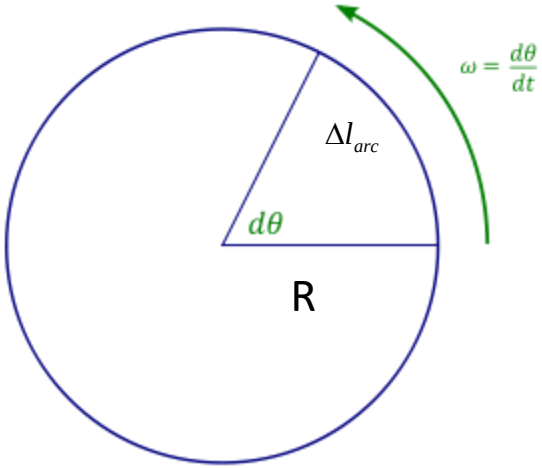
Rotational Motion

Angle (in radians): length of ark over radius

$$\Delta\alpha = \frac{\Delta l_{arc}}{R}$$



Angular velocity:

$$\varpi = \frac{\Delta\alpha}{\Delta t}$$

It is related to regular (linear) speed of rotational motion as:

$$v = \frac{\Delta l_{arc}}{\Delta t} = \varpi R$$

Centripetal acceleration

When moving along a circular path of radius R, with constant speed v, an object has acceleration directed towards the center, called Centripetal Acceleration:

$$a = \frac{v^2}{R}$$

Homework

Problem 1.

Find the speed and period of orbital motion of *the International Space Station* around the Earth. Note that its orbit is located **400 km** above the ground. This is much smaller than the Earth radius **R=6370.** This means that you can assume the gravitational force acting on the space station to be the same as on Earth surface, ***Mg***. Also, for simplicity, take the radius of the orbit to be equal to that of Earth.

Problem 2

A motorcycle is riding along a vertical wall, which has a shape of an interior of a cylinder of radius ***R=5 m***, aka "Wall of Death" (see the picture). Find the velocity ***v*** that the rider has to maintain to make sure that the motorcycle does not slide down. Friction coefficient between the wall an the tires is μ**=0.7**.