Answer on Question #76026, Physics Mechanics Relativity

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.

Solution.

(a) The centripetal acceleration

$$f = \frac{125\ rpm}{60\ sec} = 2.08\ rps$$

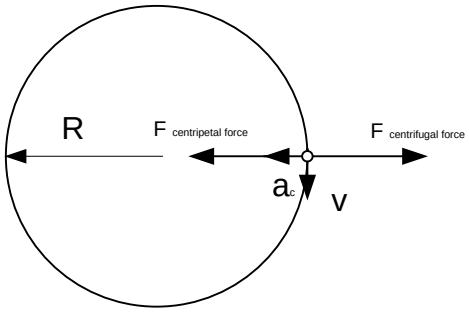
$$\omega = 2 \cdot \pi \cdot f = 2 \cdot 3.14 \cdot 2.08 = 13.08\ s^{-1}$$

$$a_c = \omega^2 \cdot R = 13.08^2 \cdot 0.5 = 85.57\ \frac{m}{s^2}$$

$$\mathrm{F_{centrifugal\ force}} = \mathrm{m} \cdot \mathrm{a_c} = 10 \cdot 85.57 = 855.7\ \mathrm{N}$$

$$\mathrm{F_{centripetal\ force}} = -\mathrm{F_{centrifugal\ force}} = -855.7\ \mathrm{N}$$

(b)



Answer:

$$a_c = 85.57\ \frac{m}{s^2}$$

$$\mathrm{F_{centrifugal\ force}} = 855.7\ \mathrm{N}$$

$$\mathrm{F_{centripetal\ force}} = -855.7\ \mathrm{N}$$