Virtual Learning

Physics

Centripetal Force

May 6, 2020

Physics

Centripetal Force: May 6,2020

Objective/Learning Target:

Students will examine the concept of centripetal force and use it to solve some basic problems.

Quick Review #1

The speedometer in a car is driven by a cable connected to the shaft that turns the car's wheels. Will speedometer readings be more or less than actual speed when the car's wheels are replaced with smaller ones?

Quick Review #2

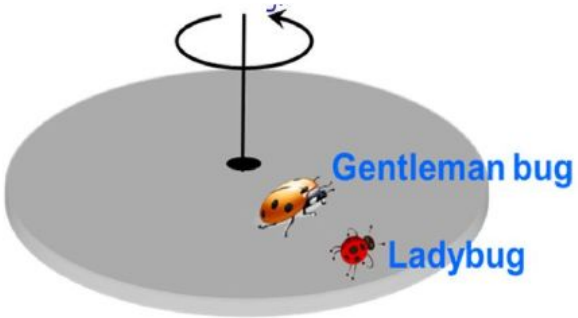
Keeping in mind the concept from the previous question, a taxi driver wishes to increase his fares by adjusting the size of his tires. Should he change to larger tires or smaller tires?

Quick Review Answers

1. The speedometer will read more; the rims of smaller wheels don't move as far per rotation, so a car with smaller wheels goes slower than the speedometer shows.

2. Smaller wheels; speedometer and odometer readings will be higher.

Centripetal Force



Link:[Centripetal Force]

Directions:

- Read through Centripetal Force.
- Work through any examples on a separate piece of paper before you scroll down to the solution.
- On a separate piece of paper complete the practice problems on the following slides.
- Check your answers.
- For additional practice check out the conceptual questions and the problems and exercises in the table of contents for the online text linked above.

Practice Problem #1

A 2-kg iron weight is swung in a horizontal circular path at the end of a 1.6-m length of rope. Assume the rope is very nearly horizontal and the weight's speed is 10 m/s. Calculate the tension in the rope.

Practice Problem #1 Answer

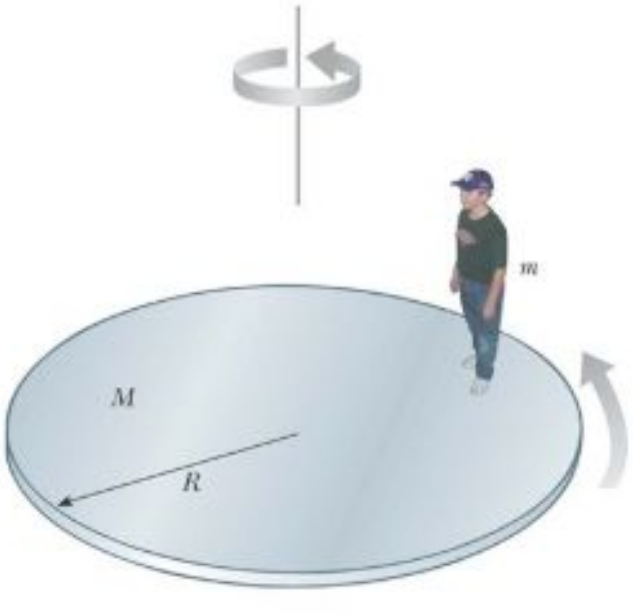
$$F_c = \frac{mv^2}{r}$$

$$= \frac{2.0\ kg\ \ X\ (10.0\ m/s)^2}{1.6\ m}$$

$$= 125\ N$$

Practice Problem #2

A 70-kg person sits on the edge of a horizontal rotating platform 2 m from the center of the platform and has a tangential speed of 3 m/s. Calculate the force of friction that keeps the person in place.

