# Uniform Circular Motion

⇒ An object in uniform circular motion is accelerating because its direction is constantly changing.

*Period* (T): time for one complete revolution

*Speed:* $v = \dfrac{2\pi r}{T}$

***Centripetal Acceleration:***

⇒ magnitude is given by $a_c = \dfrac{v^2}{r}$

⇒ direction is towards the center of the circular path.

***Centripetal Force:***

The net force required to keep an object moving in uniform circular motion.

Newton's 2nd law for circular motion:

$$F_c = ma_c = \frac{mv^2}{r} \quad \rightarrow \quad \sum F = \frac{mv^2}{r}$$

**Note:** centripetal force is not a new kind of force. It is usually a force or combination of forces such as tension, weight, normal force, friction, …

**Note:** when doing uniform circular motion problems, it is customary to define positive in the direction of acceleration (towards the center of the circle)

***Banked and Unbanked Curves:***

⇒ In an unbanked curve, static friction supplies the centripetal force.

max speed: $v = \sqrt{\mu_s g r}$

⇒ In a banked (frictionless) curve, a component of the normal force supplies the centripetal force.

angle of banked curve: $\tan\theta = \dfrac{v^2}{rg}$