ that the arm must exert on the gripped part P, which has a mass of 1.2 kg. Compare with the case of static equilibrium in the same position.

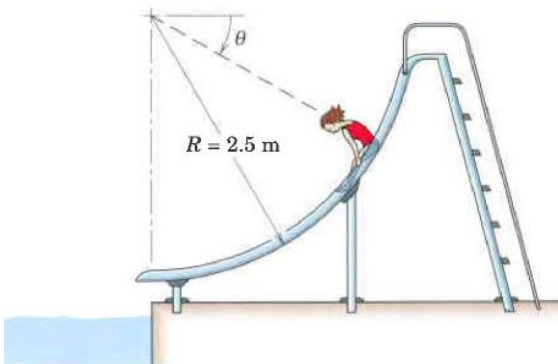


Fig 3

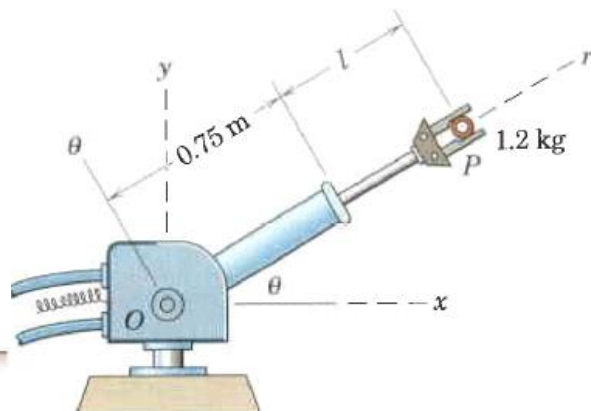


Fig 4