Question #73910, Physics / Mechanics | Relativity|

Calculate the force necessary to keep a mass 0.2kg moving in a horizontal circle of radius 0.5m with a period of 0.5s. What is the direction of the force?

Need to find: F_c - ?

m = 2 kg

R = 0.5 m

T = 0.5 s

Solution:

From Newton's second law a force will cause an $- \overrightarrow{F_c} = m \cdot \vec{a}$.

The acceleration of an object moving in a circle can be determined by either two of the following equations.

$$a = \frac{v^2}{R}$$

The speed of an object moving in a circle is given by the following equation –

$$v = \frac{2 \cdot \pi \cdot R}{T}, \quad a = \frac{4 \cdot \pi^2 \cdot R}{T^2}$$

Hence, $F_c = m \cdot \frac{4 \cdot \pi^2 \cdot R}{T^2}, \quad F = kg \cdot \frac{m}{s^2} = N, \quad F = 2 \cdot \frac{4 \cdot \pi^2 \cdot 0.5}{0.5^2} \approx 160$

Answer: F_c=160 N. The force is directed towards the center.

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