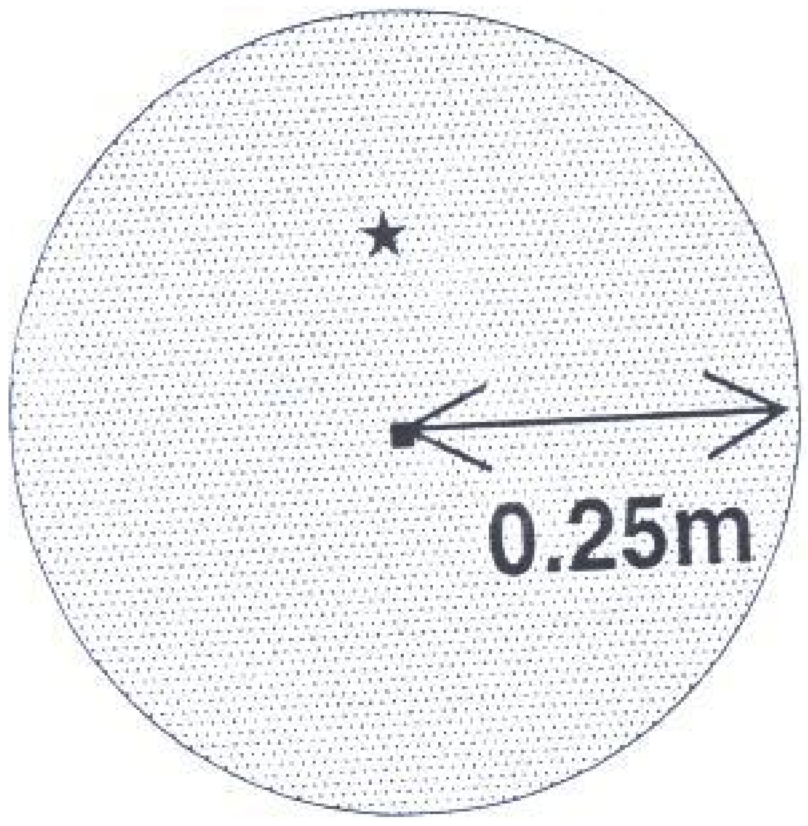
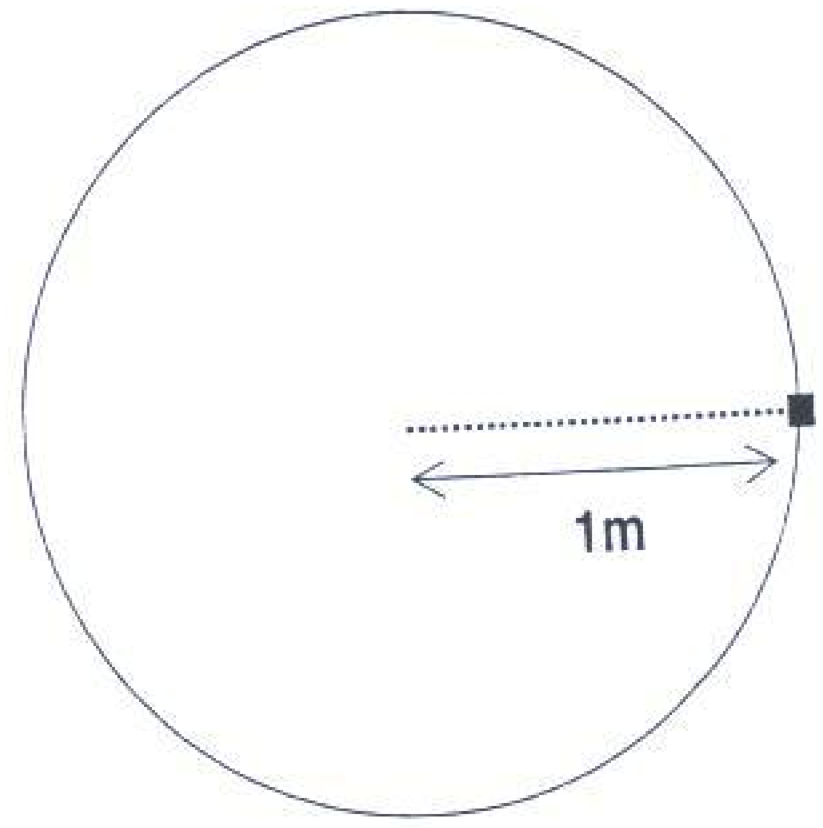
- The moment of inertia of a cylinder around the center of mass is $I_{\text{cm}} = \frac{1}{2}MR^2$ with $M = 0.5$kg the mass and radius $R = 0.25$m . Determine the moment of inertia of a cylinder around an axis which is displaced by half the radius of the wheel as indicated below by the star.
- A bead of mass $M = 1$kg is attached to a light ruler stick of length $1m$ which spins from its end at a rate of 2rad/s what is the kinetic energy of the system. Neglect the mass of the ruler stick.





