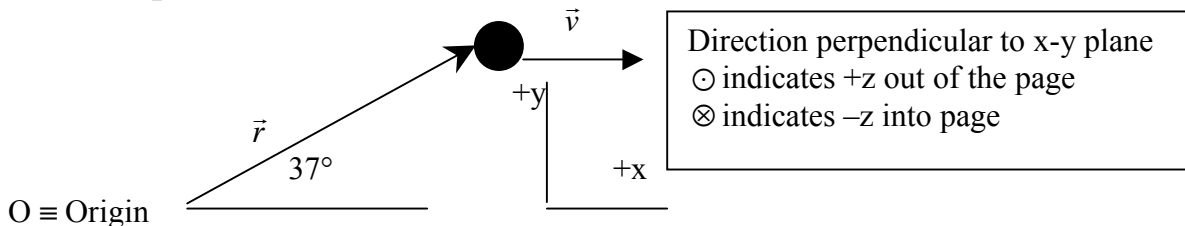


PHYS1211, QUIZ 7, Tuesday 26 November 2013

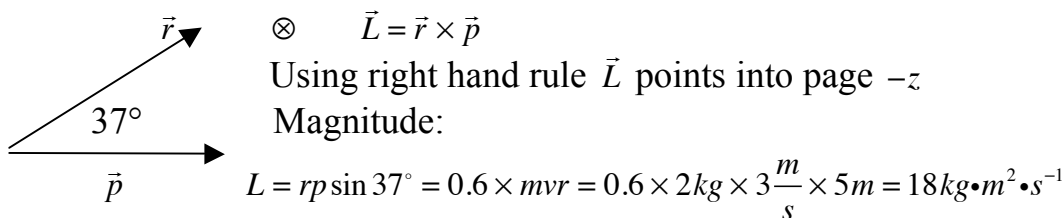
In question 1, 2 and 3, select the one correct answer.



In above diagram, a ball of mass 2kg, travels horizontally at 3 m/s. Its position from the origin (O) is  $r = 5m$  at  $37^\circ$ , above the horizontal.

1. The angular momentum with respect to (wrt) the origin is:

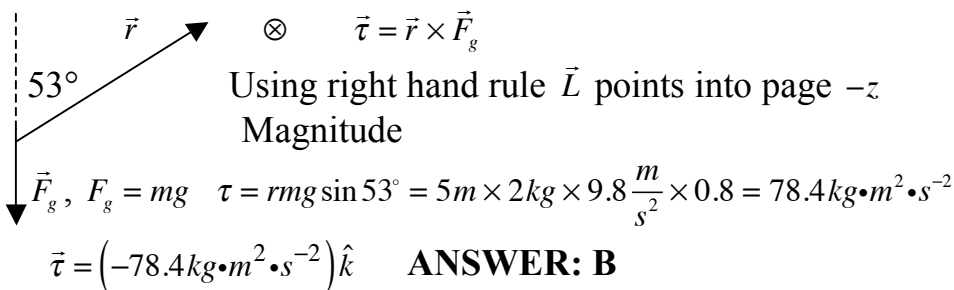
- A)  $\vec{L} = (30\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{i}$     B)  $\vec{L} = (-18\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$     C)  $\vec{L} = (24\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$   
 D)  $\vec{L} = (30\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$     E) None of the above



$\vec{L} = (-18\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$     **ANSWER: B**

2. The torque due to gravity with respect to (wrt) the origin is:

- A)  $\vec{\tau} = (-98\text{kg}\cdot\text{m}^2\cdot\text{s}^{-2})\hat{j}$     B)  $\vec{\tau} = (-78.4\text{kg}\cdot\text{m}^2\cdot\text{s}^{-2})\hat{k}$     C)  $\vec{\tau} = (58.8\text{kg}\cdot\text{m}^2\cdot\text{s}^{-2})\hat{k}$   
 D)  $\vec{\tau} = (-78.4\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$     E)  $\vec{\tau} = (58.8\text{kg}\cdot\text{m}^2\cdot\text{s}^{-1})\hat{k}$



3. The magnitude of the angular momentum will:

- A) Increase    B) Decrease    C) Zero

Since  $\vec{\tau} = d\vec{L} / dt$  is in the  $-z$  direction, the rate of change in  $\vec{L}$  is also  $-z$ . Since  $\vec{L}$  is also  $-z$  direction, magnitude of  $\vec{L}$  will increase **ANSWER:A**.

**FINAL COMMENT:** Angular momentum  $\vec{L}$  and Torque  $\vec{\tau}$  depend on the origin (O). For example,  $\vec{L} = 0$  and  $\vec{\tau} = 0$  may be zero for origin O, but nonzero  $\vec{L} \neq 0$  and  $\vec{\tau} \neq 0$  in another origin  $O'$ .