Name: _____ Date:_____

Mr. Croom's Physics Chapter 7: Rotational motion

Centripetal Force Application

Solve the following problems

1. (Walker, p. 169, #43)When you take your 1300-kg car out for a spin, you go around a corner of radius 59 m with a speed of 16 m/s. Assuming your car doesn't skid, what is the force exerted on it by static friction?

2. (Walker, p. 169, #44)Find the linear speed of the bottom of a test tube in a centrifuge if the centripetal acceleration there is 52,000 times the acceleration of gravity. The distance from the axis of rotation to the bottom of the test tube is 7.5 cm.

3. (Walker, p. 169, #45)To test the effects of high acceleration on the human body, the National Aeronautics and Space Administration (NASA) has constructed a large centrifuge at the Manned Spacecraft Center in Houston. In this device, astronauts are placed in a capsule that moves in a circular path with a radius of 15 m. If the astronauts in this centrifuge experience a centripetal acceleration nine times that of gravity, what is the linear speed of the capsule?

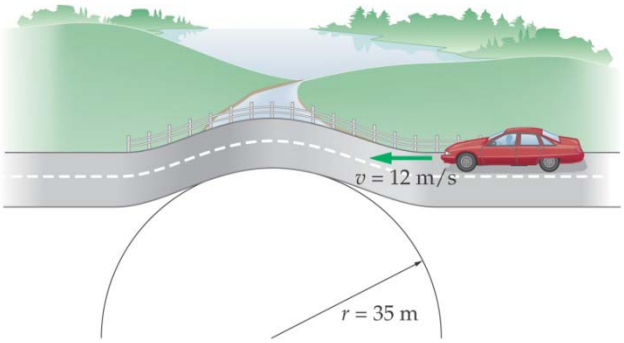
4. (Walker, p. 169, #46)A car goes around a curve on a road that is banked at an angle of 33.5°. Even though the road is slick, the car will stay on the road without any friction between its tires and the road when its speed is 22.7 m/s. What is the radius of the curve?

5. (Walker, p. 169, #47)Jill of the Jungle swings on a vine 6.9 m long. What is the tension in the vine if Jill, whose mass is 63 kg, is moving at 2.4 m/s when the vine is vertical?

6. (Walker, p. 169, #48)In Problem 47, how does the tension in the vine change if Jill's speed is doubled? How does the tension change if her mass is doubled instead? Explain.

7. (Walker, p. 169, #49) (a) As you ride on a Ferris wheel, your apparent weight is different at the top and at the bottom. Explain. (b) Calculate your apparent weight at the top and bottom of a Ferris wheel, given that the radius of the wheel is 7.2 m, it completes one revolution every 28 s, and your mass is 55 kg.

8. (Walker, p. 169, #50)Driving in your car with a constant speed of 12 m/s, you encounter a bump in the road that has a circular cross-section, as indicated in Figure Below. If the radius of curvature of the bump is 35 m, find the apparent weight of a 67-kg person in your car as you pass over the top of the bump.



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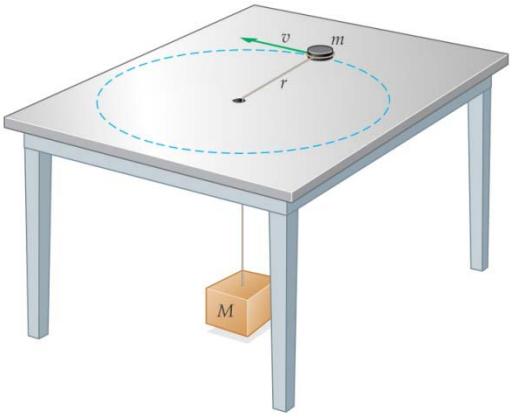
9. (Walker, p. 169, #51)Referring to Problem 50, at what speed must you go over the bump if people in your car are to feel "weightless?"

10. (Walker, p. 170, #52)You swing a 4.5-kg bucket of water in a vertical circle of radius 1.1 m. (a) What speed must the bucket have if it is to complete the circle without spilling any water? (b) How does your answer depend on the mass of the bucket?

11. (Walker, p. 172, #88)A hockey puck of mass m is attached to a string that passes through a hole in the center of a table, as shown in Figure 6–40. The hockey puck moves in a circle of radius r. Tied to the other end of the string, and hanging vertically beneath the table, is a mass M. Assuming the tabletop is perfectly smooth, what speed must the hockey puck have if the mass M is to remain at rest?



12. (Walker, p. 172, #90)A popular ride at amusement parks is illustrated in Figure 6–41. In this ride, people sit in a swing that is suspended from a long, rotating arm. Riders are at a distance of 12 m from the axis of rotation and move with a speed of 25 mi/h. (a) Find the centripetal acceleration of the riders. (b) Find the angle θ the supporting wires make with the vertical. (c) Notice that the swings in Figure below are at the same angle to the vertical, regardless of the weight of the rider. Explain.