

26. $l = ?$ $m = 2 \text{ kg}$ $\vec{r} = 3 \text{ m } 45^\circ$
 $\vec{v} = 4 \text{ m/s}, 195^\circ$

$$l = m (\vec{r} \times \vec{v})$$

$$= 2 \left((3)(4) \sin 30^\circ \right) = +12 \text{ kg m}^2/\text{s} \hat{k}$$

* By RHR

c) $\tau = ?$ $F = 2 \text{ N}, 75^\circ$

$$\tau = \vec{r} \times \vec{F} = (3)(2) \sin 30^\circ$$

$$= +3 \text{ N } \hat{k}$$

29. $l = ?$ $l = l_1 + l_2$

$$\vec{l} = \vec{r} \times \vec{p}$$

$$\vec{l}_1 = (1.5) \times (6.5)(2.2)$$

$$\vec{l}_1 = -21.45 \text{ kgm}^2/\text{s}$$

$$\vec{l}_2 = (2.8) \times (3.1)(3.6)$$

$$\vec{l}_2 = 31.25 \text{ kgm}^2/\text{s}$$

P_1	P_2
$m_1 = 6.5 \text{ kg}$	$m_2 = 3.1 \text{ kg}$
$V_1 = 2.2 \text{ m/s}$	$V_2 = 3.6 \text{ m/s}$
$r_1 = 1.5 \text{ m}$	$r_2 = 2.8 \text{ m}$

$$l = l_1 + l_2$$

$$l = -21.45 + 31.25$$

$$l = 9.8 \text{ kgm}^2/\text{s}$$

33. $l = ?$ $m = 3 \text{ kg}$ $\vec{r} = 3 \text{ m} \hat{i} + 8 \text{ m} \hat{j}$
 $\vec{v} = 5 \text{ m/s} \hat{i} - 6 \text{ m/s} \hat{j}$
 $\vec{F} = -7 \text{ N} \hat{i} + 0 \text{ N} \hat{j}$

$$l = m(\vec{r} \times \vec{v})$$

$$= 3 \left[-(3)(6) \hat{k} - (8)(5) \hat{k} \right] = -174 \text{ kgm}^2/\text{s} \hat{k}$$

$$\tau = ? \quad \tau = \vec{r} \times \vec{F}$$

$$= +(8)(7) \hat{k} = 56 \text{ Nm} \hat{k}$$

c)

$$\frac{dl}{dt} = ? \quad \Sigma \tau = \frac{dl}{dt}$$

$$56 \text{ kgm}^2/\text{s} \hat{k} = \frac{dl}{dt}$$

37. a) $I = ?$

$$I = I_{\text{rod}} + I_1 + I_2 + I_3$$

$$= \left[\frac{1}{12} mL^2 + mh^2 \right] + m_1 r_1^2 + m_2 r_2^2 + m_3 r_3^2$$

$$= \left[\frac{1}{12} (0) (3d)^2 + (0) (1.5d)^2 \right] + md^2 + m(2d)^2 + m(3d)^2$$

$$= 14md^2 = 14(0.023)(0.12)^2$$

$$I = 4.63 \times 10^{-3} \text{ kgm}^2$$

b) $l_2 = ?$ $l = m(\vec{r} \times \vec{v})$

$$= (m)(r)(\omega r) \sin 90^\circ$$

$$= mr^2 \omega \quad (= I \omega)!$$

$$= (0.023)(.24)^2 (0.85)$$

$$l = 1.13 \times 10^{-3} \text{ kgm}^2/\text{s}$$

c) $L = ?$ $L = I \omega$

$$= (4.63 \times 10^{-3})(0.85)$$

$$L = 3.91 \times 10^{-3} \text{ kgm}^2/\text{s}$$