

## Circular Motion Review

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1. Define the following terms and state the units.
  - a. Frequency
  - b. Period
  - c. Linear speed
  - d. Rotational speed
  - e. Centripetal acceleration
  - f. Centripetal force
  
2. A phonograph turntable rotates at 33 rpm. Calculate the following
  - a. frequency
  
  - b. period
  
  - c. The linear speed of a point 7 cm from the axis of rotation.
  
3. 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 1700 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?
  
4. 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.
  
5. Mary (60 kg) is on a roller coaster and starts at rest at the top of a 25 m high hill. At the bottom of the hill she goes through a curve of radius 10 m.
  - a. What is Mary's speed at the bottom of the hill? (Use conservation of energy.)

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- c. What is the centripetal acceleration of Mary? In what direction is it?
- d. What is the centripetal force on Mary? Where does this force come from?
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 frequency of the car in rpm?
- d. What is the centripetal force acting on the car?
- e. What force is the source of the centripetal force?
7. Imagine you swing a 0.4 kg ball tied to the end of a string in a horizontal circle of radius 1.3 m. The cord will break if the tension exceeds 60 N.
- a. What is the maximum speed the ball can have?
- b. In what direction is the ball accelerating?
- c. What would happen if the string broke?
8. Now you swing the ball (still 0.4 kg) in a vertical 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 is the tension in the string at the top of the circle?
- c. What is the tension in the string at the bottom of the circle?
- d. What would be the minimum speed needed so that the ball just barely makes the circle?