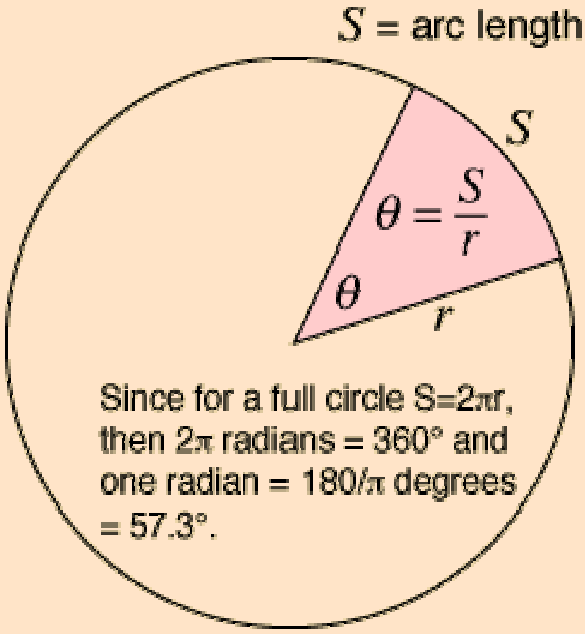
Basic Rotational Quantities



The angular displancment is defined by:

$$\theta = \frac{S}{r}$$

For a circular path it follows that the angular velocity is

$$\omega = \frac{v}{r}$$

and the angular acceleration is

$$\alpha = \frac{a_t}{r}$$

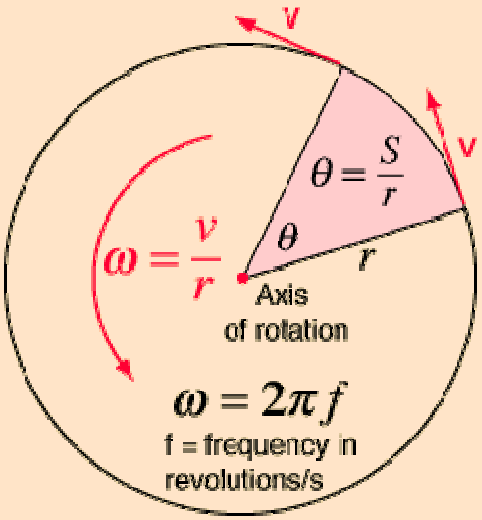
where the acceleration here is the tangential acceleration.

In addition to any tangential acceleration, there is always the centripetal acceleration:

$$a_c = \frac{v^2}{r}$$

The standard angle of a directed quantity is taken to be counterclockwise from the positive x axis.

Angular Velocity



Angular velocity can be considered to be a vector quantity, with direction along the axis of rotation in the right-hand rule sense.

Vector angular velocity

For an object rotating about an axis, every point on the object has the same angular velocity. The tangential velocity of any point is proportional to its distance from the axis of rotation. Angular velocity has the units rad/s.

$$v = \omega r \quad or \quad \omega = \frac{v}{r}$$

Angular velocity is the rate of change of angular displacement and can be described by the relationship

$$\omega_{average} = \frac{\Delta\theta}{\Delta t}$$

and if v is constant, the angle can be calculated from

$$\theta = \theta_0 + \omega t$$