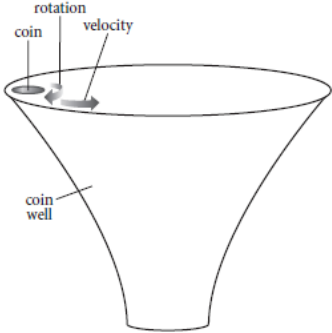# Centripetal Force Worksheet 2

Name: _____ Period: _____ Date: _____

1. Gregg Reid of Atlanta, Georgia, built a motorcycle that is over 4.5 m long and has a mass of 235 kg. The force that holds Reid and his motorcycle in a circular path with a radius of 25.0 m is 1850 N. What is Reid's tangential speed? Assume Reid's mass is 72 kg.

2. A toy model of an amusement park ride has a central shaft that rotates while carts attached to the top of the shaft by threads "fly" outward. The force that keeps the carts in a circular path is provided by the tension in the thread. When the carts are 0.25 m from the center of the shaft, the largest tangential speed that the carts can have without the threads breaking is 5.6 m/s. If the mass of a cart is 0.20 kg, how large is the maximum centripetal force?

3. An automobile with a tangential speed of 48.0 km/h follows a circular road that has a radius of 35.0 m. The pavement is wet and oily, so the coefficient of kinetic friction between the car's tires and the pavement is only 0.500. Assume the automobile has a mass of 1250 kg.
   a. How large is the centripetal force needed to maintain the car's circular motion?
   b. How large is the available frictional force?
   c. Is the available frictional force large enough to maintain the automobile's circular motion?

4. The comets with the longest periods between appearances, as well as comets that appear only once, come from a region of the solar system called the Oort cloud. In the Oort cloud, comets have slow tangential speeds as they orbit the distant sun. Suppose one of these comets has a mass of 7.55×10^{13} kg and moves with a tangential speed of 0.173 km/s. If the magnitude of the gravitational force that keeps the comet in orbit is 505 N, how far is the comet from the sun?

5. To encourage donations of loose change, a zoo has placed an interesting type of coin well at its visitor's center. The well is about 1 m tall and is shaped like the flared bell of a trumpet, with the widest part at the top and the hole perpendicular to the ground. A coin placed in a chute and knocked into the well does not simply drop in, but rolls on its edge around the rim of the well, gradually moving lower down it. If the coin is placed correctly, it can still roll around the well's wall even when the wall is nearly vertical. Consider a half dollar rolling around the top rim of this coin well. The radius of the top of the well is 35.0 cm and the coin rolls around its edge with a tangential speed of 2.21 m/s. If the well's inner wall exerts a force of 0.158 N on the rim of the coin, what is the coin's mass?

6. Since antiquity people have used the sling to increase the speed of a rock and send it swiftly in a specific direction. While the rock is being spun overhead, the force that keeps the rock moving in a circle is provided by the tensile strength of the sling material. Leather has a fairly high tensile strength, so that a strip of leather with a cross-sectional area of 0.25 cm^2 can withstand a pulling force of 800 N. Assume that, for a certain sling, 8.00×10^2 N is the largest possible centripetal force. If the rock in the sling is 0.40 m from the center of rotation and has a tangential speed of 6.0 m/s, what is the largest mass the rock can have?