PHYSICS 12 CIRCULAR MOTION WORKSHEET 1

1. A race car makes one lap around a track of radius 50 m in 9.0 s.
   a) What is the average velocity?
   b) What was the car's centripetal acceleration?

2. Normie Neutron swings a rubber ball attached to a string over his head in a horizontal, circular path. The piece of string is 1.5 m long and the ball makes 120 complete turns each minute.
   a) What is the average velocity of the ball?
   b) What is the ball's centripetal acceleration?

3. A car goes around a curve at 20. m/s. If the radius of the curve is 50 m, what is the centripetal acceleration of the car?

4. Professor Brown holds on to the end of the minute hand of a clock atop city hall. If the minute hand is 4.0 m long, what is the professor's centripetal acceleration?

5. A flea gets its thrills by riding on the outer edge of a golden oldies record album of radius 15 cm as it is being played with a rotational period of 1.8 seconds.
   a) What is the flea's average speed?
   b) What is the flea's centripetal acceleration?
   c) What would be the flea's new speed and acceleration if it moved 6.0 cm in towards the center of the album?

6. 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:
   a) the centripetal acceleration of the mass.
   b) the tension in the string.

7. A 0.50 kg mass is attached to a string 1.0 m long and moves in a horizontal circle at a rate of 2.0 Hz. Calculate:
   a) the centripetal acceleration of the mass.
   b) the tension in the string.

8. It takes a 900. kg racing car 12.3 s to travel at a uniform speed around a circular racetrack of radius 90.0 m. What is the centripetal force acting on the car, and which force provides it?

9. 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. Determine:
   a) the velocity of the object.
   b) the acceleration of the object.
   c) the pull of the object.
   d) what happens if the cord breaks.

10. A mass of 1.5 kg moves in a circle of radius 25 cm at 2.0 Hz. Calculate:
    a) the velocity. b) the acceleration. c) the centripetal force acting on the mass.

11. Compute the centripetal acceleration of an object on the equator. Use an equatorial radius of 6400 km.

12. 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/s^2?

13. A 0.30 kg mass is attached to a long string and revolves clockwise (looking down from the top) in a horizontal circle of radius 0.10 m with a speed of 0.50 m/s and a period of 1.3 s.
    a) Calculate the change in velocity **Δv** (magnitude & direction) between the point when it is travelling due north and the point when it is travelling due east.
    b) Determine the centripetal acceleration of the mass.
    c) What force is acting through the string?

14. Using values listed on the formula sheet, calculate the centripetal acceleration of the Earth towards the Sun.

1. a) 35 m/s b) 24 m/s^2 2. a) 19 m/s b) 240 m/s^2 3. 8.0 m/s^2 4. 1.2 x 10^{-5} m/s^2 5. a) 0.52 m/s b) 1.8 m/s^2 c) .31 m/s, 1.1 m/s^2 6. a) 46 m/s^2 b) 4.6 N 7. a) 160 m/s^2 b) 79 N 8. 2.11 x 10^4 N, friction 9. a) 75 m/s b) 1.4 x 10^3 m/s^2 c) 2.8 x 10^3 N d) object flies of in tangent @ 75 m/s 10. a) 3.14 m/s b) 39 m/s^2 c) 59 N 11. 3.4 x 10^{-2} m/s^2 12. 12 m/s 13. a) .71 m/s @ 45° SofE b) 2.5 m/s^2 c) 0.75 N 14. 6.0 x 10^{-3} m/s^2