(1)

$$I = Md^2 + I_{cm}$$

(1) $$I = M\left(\frac{R}{2}\right)^2 + \frac{1}{2}mR^2$$

$$I = \frac{3}{4}mR^2 = 0.023\ kgm^2$$

(2) $$KE = \frac{1}{2}I\omega_r^2$$

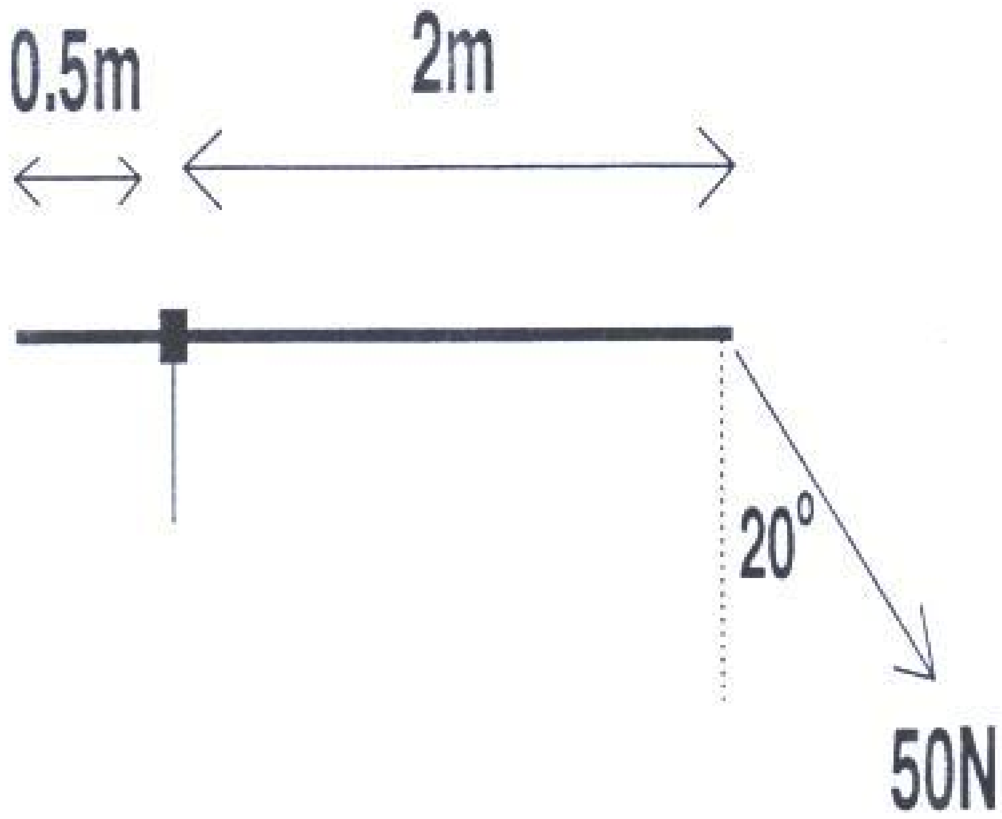
(2) $$KE = \frac{1}{2}(mR^2)\,\omega_r^2$$

