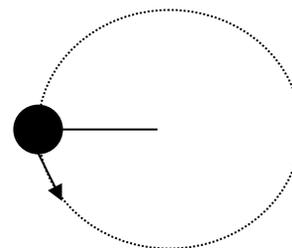
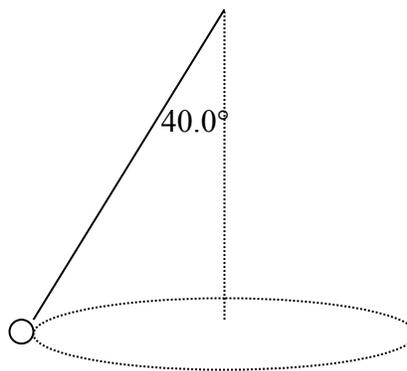


## Physics 12 – Circular Motion Practice Test

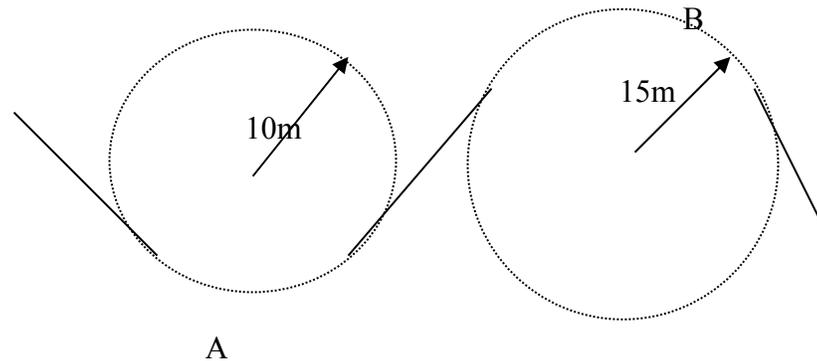
1. A 2.4 kg puck on an air table is tied to a string. It is swung in a circle of radius 1.7 m. If the period of revolution of the puck is 1.2 s, what is the tension in the string?
2. An object is moving in a circular path at a constant speed. If the speed is tripled, but the radius of the path remains the same, by what factor will the centripetal force be multiplied?
3. A roller coaster designer wants the riders to experience “weightlessness” as they round the top of a hill. How fast must the car be going if the radius of curvature at the hilltop is 25.0 m?
4. What is the maximum speed that a 1200 kg car can travel around a curve of radius 45.0 m with out slipping? (coefficient of friction between the tires and the road is 0.45)
5. The diagram shows a ball being swung in vertical a circle at the end of a string. The length of the string is 1.2 m and the mass of the ball is 0.450kg. The speed of the ball is 3.0 m/s.
  - a) At the moment shown, show the direction of the acceleration of the ball (draw a arrow showing the direction)
  - b) What is the acceleration of the ball?
  - c) What is the tension of the string at the top of the circle?
  - c) What is the tension of the string at the bottom of the circle?



6. A child swings a yo-yo of mass 15.0g in a horizontal circle so that the cord makes an angle of  $40.0^\circ$  with the vertical as shown. Find the acceleration of the yo-yo.



7. A roller coaster vehicle has a mass of 2500.0kg when fully loaded with passengers.
- If the vehicle has a speed of 18.0 m/s at point A, what is the force of the track on the vehicle at this point?
  - What is the maximum speed the vehicle can have at B in order for gravity to hold it on the track?
  - If the actual speed at B is 0.75 times the speed calculated in part (b), what is the force of the track on the vehicle?



8. A 1420 kg satellite moves in a circular orbit about the Earth with a constant speed of  $v$  and a height of 1800 km above the Earth's surface. Find the orbital speed of the satellite.
9. Io, a small moon of the giant planet Jupiter, has an orbital period of 1.77 days and an orbital radius of  $4.22 \times 10^5$  km. From these data, determine the mass of Jupiter.
10. A satellite moves in a circular orbit around Earth at a speed of 5450 m/s. Determine:
- The satellite's altitude above the Earth's surface.
  - The period of the satellite's orbit.

### BONUS

A particular amusement park ride is designed as a rotating cylinder. The riders stand with their backs against the inside of the cylinder. As the cylinder spins, the floor drops away and the riders are "plastered" against the wall. In this example, the radius of the cylinder is 3.5 m, and the cylinder spins at a speed of 12.0 m/s.

- Draw the free body diagram for one of the riders.
- What is the minimum coefficient of friction between the rider's back and the wall in order to prevent a 55.0 kg rider from slipping?