Forces in Circular Motion

Pre-Lecture Questions

Problem Set #14(due next time)

Lecture Outline

1. Uniform Circular Motion
2. Non-uniform Circular Motion

Pre-Class Summary:

Our goal is to understand what objects do and why they do it.

Newton's Laws explain circular motion:

- A net force toward the center of the circle is required to create the centripetal acceleration.
- Any forces tangential to the circle cause changes in the orbital speed.

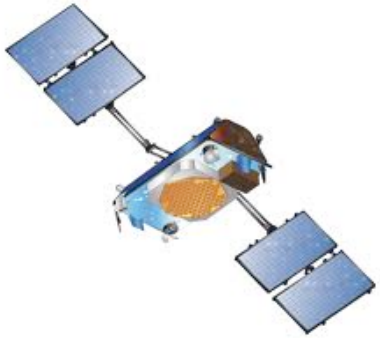
The four satellites shown below all orbit Earth at the same radius and with the same speed. They all have different masses which are indicated.

First, name the force that causes the circular orbit. _____.

Second, rank them from greatest to least based upon their centripetal acceleration.

Finally, rank them from greatest to least based upon the net force on them.

A. 183kg



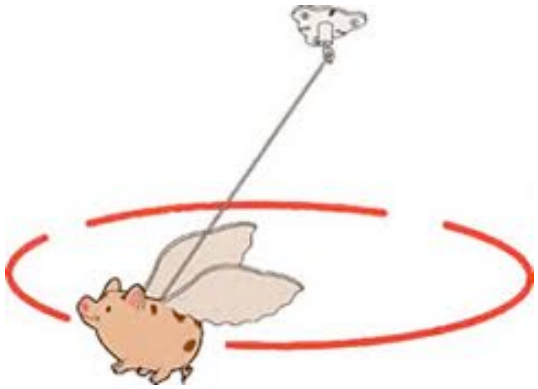
B. 105kg

C. 92kg

D. 141kg

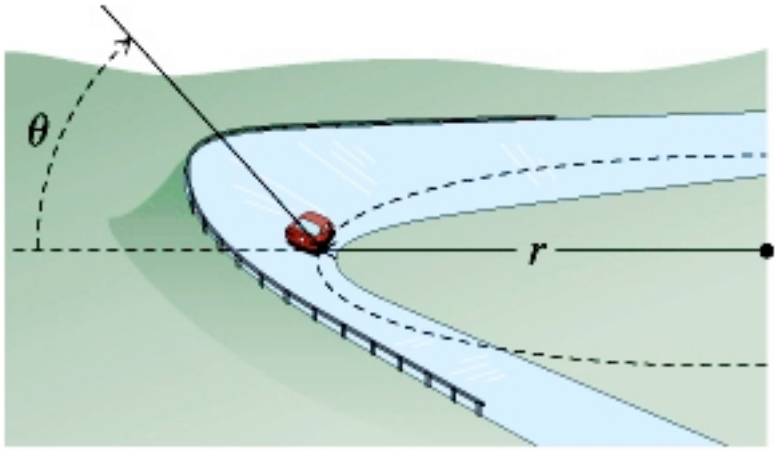
Example 1: The Gravitron is a carnival ride that spins fast enough that the floor can be removed and you don't fall. Suppose the radius is 8.0m and the coefficient of friction between a person and the wall is 0.40. Find the speed the wall must move.

Example 2: The Flying Pig is a toy that hangs from the ceiling and rotates around in a circle while flapping its wings. Suppose the circle has a radius of 40cm and the pig goes around every 2.0s. Find (a)the speed of the pig and (b)the angle the string makes with the vertical.



http://www.youtube.com/watch?v=BEeQQZdt5ok

Example 3: An engineer needs to design a banked curve on a highway where cars are traveling 45mph (20.1m/s). The situation limits the radius of the turn to 80.0m. (a)Find the angle so that the cars require no friction to complete the turn. (b)If the COSF between the road and the tires is 0.500, find the maximum speed around the turn.



Lecture 14 - Summary

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- A net force toward the center of the circle is required to create the centripetal acceleration.
- Any forces tangential to the circle cause changes in the orbital speed.