Angular Velocity.

The angular displacement per unit time is defined as angular velocity.

If a particle moves from P to Q in time Δt, $\omega = \dfrac{\Delta \theta}{\Delta t}$ where $\Delta \theta$ is the angular displacement.

(1) Instantaneous angular velocity $\omega = \lim\limits_{\Delta t \to 0} \dfrac{\Delta \theta}{\Delta t} = \dfrac{d\theta}{dt}$

(2) Average angular velocity $\omega_{av} = \dfrac{\text{total angular displaceme nt}}{\text{total time}} = \dfrac{\theta_2 - \theta_1}{t_2 - t_1}$

(3) Unit: Radian/sec

(4) Dimension: $[M^0 L^0 T^{-1}]$ which is same as that of frequency.

(5) Vector form $\vec{v} = \vec{\omega} \times \vec{r}$ [where $\vec{v}$ = linear velocity, $\vec{r}$ = radius vector]

$\vec{\omega}$ Isan axial vector, whose direction is normal to the rotational plane and its direction is given by right hand screw rule.

(6) $\omega = \dfrac{2\pi}{T} = 2\pi n$ [where T = time period, n = frequency]

(7) The magnitude of an angular velocity is called the angular speed which is also represented by ω.