

scalar quantity/ अदिश मात्रा

vector quantity/ सदिश मात्रा

Magnitude
Direction (दिशा)

Scalar Quantities	Vector Quantities
Have magnitude but no direction	Have magnitude and direction
Distance Speed Mass Energy Density Power Length, Area, Volume Time Temperature Work	Displacement Velocity Weight Acceleration Force Impulse Pressure Momentum Gravity Drag

दी
दिशा

10

Distance/ दूरी and Displacement/ विस्थापन

The complete length of the path between any two points is called distance./ किन्हीं दो बिंदुओं के बीच पथ की पूरी लंबाई को दूरी कहा जाता है।

Displacement is the direct length between any two points when measured along the minimum path between them. विस्थापन किन्हीं दो बिंदुओं के बीच की सीधी लंबाई है जब उनके बीच न्यूनतम पथ के साथ मापा जाता है



velocity and acceleration / वेग और त्वरण

(v) $\frac{dS}{dt} = \frac{d(S)}{dt} = \frac{m}{s}$ $v=0$ $a=0$

कि.मी.प्रति घंटा

82,
98

acceleration $\frac{dv}{dt} = \frac{m}{s^2}$

Retardation (धीमे चलना) = $-a$



BPSC (A) 63



अभिकेन्द्रीय बल (Centripetal Force)-

when a body move in a circular path a force act on the body toward its centre

जब कोई वस्तु वृत्ताकार पथ पर चलती है तो वस्तु पर उसके केंद्र की ओर एक बल कार्य करता है

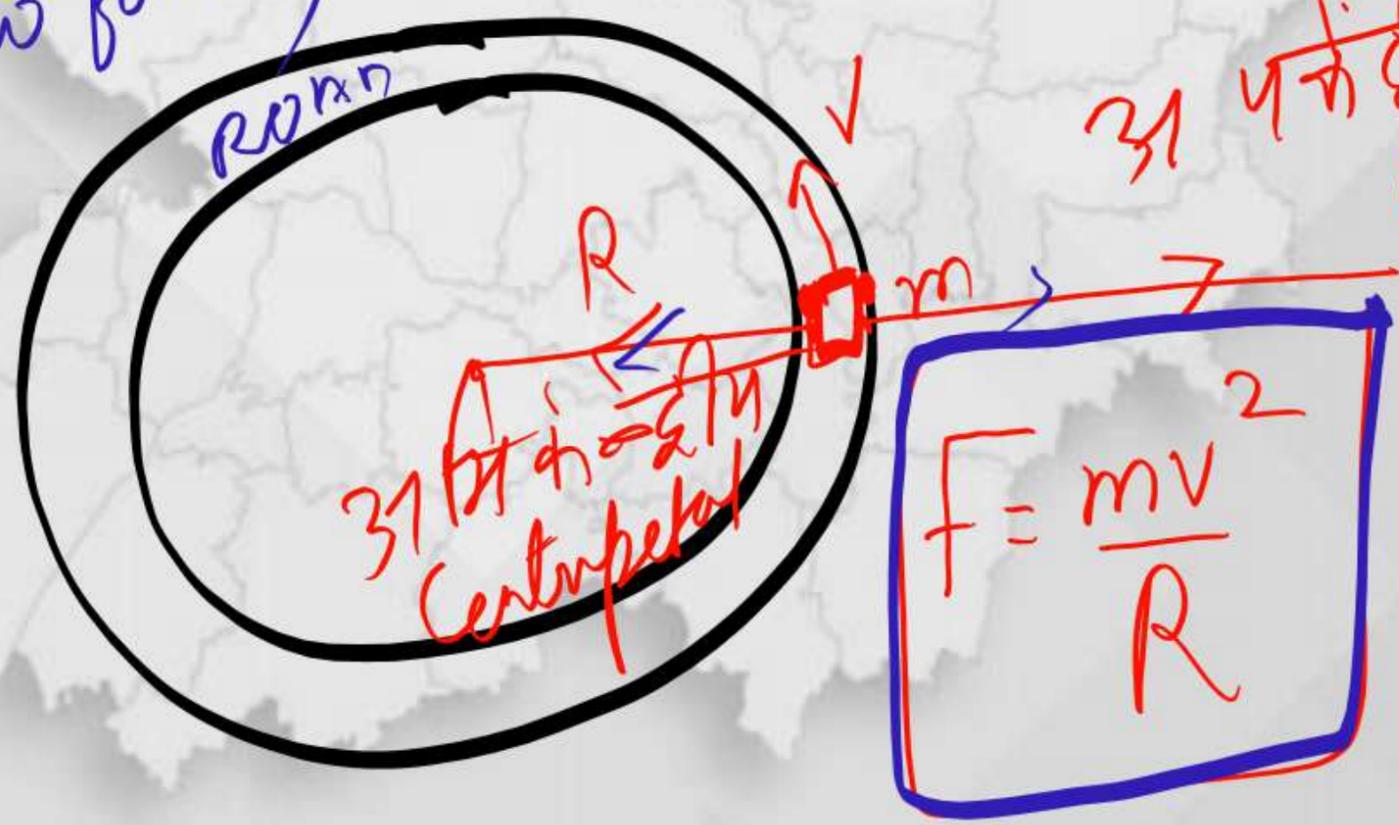
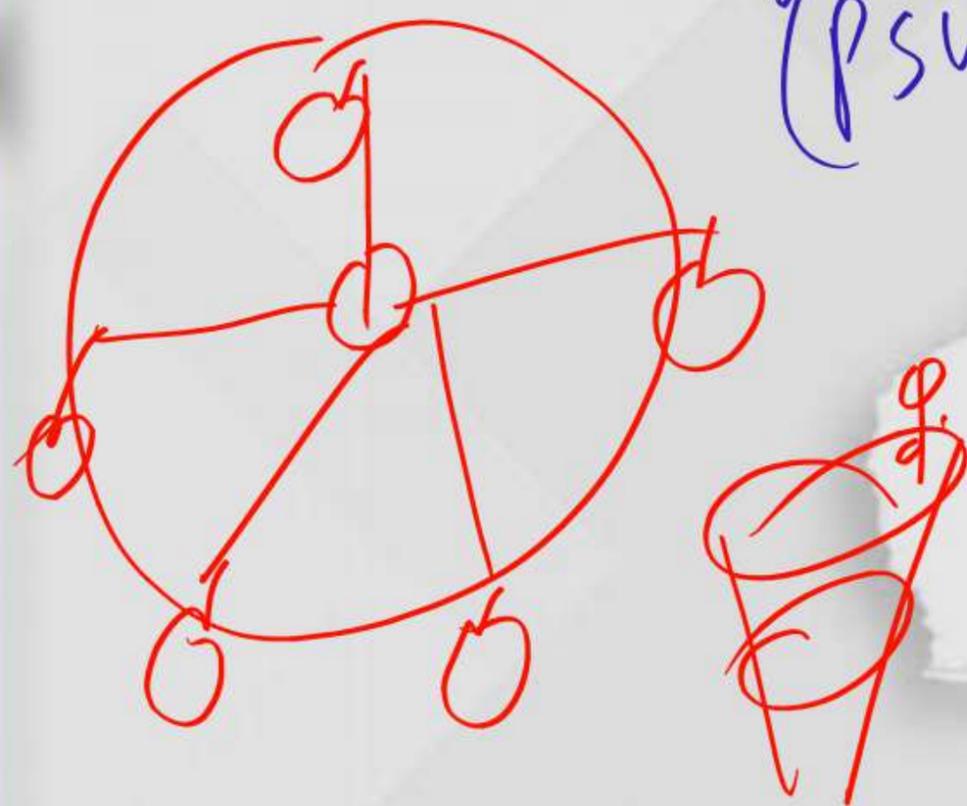
अपकेन्द्रीय बल (Centrifugal Force)