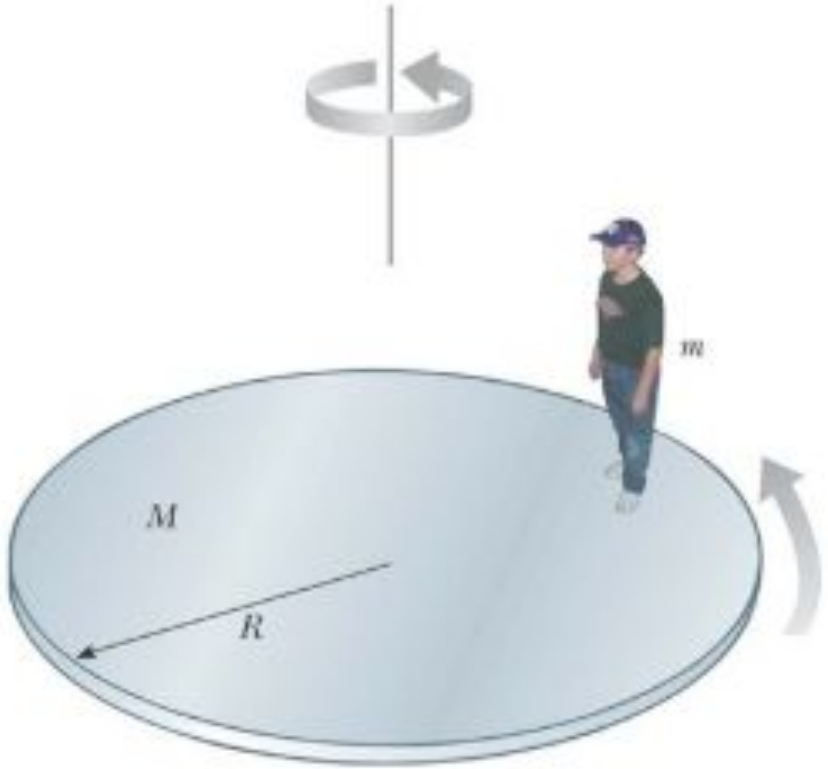


Practice Problem #2 Answer

$$F_c = \frac{mv^2}{r}$$

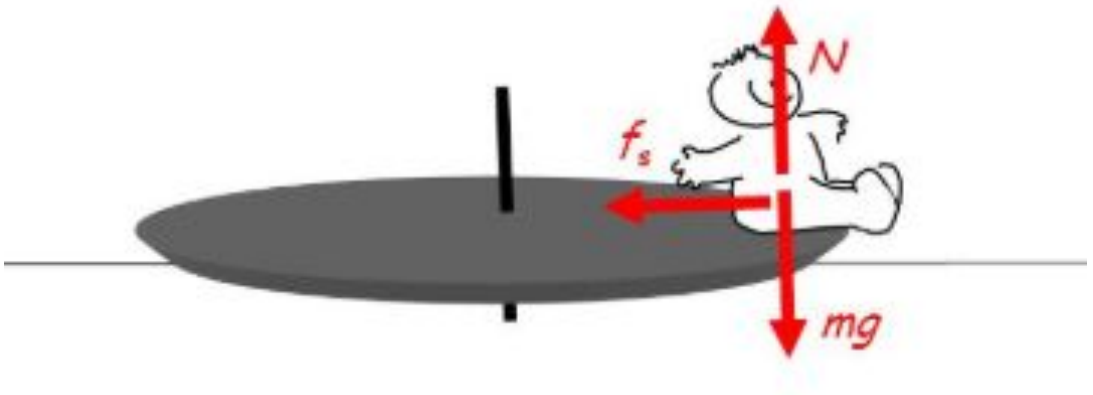
$$= \frac{70\ kg\ X\ (3\ m/s)^2}{2\ m}$$

$$= 315\ N$$



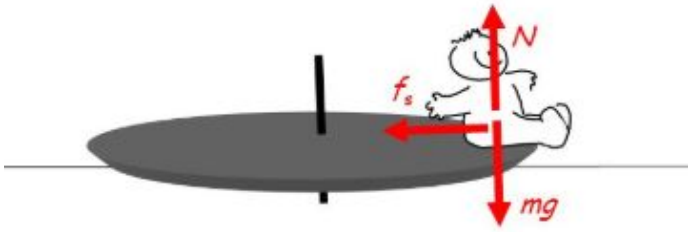
Practice Problem #3

Assume the coefficient of friction between rubber tennis shoes and the wooden platform in question #2 is (0.8). What is the maximum tangential speed the 70 kg rider could experience before sliding off the ride? Assume they are still sitting 2 m from the center with their shoes flat and trying to stop the slide.



Practice Problem #3 Answer

Friction supplies the centripetal force that holds the rider on the ride.



$F_f = \mu F_n = \mu mg$

0.8 x 70 kg x 9.8 m/s² = 548.8 N

So the F_c = 548.8 N

$F_c = \frac{mv^2}{r}$ rearrange for v $v = \sqrt{(F_c \times r / m)}$

$= \sqrt{(548.8N \times 2m / 70kg)}$

$= 3.96$ m/s $\rightarrow_{\text{sig fig}}$ 4 m/s

Additional Practice

For additional practice check out the conceptual questions and the problems and exercises in the table of contents from the online text linked above.