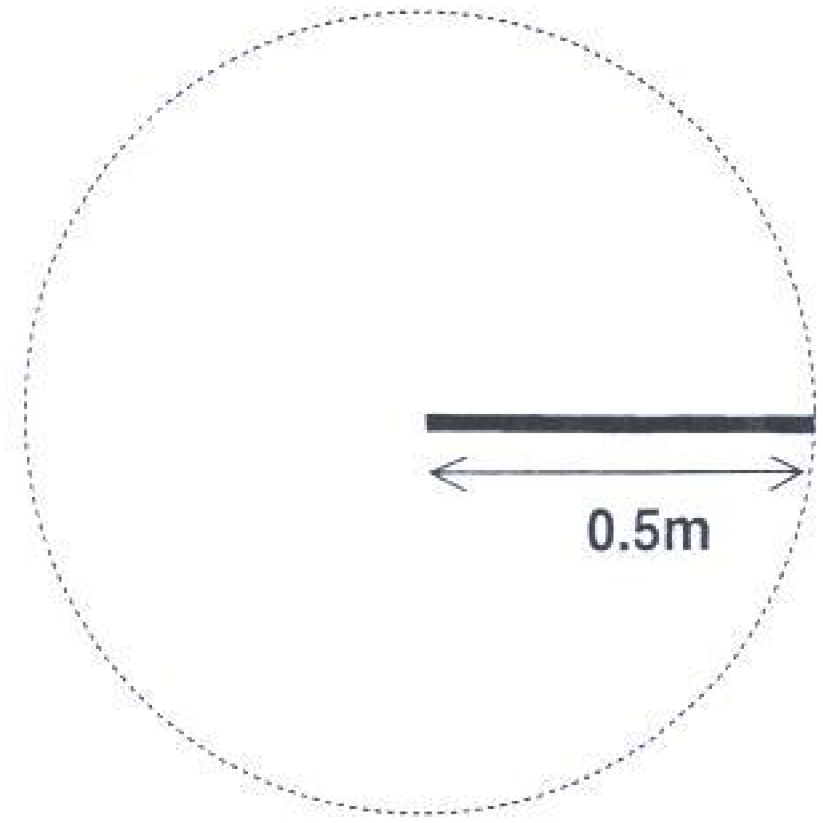
$$KE = \frac{1}{2}(1kg\cdot(1m)^2(2\,\tfrac{1}{s})^2$$

$$KE = 2J$$

- A person pulls down and out on the end of diving board with a force of 50N at an angle of 20° as shown below. The lengths of the board are indicated in the figure Calculate the torque vector of the person on the board around the pivot – indicate the magnitude and direction.

- A rod is spinning around its end as shown below. The rod has mass $M = 0.2\,\mathrm{kg}$ and length $L = 0.5\,\mathrm{m}$. Determine the moment of inertia from the supplied table copied from pg. 304. If the angular speed is 2 rev/s determine the angular momentum.





(1)

From r.h. rule

$$\tau = R F_{\perp} \; -\hat{k}$$

$$\tau = (2\,\mathrm{m})(50\,\mathrm{N} \cos 20^\circ) \; -\hat{k}$$

$$\tau = -93.9\,\hat{k}$$

(2)

