Name: _____ Date:_____

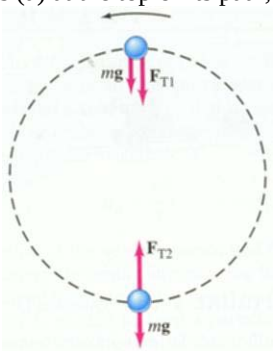
Mr. Croom's Physics Chapter 7: Rotational motion

Centripetal Force Application 2

Solve the following problems

1. (Giancoli, p.139, #1) A jet plane traveling 1800 km/h (500 m/s) pulls out of a dive by moving in an arc of radius 6.00 km. What is the plane's acceleration in g's

2. (Giancoli, p.140, #8) A ball on the end of a string is cleverly revolved at a uniform rate in a vertical circle of radius 85.0 cm, as shown in the figure below. If its speed is 4.15 m/s and its mass is 0.300 kg, calculate the tension in the string when the ball is (a) at the top of its path, and (b) at the bottom of its path.



3. (Giancoli, p.140, #9) How large must the coefficient of friction be between the tires and the road if a car is to round a level curve of radius 85 m at a speed of 95 km/h?

4. (Giancoli, p.140, #11) A coin is placed 11.0 cm from the axis of a rotating turntable of variable speed. When the speed of the turntable is slowly increased, the coin remains fixed on the turntable until a rate of 36 rpm is reached, at which point the coin slides off. What is the coefficient of static friction between the coin and the turntable?

5. (Giancoli, p.140, #12) At what maximum speed must a roller coaster be traveling when upside down at the top of a circle if the passengers are not to fall out? Assume a radius of curvature of 8.6 m.

6. (Giancoli, p.140, #13) A 1000-kg sports car moving at 20 m/s crosses the rounded top of a hill (radius = 100 m). Determine (a) the normal force on the car, (b) the normal force on the 70-kg driver, and (c) the car speed at which the normal force equals zero.

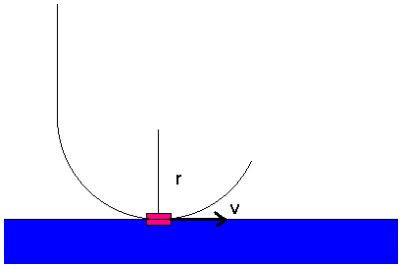
7. (Giancoli, p.140, #14) How many revolutions per minute would a 15-m-diamter Ferris wheel need to make for the passengers to feel weightless a the topmost portion of the trip?

8. (Giancoli, p.140, #17) A 1200 kg car round a curve of radius 70 m banked at an angle of 12°. If the car is traveling at 90 km/h, will a friction force be required? If so, how much and in what direction?

9. (Giancoli, p.140, #18) In a "Rotor-ride" at a carnival, people pay money to be rotated in a vertical cylindrically walled "room". (See Fig. 5-36.) If the room radius is 5.0 m, and the rotation frequency is 0.50 revolutions per second when the floor drops out, what is the minimum coefficient of static friction so that people will nit slip down? People describe this ride by saying they were being "pressed against the wall". Is this true? Is there really an outward force pressing them against the wall? If so, what it is source? If not, what is the proper description of their situation (besides "scary")? (Hint: First draw the free-body diagram for a person.)

10. (Giancoli, p.140, #20) If a curve with a radius of 80 m in perfectly banked for a car traveling 70 km/h, what must be the coefficient of static friction for a car not to skid when traveling at 90 km/h

11. (Giancoli, p.140, #21) A pilot performs an evasive maneuver by diving vertically at 310 m/s. If he can withstand an acceleration of 9.0 g's without blacking out, at what altitude must he begin to pull out of the dive to avoid crashing into the sea?



12. (Giancoli, p.140, #22) Determine the tangential and centripetal components of the net force exerted on a 1000 kg race car that is at rest and accelerates to 30m/s in 11 seconds around a circular track of radius 500m.

13. (Giancoli, p.140, #23) A car at the Indianapolis 500 accelerates uniformly from the pit area going from rest to 320 km/h in a semicircular arc with a radius of 200m. Determine the tangential and radial acceleration of the car when it is halfway through the turn, assuming constant tangential acceleration. If the curve were flat what would the coefficient of static friction have to be between the tires and the roadbed to provide this acceleration with no slipping or skidding?