(1) Average Acceleration & Instantaneous acceleration

Average Acceleration :→ $\boxed{\vec{a}_{av} = \dfrac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1}}$

Instantaneous Acceleration :→ $\boxed{\vec{a} = \dfrac{d\vec{v}}{dt}}$

§§ Motion with Constant Acceleration

$v = \frac{dn}{a_7}$

$$v = \frac{dx}{dt} \quad \text{— (1)} \qquad a = \frac{dv}{dt} \quad \text{— (2)}$$

(1) $a = \dfrac{dv}{dt} \Rightarrow dv = a\,dt$

$t=0$	$t=t$
u	V

$$dv = \int a\,dt$$

$$\int_u^V dv = a\int_0^t dt \Rightarrow V - u = at$$

$$\boxed{V = u + at} \quad \text{— (1)}$$

(2) $V = u + at$

$t=0 \Rightarrow x=0$
$t=t \Rightarrow x=x$

$$\frac{dx}{dt} = u + at$$

$$\int_0^x dx = \int_0^t (u+at)\,dt$$

$$[x]_0^x = ut + \tfrac{1}{2}at^2 \Rightarrow \boxed{x = ut + \tfrac{1}{2}at^2} \quad \text{— (2)}$$

(3) $(V)^2 = (u + at)^2$

$$V^2 = u^2 + a^2t^2 + 2uat$$

$$V^2 = u^2 + 2a\underbrace{(ut + \tfrac{1}{2}at^2)}_{x}$$

$$\boxed{V^2 = u^2 + 2ax} \quad \text{— (3)}$$

Newton's laws of Motion

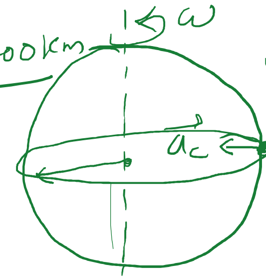
Friday, February 12, 2021 6:28 PM

① **First law:—** If the (vector) sum of all the forces acting on a particle is zero then and only then the particle remains unaccelerated i.e., remain at rest or moves with a constant velocity.

$\Rightarrow$ It is true only in the intrenal frames

Interial frame: Acceleration free $\Rightarrow$ $\boxed{\vec{a}=0}$

$\boxed{a_c = ?}$



$\omega = \frac{2\pi}{T}$

$T = 24 \times 3600$ sec

$\omega = \frac{2\pi}{24 \times 3600}$

$\boxed{a_c = 0.034\,m/sec^2}$

$\Rightarrow a_c = 0.034\,m/sec^2$

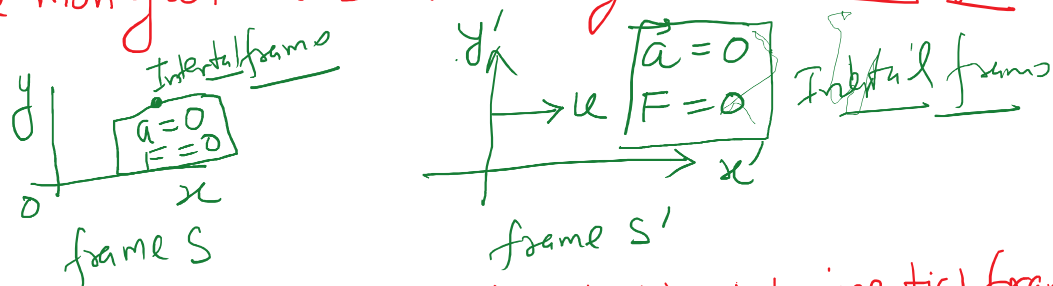
$g = 9.8\,m/sec^2$

$\Rightarrow \boxed{\frac{g}{a} \Rightarrow 288.23}$

It is showing that gravity is almost 288 times stronger than a_c

Earth's accelration is very very low and we can safely assume $\boxed{\text{Earth as a interial frame}}$

① Frame moving with constant velocity w.r.t to intrenal frame



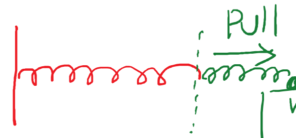
Frame moving with velocity V (constant) w.r.t inertial frame then this frame will also be a interial fram

Friday, February 12, 2021 7:10 PM

Second law :→ The acceleration of a particle as measured from an inertial frame is given by the vector sum of all the forces acting on the particle divided by its mass.

$\boxed{m_1 a_1 = m_2 a_2}$

$\boxed{ma = F}$



$\boxed{\begin{array}{l} m_1 \Rightarrow a_1 \\ m_2 \Rightarrow a_2 \end{array}}$

$m_1 = 1\,kg$

$m_2 = 10\,kg$ $\Rightarrow \boxed{a_2\,?}$

$\boxed{a_2 = \dfrac{a_1}{10}}$

Calculate the Unit of force?

$kg \dfrac{m}{sec^2} \Rightarrow$ Newton → in SI

Change it in Cgs $= gm \dfrac{cm}{sec^2} =$ dyne

$\boxed{1N = 10^5\,dyne}$

③ **3rd law of Motion** :→