Centripetal Forces Worksheet

1. A 0.65 ball is moving in a circular path, which has a radius of 1.35 meters, with a linear speed of 4.5 m/s. What is the centripetal force acting on this ball?

2. A 1200 kg car is moving with a speed of 18 m/s as it passes through a curve in the road which has a radius of curvature of 65 meters. What is the centripetal force acting on this car?

3. There is an amusement ride called the “ROTOR” where you enter a cylindrical room. The room begins to spin very fast until at some point the floor beneath you "falls out". Suppose that this room has a radius of 4.2 m and that the room rotates such that you make one complete revolution in 3.65 s.

a. What will be your linear speed as the room spins at this speed?

b. What is the magnitude of your centripetal acceleration? How many "g's" is this?

c. What will be the magnitude of the centripetal force acting on a 50 kg person on this ride?

d. What will be the magnitude of the normal force acting on this person?

4. One of the classic stories of science fiction is the concept of a spoked wheel space station. The point of this concept is to use the rotation of the wheel to generate an artificial gravity. Suppose that a space station was built with a radius of 125 meters and aperiod of rotation of 28 s.

a. What would be the linear speed of a person standing on the outer rim of the space station?

b. What would be the magnitude of the centripetal acceleration of this person?

c. How many "g's" is this acceleration?

d. What would be the direction of the centripetal acceleration of this person?

5. Consider a roulette wheel, as shown to the left, where the radius of the wheel is 0.85 m. A 135 gram ball is thrown into the roulette wheel after which it rotates with a speed of 3.4 m/s.

a. What will be the magnitude of the centripetal acceleration of this ball?

b. What will be the direction of the centripetal acceleration of this ball?

c. What will be the magnitude of the centripetal force acting on this ball?

d. What will be the direction of the centripetal force acting on this ball?

6. An 1140 kg automobile is moving with a velocity of 22 m/s around a curve in the highway which has a radius of 85 meters and which has a coefficient of static friction of = 0.72.

a. Draw a freebody diagram showing each of the forces acting on this car.

b. What will be the magnitude of the normal force acting on this car?

c. What will be the maximum frictional force available to this car as it passes through the curve?

d. What will be the direction and magnitude of the centripetal acceleration of this car?

e. What will be the direction and magnitude of the centripetal force acting on this car?

f. Is this car going too fast to make it safely through the curve? Explain!

7. You are standing 17 m from the center of a merry-go-round. The merry-go-round takes 9.5 s to go completely around once and you have a mass of 55 kg.

a. What will be your speed as you move around the center of the merry-go-round?

b. What will be your centripetal acceleration as you move around the center?

c. What will be the magnitude of the centripetal force necessary to keep your body moving around the center of this merry-go-round at the calculated speed?

d. How much frictional force will be applied to you by the surface of the merry-go-round?

e. what is the minimum coefficient of friction between your shoes and the surface?