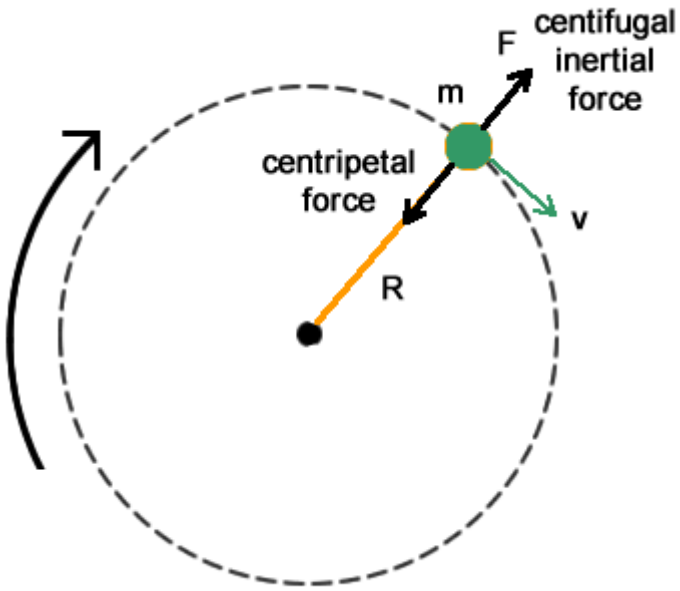
Answer on Question#75920 - Physics / Mechanics | Relativity

Question:

An object is suspended by a thread of 50 cm long and both the object and the thread move along in a horizontal circle with 125 rpm. If the mass of the object is 10 kg,
(a) Determine the following for the rotating object ,
(i) the centripetal acceleration
(ii) the centripetal force
(iii) the centrifugal force
(b) Draw a neat sketch explaining the problem and interpret your solution briefly.

Answer:



Centripetal acceleration:

$$a = \frac{v^2}{R} = \frac{(rpm \times 2\pi \times R \times 60^{-1})^2}{R} = \frac{(125\ rpm \times 2\pi \times 0.5\ m \times 60^{-1}\ s^{-1}\ )^2}{0.5} = 85.7\ \frac{m}{s}$$

Centripetal force:

$$F_{cp} = ma = 10\ kg \times 85.7 \frac{m}{s} = 857\ N$$

Centrifugal force:

$$\overrightarrow{F_{cf}} = -\overrightarrow{F_{cp}} \ \ and \ \ \left|\overrightarrow{F_{cf}}\right| = ma = 857\ N$$