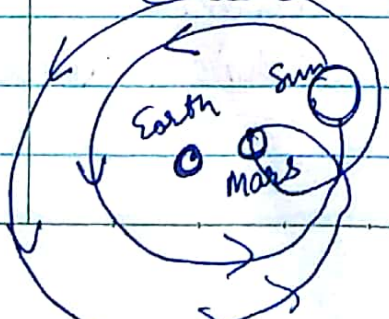
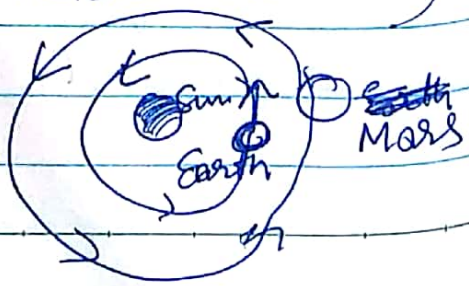
challenged by the polish astronomer after 2000 years by a polish astronomer Nicolaus Copernicus. He introduced the concept of Helio-centric system of planets. It set the foundation of modern Solar system. To establish this foundation, Copernicus need a very strong evidence due to orthodox and in church. If someone doesnot believe in bible will be executed or burnt alive. He was really afraid of that punishment and embarassment.
The reasoning become more difficult because there was no concept of gravity at that time. If earth is spining around than why don't we flew off the planet? Copernicus has no answers He stated that God wants universe to be in this way. Unfortunately he was not able to prove it.

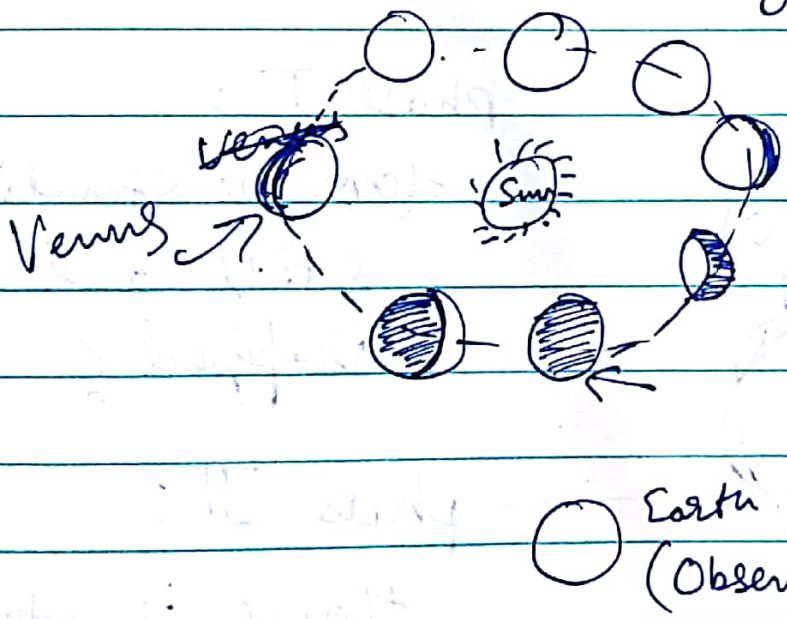
In plato system (Geocentric)



In Copernicus system (Helocentric)



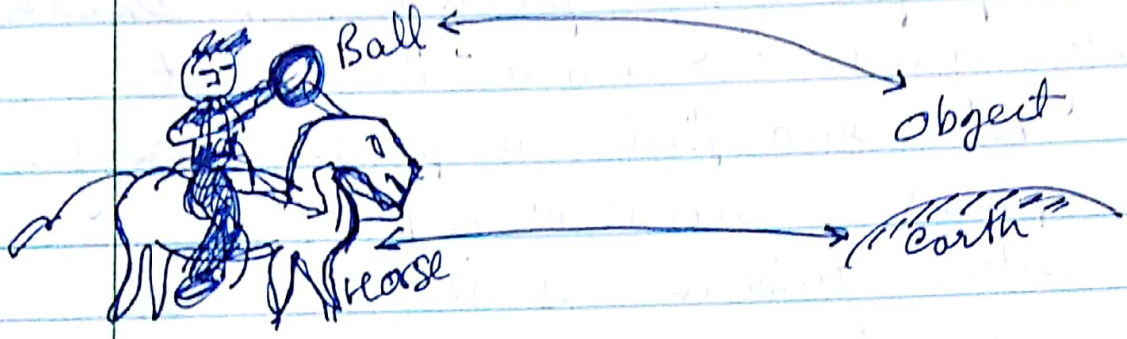
Copernicus book was banned by the church. After decades, a poineer Galileo galilie started his investigation on heliocentric system proposed by Copernicus. The church finally agreed to consider the concept if he could find a physical proof. The phases of venus as a proof of sun centred universe as it was too complicated to believe for the common people and was not convincing enough.



