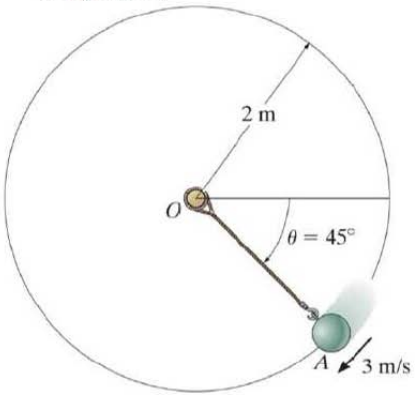
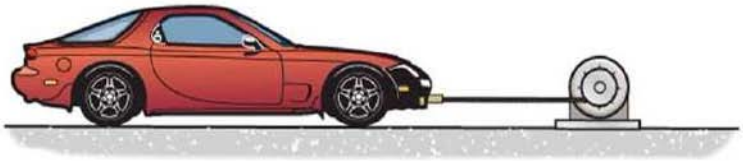
2. If the 10-kg ball has a velocity of 3 m/s when it is at the position A, along the ***vertical path***, determine the tension in the cord at this position and the magnitude of acceleration of the ball at this position.

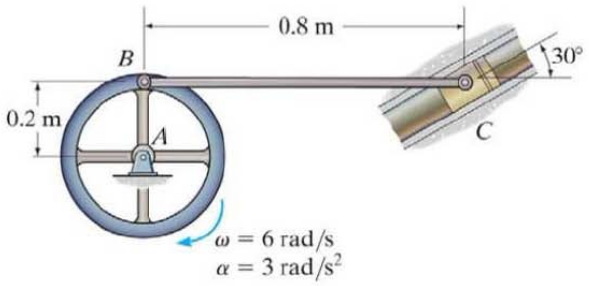


3. The 2-Mg car is being towed by a winch. If the winch exerts a force of $T = (100s)$ N on the cable, where s is the displacement of the car in meters, determine the speed of the car when $s = 10$ m, starting from rest. Neglect friction.

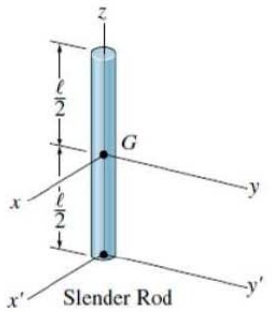


4. The 15-Mg freight car A and 25-Mg freight car B travel towards each other with the velocities shown. If the coefficient of restitution between the cars is $e = 0.6$, determine the velocity of each car just after the collision. (*Hint*: $e = \dfrac{(v_B)_2 - (v_A)_2}{(v_A)_1 - (v_B)_1}$)

5. At the instant shown, wheel A rotates with angular velocity and angular acceleration shown in the figure. Determine:
   (a) the angular velocity of link BC and the velocity of piston C at this instant;
   (b) the angular acceleration of link BC and the acceleration of piston C at this instant;
   (c) the angular momentum of link BC about point A at this instant if link BC has a mass of 5-kg and can be treated as a uniform rod.

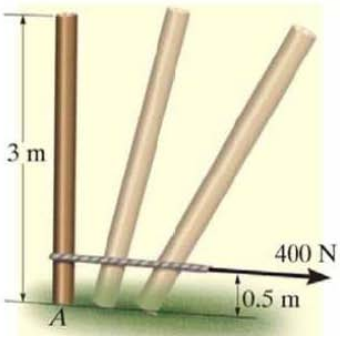


Hint:



$I_{xx} = I_{yy} = \frac{1}{12} m\ell^2 \quad I_{x'x'} = I_{y'y'} = \frac{1}{3} m\ell^2 \quad I_{z'z'} = 0$

6. The uniform slender pole shown has a mass of 100 kg. If the coefficients of static and kinetic friction between the end of the pole and the surface are $\mu_s = 0.3$ and $\mu_k = 0.25$, respectively, determine the pole's angular acceleration at the instant the 400-N horizontal force is applied. The pole is originally at rest.



7. The 60-kg rod OA is released from rest when $\theta = 0°$. Determine its angular velocity when $\theta = 45°$. The spring remains vertical during the motion and is unstretched when $\theta = 0°$.