Centripetal Force Worksheet

Name: _____ Period: _____ Date: _____

Answer the following questions and show all work.

1. In 1994, Mata Jagdamba of India had very long hair. It was 4.23 m long. Suppose Mata conducted experiments with her hair. First, she determined that one hair strand could support a mass of 25 g. She then attached a smaller mass to the same hair strand and swung it in the horizontal plane. If the strand broke when the tangential speed of the mass reached 8.1 m/s, how large was the mass?

2. A steam governor uses negative feedback to control the speed of a steam engine. Suppose a steam governor has two balls that are each rotating with a tangential speed of 3.7 m/s. The balls are 0.10 m from the rotation axis, and the centripetal force on each ball is 670 N. What is the mass of one of the balls?

3. With an average mass of only 30.0 g, the mouse lemur of Madagascar is the smallest primate on Earth. Suppose this lemur swings on a light vine with a length of 2.4 m, so that the tension in the vine at the bottom point of the swing is 0.393 N. What is the lemur's tangential speed at that point? (Think about gravity)

4. A small asteroid with a mass of 2.05×10^8 kg is pulled into a circular orbit around Earth. The distance from the asteroid to Earth's center is 7378 km. If the gravitational force needed to keep the asteroid in orbit has a magnitude of 3.00×10^9 N, what is the asteroid's tangential speed?

5. Pat Kinch used a racing cycle to travel 75.57 km/h. Suppose Kinch moved at this speed around a circular track. If the combined mass of Kinch and the cycle was 92.0 kg and the average centripetal force was 12.8 N, what was the radius of the track?

6. The first of the great amusement parks on Coney Island, in Brooklyn, New York, was Steeplechase Park. In 1905, one of the rides in the fun house at Steeplechase Park was the "Human Roulette Wheel." This ride consisted of a large wooden wheel, nearly 6 m in diameter, on which several people climbed. The wheel would then spin, causing all but the passengers closest to the center to slide off. Suppose a 55 kg passenger with a tangential speed of 1.3 m/s was just barely able to stay on the wheel. If the magnitude of the frictional force that held the passenger on the wheel was 135 N, how far was the passenger from the center of the wheel?

7. In 1992, a team of 12 athletes from Great Britain and Canada rappelled 446 m down the CN Tower in Toronto, Canada. Suppose an athlete with a mass of 75.0 kg, having reached the ground, took a joyful swing on the 446 m-long rope. If the speed of the athlete at the bottom point of the swing was 12 m/s, what was the centripetal force? What was the tension in the rope? Neglect the rope's mass. (Don't forget Gravity!!!)

8. A 45 kg child riding a Ferris wheel has a tangential speed of 8.5 m/s. Find the magnitude of the centripetal force on the child if the distance from the child to the axis of the wheel is 18 m.