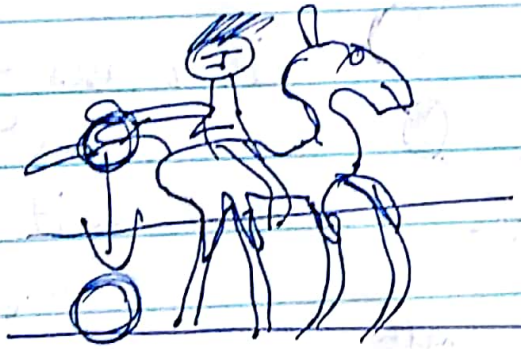
if phases of venus changes then it must signify that venus revolves around the sun.

But besides that he really require a better proof. He tried many experiments and finally arrived with a thought experiment. "Horse and ball" experiment. ~~He was so convinced to this~~

In this experiment,
Galileo made a analogy of horse as earth and ball as objects on the earth.



This experiment was conducted in 3 phases.



phase I:
Horse is standing still and ball is dropped?

phase II:
Horse is ~~stop~~ running and ball is dropped?
→ ~~It will drop~~

We will see dropping ball with ~~horse~~ horse.

phase III
Horse is running and ball is thrown up.
↓
It will return back in the hands of rider

By this experiment It was clear that ~~if~~ ~~ball~~ horse share it's motion with horse that's why it fall back in the hands of rider.

You can see it, just by a common observation. Whenever you throw ball ~~it~~ upward while ~~ball~~ traveling in moving bus or train. The ball exactly fall back in your hands. The motion of bus / train or car or any moving object is shared with the object we throw up. even observed if you jump inside the bus when it is moving your position inside the bus doesn't change at all.

This idea become foundation for the Newton's third law, theory of relativity and concept of ~~Ideal~~ Inertia. later on in the discovery. ~~Finally~~, ~~decided~~ to publish his theory of heliocentric ~~he got permission~~

universe. Unfortunately, catastrophey occurs plague hits all over the Italy. his work was stolen when submitted to publication in Roman ~~catholic~~. censers and church. Few year later his book was found and got convicted for his book about heleocentric system.

In between, he discoverd his own ~~pubi~~ studies ~~he help kept away from everyone~~ of motion he did in early ages. He eventually forgot about his own work which made an enormous contribution in ~~sti~~ study of ~~motion~~. motion.

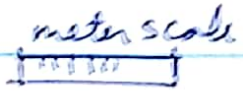
We see the concept of inclined plane and in almost every books of physics. Where does it came from Why it is so popular.

Answers to these questions lies in Galileos experiments.

Lets start our journey of motion from very basic foundations.

Q What is distance?

It is the length of path measured by ~~on~~ any scale.



from A to B I need 5 scales of 1 meter. So, distance between point A and point B is 5 meters. It can be measured by scales, inch tapes etc.

Q What is time?

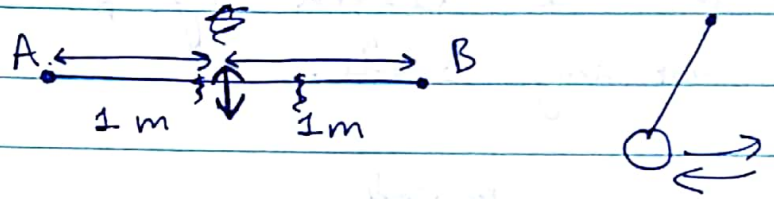
It is a way to measure the past, present and future.
We used to measure it by sand clocks in early ages for long durations and for short duration we use pendulums

Sand clock
(To measure long duration)

pendulum
(to measure short duration)

Q What is speed?

It is the distance travelled per unit time.



if I travelled from A to B in 4 periods

Then we can say

Speed is $\frac{\text{distance}}{\text{time}}$

$$\left[\text{Speed} = \frac{\text{distance}}{\text{time period}}\right] \Rightarrow \frac{2 \text{ meters}}{4 \text{ periods}} = 0.5 \text{ m/period}$$

for each period of or oscillation of pendulum I travel 0.5 meters of distance.

Where does ~~is~~ we find concept of speed useful?

Whenever we want to predict

how much time I need to travel a particular distance.

