

Circular Motion Review

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. 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?

3. A phonograph turntable 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 axis of rotation.

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. A 1500 kg car is going around in a circle of radius 25 meters. Its frequency is 2.5 rpm.
 - 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?

6. 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?

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- 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?
7. 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.
- Is the car accelerating? Explain.
 - How long does it take the car to complete one lap?
 - What is the frequency of the car in rpm?
 - What is the centripetal force acting on the car?
 - Where does the centripetal force come from?
8. 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 tension in the string is 60 N.
- What is the speed the ball?
 - In what direction is the ball accelerating?
 - What would happen if the string broke?
 - What is the frequency of the swinging ball?
9. 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.
- What is the net force on the ball? In what direction is the net force?
 - What is the tension in the string at the top of the circle?
 - What is the tension in the string at the bottom of the circle?
 - What would be the minimum speed needed so that the ball just barely makes the circle?