$$L = I\,\omega_r$$

$$L = \left(\frac{1}{3} M L^2\right) \omega_r$$

$$L = \frac{1}{3}\, 0.2\,\mathrm{kg}\,(0.5\,\mathrm{m})^2\, \frac{4\pi}{s}$$

$$L = 0.21\ \mathrm{kg}\,\frac{m^2}{s}$$

$$\omega_r\ \mathrm{rad} = \frac{2\,\mathrm{rev}}{s}$$

$$\omega_r\ \mathrm{rad} = 2 \cdot \frac{2\pi}{s}\ \mathrm{rad}$$

$$\omega_r = \frac{4\pi}{s}$$

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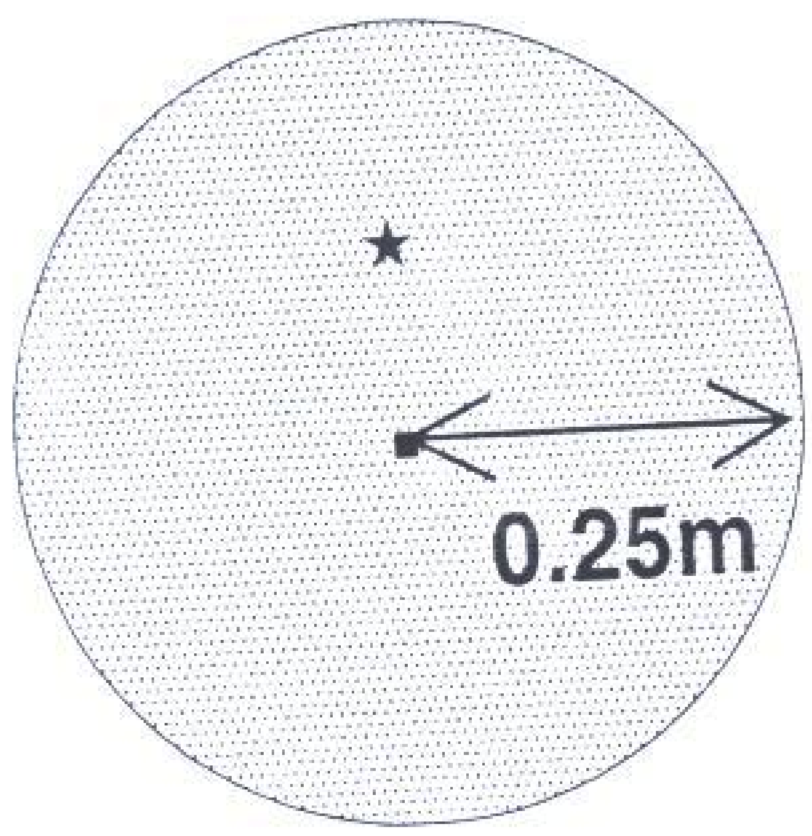

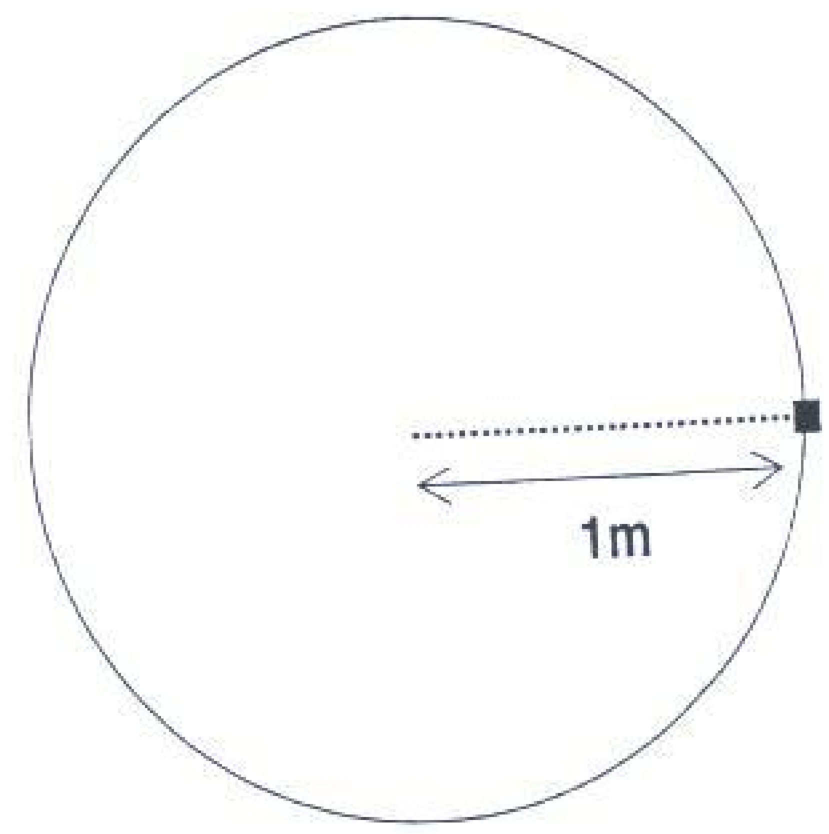

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