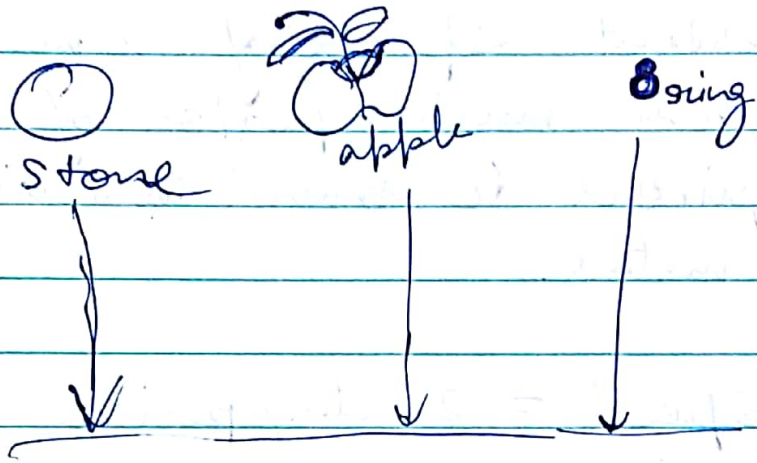
Say, if a bullock cart move with a constant speed of 2 meter / period. then how much period of time is required to travel a distance of 500 meters.

Speed = 2 meter / period
distance = 500 meter

Time = $\frac{\text{distance}}{\text{speed}} = \frac{500}{2}$ = 250 periods of time is required to reach from A to B.

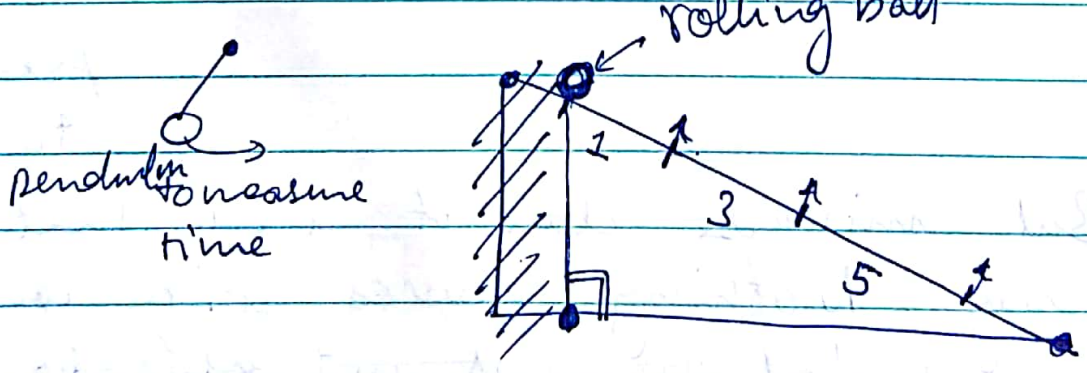
But universe doesn't work that way. Nothing moves with constant speed. ~~but he was not able to~~ When an object is drop from the height speed increasses. ~~This was~~ Galileo was the first who ~~fi~~ make ~~He was surpr~~ a move on this concept with really intuitive way.

It can be easily observed at that time that two falling objects always tend to fall down at the same rate independent of their masses.



They all fall down at the same rate we can see ~~it~~ it experimentally

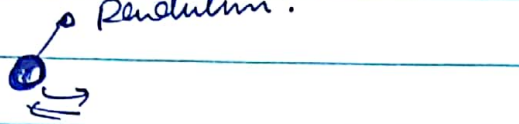
For this he devised an experiment

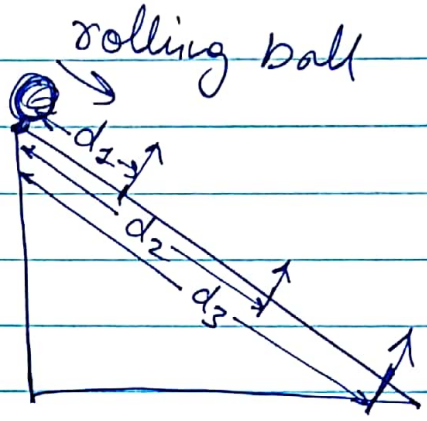


He rolls a ball through the inclined plane and start measuring time period.

He found out an amazing

add number sequence in distance travelled in each subsequent period of time.





1st period → d_1
2nd period → $3d_1$
3rd period → $5d_1$

~~$d_1 : d_2 : d_3 = 1 : 3 : 5 \ldots$~~

$d_1 = d$
$d_2 = 4d$
$d_3 = 9d$

$d_1 - d_0 = 1$
$d_2 - d_1 = 3$
$d_3 - d_2 = 5$

So, he observed this pattern for every subsequent period of time the speed of rolling ball increases in odd number fashion.

Clearly, this gives some sonce Idea of acceleration (change in speed) later discovered by Isaac Newton. Inclined plane became one of the major source of experimentations after these discoveries.