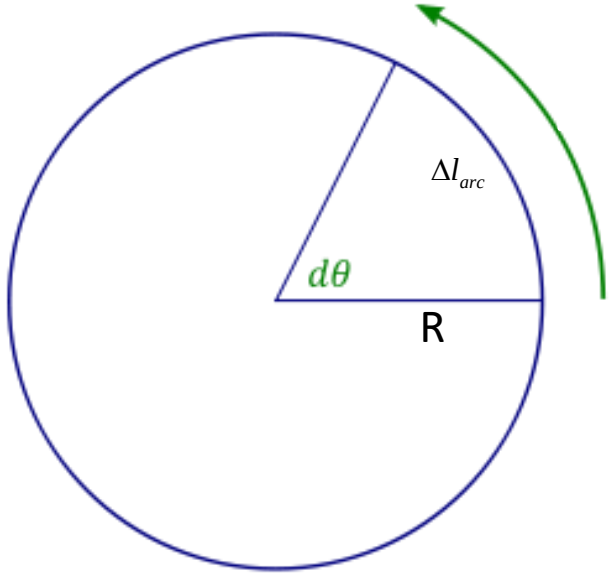
Rotational Motion

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:

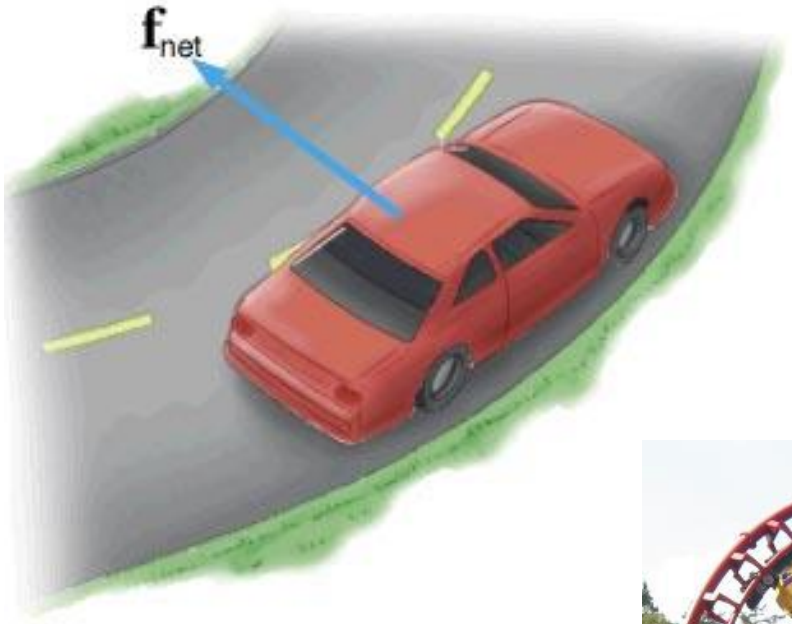
$$v = \frac{\Delta l_{arc}}{\Delta t} = \varpi R$$

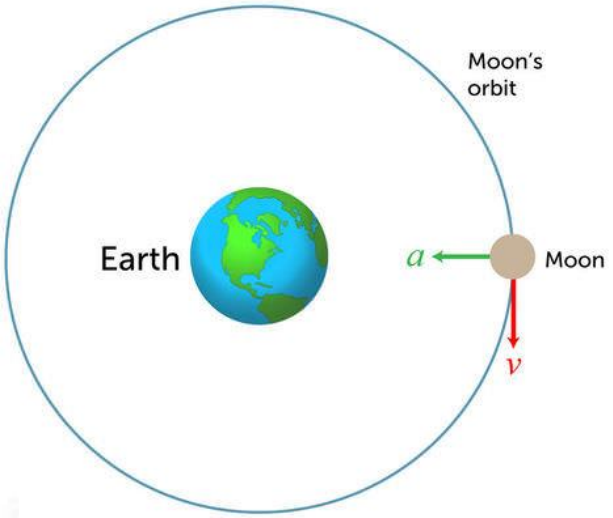
Centripetal acceleration

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

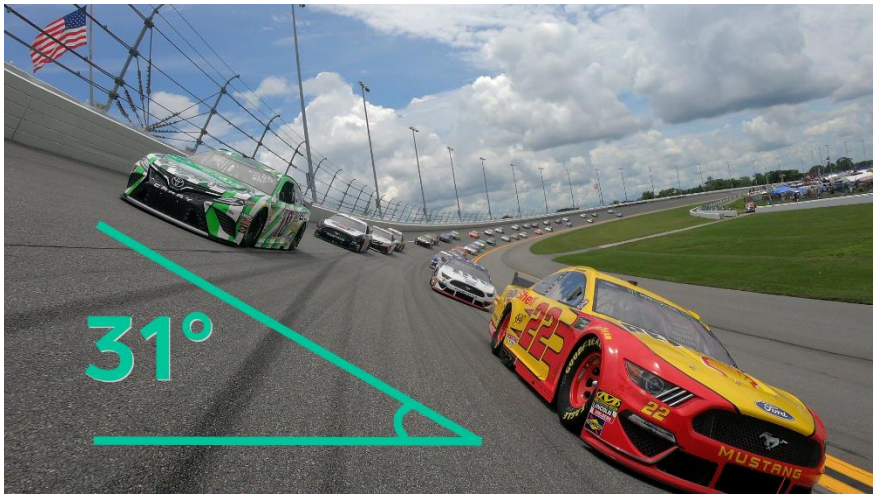
$$a = \frac{v^2}{R}$$

Examples





More Examples



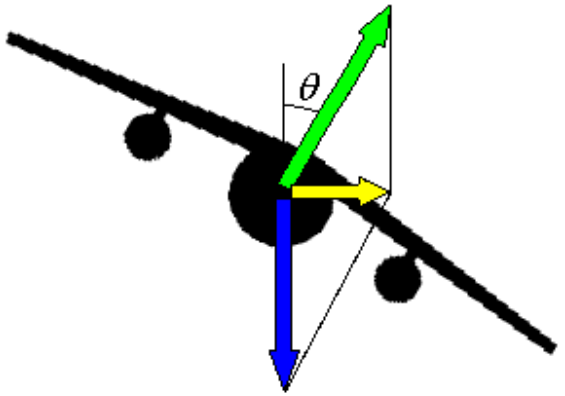
Homework

Problem 1

Friction coefficient between the cars wheels and the road is μ. Find the maximum speed with which it can move on a curved road without slipping, if the radius of curvature of the road is R. If the friction coefficient changes from 0.7 to 0.35 due to rain, how much that speed changes?

Problem 2

An airplane in order to turn must roll to a banked position (see picture) so that its are angled towards the desired direction of the turn. Find the radius of such a turn, if the bank angle is $\theta=5^o$, and speed is v=700 km/hr



Problem 3

How much (in %) a weight of an object measured on an Equator would be different from the one on a Pole, due to rotation of the Earth? Assume Earth to be a perfect sphere with uniform mass distribution.