Uniform Circular Motion: Worksheet 1

**For this worksheet DO NOT USE A CALCULATOR. Assume g=10.0m/s2 N**

1. A mass is traveling in a clockwise circular path (as viewed from above) at a constant speed. W E

a. Answer the following with true or false:

i. The mass has a constant velocity.

ii. The mass has a constant acceleration.

iii. The net force on the mass is zero. S

iv. The direction of the velocity is parallel to the direction of acceleration.

v. The period of the rotation is decreasing.

vi. The magnitude of the acceleration is constant.

b. For each of the following answer with North, East, South or West.

i. What direction is the acceleration when the velocity is west?

ii. What direction is the acceleration when the velocity is north?

iii. What direction is the acceleration when the velocity is east?

iv. What direction is the net force when the velocity is south?

v. What direction is the velocity when the acceleration is west?

vi. What direction is the velocity when the acceleration is north?

c. For each of the following answer with correct units and sig.figs.

i. if the radius of the path is 2.0m and the mass takes 3.14s to complete one lap, what is the speed?

ii. if the radius of the path is 2.0m and the acceleration is 8.0m/s2, what is the speed of the mass?

2. Use dimensional analysis to show that the equation a=v2/r is dimensionally accurate.

3. A 1.0x103kg car travels at 8.0m/s around a circular track with a radius of 16m. When the car is traveling east the acceleration is 4.0m/s2 north.

a. What is the acceleration of the car when the velocity is south?

b. What is the acceleration of the car when the velocity is west?

c. What is the net force acting on the car when the velocity is north?

4. A 1.00x102g mass is resting on a rotating platform (turntable). The mass does not slip. The platform rotates clockwise at 30.0rpm (rotations per minute).

a. What is the frequency of the platform in Hertz (rotations per second)?

b. What is the period of rotation in seconds?

c. If the speed of the mass is 0.0628m/s, how far from the centre of the platform is it?

d. To one significant figure, what is the magnitude of the acceleration of the mass? (Hint: π2 ≈ ?)

5. A car travels at constant speed around a circular track with a diameter of 400.0m. At the instant the car is moving south its acceleration is 4.50m/s2 east.

a. What is the speed of the car?

b. What is the acceleration of the car when it is at the 12 o’clock position?

c. What is the acceleration of the car when it is at the 6 o’clock position?

d. What direction is the acceleration of the car when it is at the 8 o’clock position?

6. **For this question assume g=10m/s2**.A 50.0kg child rides a Ferris wheel with r=8.00m. (ask if you don’t know!). The Ferris wheel rotated at a constant speed. At the highest point the normal force on the child is 4.00x102N.

a. What is the net force on the child at the highest point?

b. What is the acceleration of the child at the highest point?

c. What is the normal force on the child at the lowest point?

d. What is speed of the child?

7. **For this question assume g=10m/s2.**A car travels at constant 72.0km/h around a level circular track with a radius of 80.0m. What is the minimum coefficient of static friction between the tires and the road?

8. Two identical cars, with identical drivers, travel at the same speed over different sections of road.



**A B**



Each section of road can be considered a section of a circle with a radius of 15m.

a. Answer the following with ‘greater than’, ‘less than’ or ‘equal to’.

i. The magnitude of the acceleration of **A** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the magnitude of the acceleration of **B**.

ii. The normal force on **A** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the normal force on **B**.

iii. The net force on **A** is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the net force on **B**.

b. If the mass of each car is 1.00x103kg, the speed for each is 10.0m/s and the radius of the curve (for **A** and **B**) is

20.0m, then the normal force on **A** is:

c. If the mass of each car is 1.00x103kg, the speed for each is 10.0m/s and the radius of the curve (for **A** and **B**) is

20.0m, then the normal force on **B** is:

9. Two identical cars, with identical drivers, travel at the same speed over different sections of road.



**A B**



The radius for each section of road is the same, and each car has a mass of 1.00x103kg. If FNA=8800N find FNB.

10. Two masses are at rest on the same turntable. Mass 1 is 12cm from the centre and has an acceleration of 1.0m/s2. Mass 2 is 24cm from the centre (OF THE SAME TURNTABLE), what is its acceleration?

11. Two cars travel at the same speed around two different level circular corners. Corner 1 has a radius of 12m and corner 2 has a radius of 24m. The acceleration of Car 1 (corner 1) is 10.0m/s2, what is the acceleration of Car 2?

12. Two masses are at rest on the same turntable. Mass 1 is 12cm from the centre and has speed of 1.0m/s. Mass 2 is 24cm from the centre (OF THE SAME TURNTABLE), what is its speed?