Uniform Circular Motion

1. An amusement park ride has a radius of 2.8 m. If the time of one revolution of a rider is 0.98 s, what is the speed of the rider?

2. A centrifuge is spinning at 4200 rpm. If the radius of the centrifuge is 0.16 m, how fast is a point on the outer edge moving?

3. A car goes around a curve at 20.0 m/s. If the radius of the curve is 50.0 m, what is the centripetal acceleration of the car?

4. A steel beam is rotated in a horizontal plane to provide the centripetal acceleration for training pilots. If the pilot sits 2.0 m from the center of rotation, at what speed must he rotate to experience a horizontal centripetal acceleration of 78 m/s²?

5. Evil is riding his motorcycle at 12.0 m/s. If the centripetal acceleration of a point on his tire is 221.5 m/s², what is the diameter of the tire?

6. A 900.0 kg car moving at 10.0 m/s takes a turn around a circle with a radius of 25.0 m. Determine the acceleration and the net force acting upon the car.

7. A car is negotiating a flat curve of radius 50.0 m with a speed of 20.0 m/s. If the centripetal force provided by friction is 12000 N. What is the mass of the car?
8. An electron (m = 9.11 \times 10^{-31} \text{ kg}) moves in a circle whose radius is 2.00 \times 10^{-2} \text{ m}. If the force acting on the electron is 4.60 \times 10^{-14} \text{ N}, what is its speed?

9. A 0.50 \text{ kg mass} is attached to a string 1.0 \text{ m long} and moves in a horizontal circle at a rate of 2.0 \text{ Hz}. Calculate the tension in the string.

10. A 60.0 \text{ kg merry-go-round worker} stands on the ride's platform 4.0 \text{ m from the center}. If her speed as she goes around the circle is 5.0 \text{ m/s}, what is the force of friction needed to keep her from falling off the platform?

11. A 1200 \text{ kg car} is travelling at 25 \text{ m/s} on a horizontal surface in a circular path of radius 85 \text{ m}. What is the net force acting on this car?

12. An object of mass \text{ m} is on a horizontal rotating platform. The mass is located 0.22 \text{ m from the axle} and makes one revolution every 0.74 \text{ s}. The friction force needed to keep the mass from sliding is 13 \text{ N}. What is the object's mass?

13. An object moves at a constant speed along a circular path as shown.
   (a) Which vector best represents the centripetal acceleration of the object at this point?
   (b) Which vector best represents the velocity of the object at this point?
14. A CD with a diameter of 0.12 m spins at 200 rpm. What is the speed of a point on the outer rim of the CD?
15. A race car makes one lap around a track of radius 50.0 m in 9.0 s. What is the average velocity?
16. What is the centripetal acceleration of a point on the perimeter of a bicycle wheel of diameter 70.0 cm when a bike is moving at 8.0 m/s?
17. A car is traveling around a curve with radius 25 m with a centripetal acceleration of 64 m/s². How fast is it traveling?
18. A kid on a swing is moving 12 m/s and has a centripetal acceleration of 48 m/s². What is the length of the chain on the swing?
19. Calculate the centripetal force acting on a 925 kg car as it rounds an unbanked curve with a radius of 75 m at a speed of 22 m/s.
20. A car rounds an unbanked curve in the road at a speed of 28.0 m/s. If the radius of the curve is 105 m, and the centripetal force of friction is 6200 N, what is the mass of the car?
21. A 2.7x10³ kg satellite orbits the Earth at a distance of 1.8x10⁷ m from the Earth’s center. Calculate the gravitational force on the satellite. Calculate the speed of the satellite.
22. A 0.100 kg mass is attached to a string 75 cm long and swings in a horizontal circle, revolving once every 0.80 s. Calculate the tension in the string.
23. A 2.0 kg object is tied to the end of a cord and whirled in a horizontal circle of radius 4.0 m at 3.0 Hz. Calculate the centripetal force.
24. An object is attached to a string that can withstand a maximum tension force of 6.3 N. The object travels in a circular path of radius 0.40 m with a period of 2.1 s. What is the maximum mass of the object?
25. A person is on a horizontal rotating platform at a distance of 4.3 m from its center. This person experiences a centripetal acceleration of 5.6 m/s². What centripetal acceleration is experienced by another person who is at a distance of 2.5 m from the center of the platform?
26. Which of the following diagrams shows the instantaneous velocity v and centripetal force F for an object in uniform circular motion.

A. 
B. 
C. 
D. 

27. A ball attached to a string is swung in a horizontal circle. Which path will the ball follow at the instant the string breaks?