- 1. Define the following terms and state the units. a. Period
 - b. Linear Speed
 - c. Rotational Speed
 - d. Centripetal Acceleration
 - e. Centripetal Force
- 2. a. If you are going in a circle, what is ALWAYS true about your acceleration and your velocity?
 - b. If your acceleration is ALWAYS perpendicular to your velocity, what is happening to you?
- Mary and Larry are riding on a merry-go-round. Mary is 3 m from the center and Larry is 4 m. The merry-go-round completes 3 revolutions every minute.
 a. Who has a greater rotational speed? Explain.
 - b. Who has a greater linear speed? Explain.

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- 4. A 1500 kg car is going around in a circle of radius 25 meters. In one minute, it goes 2.5 times around the circle
 - a. How many seconds does it take the car to go around the circle once?
 - b. How fast is the car moving, in m/s?
 - c. What is the net force on the car?
- 5. A jet plane traveling at 500 m/s moves in an arc of radius 6000 m.
 - a. What is the plane's acceleration?
 - b. The mass of the plane is 17,000 kg, what is the centripetal force on the plane?
 - c. How would the centripetal force change if the radius is doubled but the speed stayed the same? What if instead the speed doubled and the radius stayed the same?
- 6. A 1200 kg car drives around a circular track of radius 50 m. The car is traveling at a constant speed of 25 m/s.
 - a. Is the car accelerating? Explain.
 - b. How long does it take the car to complete one lap?
 - c. What is the centripetal force acting on the car?

- d. Where does the centripetal force come from?
- 7. Imagine you swing a 0.4 kg ball tied to the end of a string in a <u>horizontal</u> circle of radius 1.3 m. The tension in the string is 60 N.
 - a. What is the speed the ball?
 - b. In what direction is the ball accelerating?
 - c. What would happen if the string broke?
- 8. Now you swing the ball on the string (still 0.4 kg) in a <u>vertical</u> circle (still radius of 1.3 m) at a constant speed of 5 m/s.
 - a. What is the net force on the ball? In what direction is the net force?
 - b. What would be the minimum speed needed so that the ball just barely makes the circle?
 - c. Why is there a minimum speed that the ball needs to just barely make the circle?
- 9. A car drives over a small hill that is circular and has a radius of 4 meters. The driver is not being careful and just barely stays on the hill while driving over it.a. How fast is the driver going?
 - b. What would happen if the driver was going *slower* than your answer in part a?

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- c. What would happen if the driver was going *faster* than your answer in part a?
- 10. A 5 kg ball is experiencing a 45 N centripetal force. It is moving in a circle with a radius of 2 meters. How long does it take for the ball to go around the circle once?

11. A 40 kg ball is moving in a circle with a radius of 5 meters. It takes only 2 seconds to go once around the circle. What is the net force on the ball?

12. A vinyl record rotates at 33 rpm. Calculate the following:

- a. frequency in both units.
- b. period in both units.
- c. The linear speed of a point 7 cm from the center of the record.
- 13. If it takes 15 seconds to rotate three times, how many rpm is that?