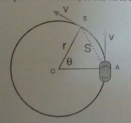
The direction of a particle’s velocity changes when it moves along a curved path. This means that the particle must have a component of acceleration perpendicular to the path, even if the speed is constant. When a particle moves in a circle with constant speed, the motion is called uniform circular motion.

Let us suppose that a particle moves in a circle with a uniform speed (v) round a fixed point (O) as center,



Consider the motion of the object in the time interval between and . In this interval, the object rotates through an angle theta and traces out a circular arc of length S. If theta is in radians, from the formula of math,

Although the speed (V) of the particle is constant, its velocity (v) is not because the direction of motion changes as the particle moves round the circle. Therefore, the particle is acceleration.

Assuming the radius of the circular path to be constant

The average angular speed of the motion, denoted by the symbol is the angular displacement divided by the total time taken to travel the distance S.

The SI unit of angular speed is radians per second . In calculus notation, we can also have

Substituting the equations, we will get that

The above formula is the relationship between linear and angular speeds

Angular Acceleration

The angular acceleration, , can be defined as the time rate of change of angular velocity:

Therefore,

Recall that from the normal equation of motion,

Angular displacement can also be given as

CENTRIPETAL ACCELERATION

Consider an object moving in a circular orbit of radius r with uniform tangential speed (v). Assume that the object possesses a velocity vector v whose magnitude is constant, but whose direction is continuously changing. This implies that the object must be accelerating, since (vector) velocity is indeed varying in time. The direction of the instantaneous acceleration at each point is always along a radius of the circle toward its center. Because the speed is constant, the acceleration is always perpendicular to the instantaneous velocity.

Centripetal accelerating means center-seeking acceleration

PERIOD

The period T of the motion is the time for one revolution (or complete trip aroud the circle). The particle travels a distance equal to the circumference of the circle in the time T. Its speed is therefore given as

Putting this equation in the equation for acceleration, we get

For the newton’s second law, the centripetal acceleration is

Here, M is the mass of the particle.

CONICAL PENDULUM

Consider a small object of mass m tied to a string of length L fixed at a point O and the whirled round in the horizontal circle of radius r. with the fixed point O directly above the center of the circle . We assume that the circular \_\_\_\_\_\_\_\_ of the object constant and the string turns at a constant angle to the vertical. This arrangement is called a conical pendulum

The tension T in the string has two constituents: and . The horizontal component of the tension T in the string provides the centripetal acceleration (force) along the radius of the horizontal circular path. So that

The weight must be equal to the vertical component of the tension since the object does not move in a vertical direction.

Therefore

If you draw the diagram for the figure above, you’ll notice that the radius r, is given as

Recall that,