THE PHYSICS PUZZLER 💡

Consider a spinning carousel at an amusement park. The carousel has a radius of 4m and spins at a constant angular velocity. A rider on the carousel has a mass of 50kg and is experiencing a centripetal force of 200 N.

Calculate the angular velocity (in radians per second) that the rider experiences in the carousel and how long it takes for the carousel to complete one full revolution.

SOLUTIONS

Spin Speed Calculation

Centripetal Force Formula:

$$F_c = m\omega^2 r$$

Where Fc = 200n, m = 50 kg, and r = 4 m

Find Angular Velocity 'ω'

$$\omega^2 = \frac{F_c}{mr}$$

Rearrange the formula & sub in values:

$$\omega^2 = \frac{200N}{50kg \times 4m}$$

Solve:

$$\omega = \sqrt{1} = 1 \ rad/s$$

Therefore, the spin speed is 1 rad/s

SOLUTIONS 💡

Revolution Time Calculation

The period 'T' is related to angular velocity by:

$$T = \frac{2\pi}{\omega}$$

Sub in the known values and solve:

$$T = \frac{2\pi}{1\,rad/s} = 6.28s$$

Therefore, it takes 6.28 seconds for one full revolution of the carousel