# Additional Material for Circular Motion

**Uniform circular motion:** It is a motion of an object on a circular path with a constant speed.

Below are a few examples of circular motion.

**Ex:** 1) Motion of the earth around the sun.

2) Motion of the satellites around the planets.

3) Motion of the blades of a fan.

In uniform circular motion, magnitude of velocity is constant but its direction changes continuously. Since there is a change in the direction of velocity we can say that the object is being accelerated.

Below are the formulae to calculate:

**Linear velocity:** $v = 2\pi r / t$

**Angular Velocity :** $\omega = v/r$

**Centripetal Acceleration:** $a_c = \omega^2 r$

**Centripetal Force:** $F_c = mv^2/r$

**Q1.** Consider the white point as a toy car of mass 1 Kg that moves on a circular track of radius 8.00 m in 10.0 seconds. Calculate the centripetal acceleration of the car.

**Solution:** given data: mass = 1 kg

radius = 8 m

time period = 10 s

Formula to calculate linear velocity:

$v = 2\pi r / t$

$= \frac{2 \times 3.14 \times 8}{10}$

$= 5.024$ m/s

Formula to calculate Angular velocity:

$\omega = v/r$

$= 5.024/8$

$= 0.628$ rad/s

Using the values of angular velocity and radius we can calculate centripetal acceleration.

$a_c = \omega^2 r$

$= (0.628)^2 \times 8$

$= 3.15$ m/s$^2$

**Answers to the Assignment Numericals**

1) $v = 1.25$ m/s

$\omega = 0.628$ rad/s

2) $v = 7.85$ m/s

$\omega = 0.78$ rad/s

$F_c = 12.32$ N

3) $F_c = 4.85$ N (Hint: change the values according to numerical in the App. Use the values of velocity and radius from the App to calculate centripetal force.)