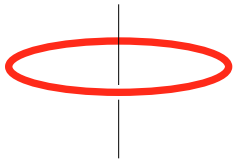
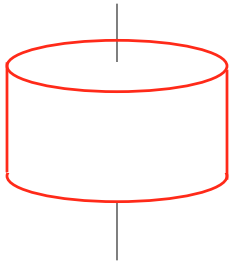
## Problem 8.54

Each object has a radius of .18 meters and a mass of 2.4 kg. Each rotates around its center with angular velocity 35 rad/sec. Find the angular momentum of each.

a.) a hoop



b.) a solid cylinder





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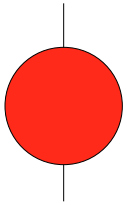
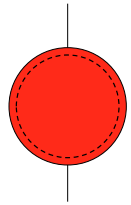
Each object has a radius of .18 meters and a mass of 2.4 kg. Each rotates around its center with angular velocity 35 rad/sec. Find the angular momentum of each.

c.) a solid sphere



d.) a hollow spherical shell





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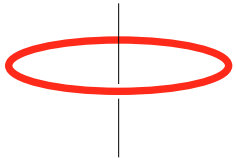
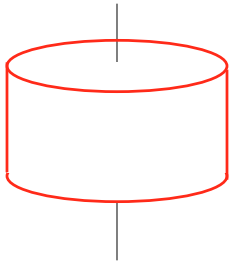
a.) a hoop



$$L_{cm} = I_{cm}\omega$$
$$= \left(mR^2\right)\omega$$
$$= \left[(2.4\text{ kg})(.18\text{ m})^2\right](35\text{ rad/sec})$$
$$= 2.72\text{ kg}\bullet\text{m}^2/\text{sec}$$

b.) a solid cylinder



$$L_{cm} = I_{cm}\omega$$
$$= \left(\frac{1}{2}mR^2\right)\omega$$
$$= \left[\frac{1}{2}(2.4\text{ kg})(.18\text{ m})^2\right](35\text{ rad/sec})$$
$$= 1.36\text{ kg}\bullet\text{m}^2/\text{sec}$$



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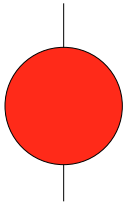
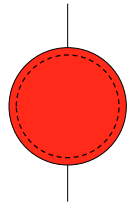
c.) a solid sphere



$$L_{cm} = I_{cm}\omega$$
$$= \left(\frac{2}{5}mR^2\right)\omega$$
$$= \left[\frac{2}{5}(2.4\text{ kg})(.18\text{ m})^2\right](35\text{ rad/sec})$$
$$= 1.09\text{ kg}\bullet\text{m}^2/\text{sec}$$

d.) a hollow spherical shell



$$L_{cm} = I_{cm}\omega$$
$$= \left(\frac{2}{3}mR^2\right)\omega$$
$$= \left[\frac{2}{3}(2.4\text{ kg})(.18\text{ m})^2\right](35\text{ rad/sec})$$
$$= 1.82\text{ kg}\bullet\text{m}^2/\text{sec}$$