when a body move in a circular path a force act on the body away from centre.

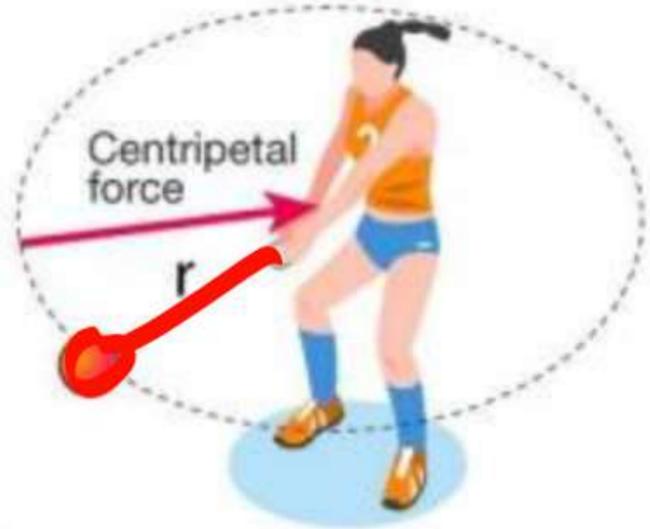
जब कोई वस्तु वृत्ताकार पथ पर चलती है तो केंद्र से दूर वस्तु पर एक बल कार्य करता है

→ Washing machine, दूध से मक्खन (Separation of cream from milk)

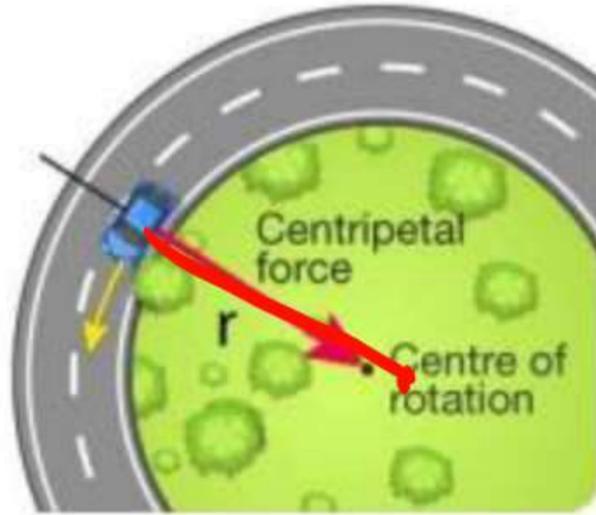
(Pseudo force)



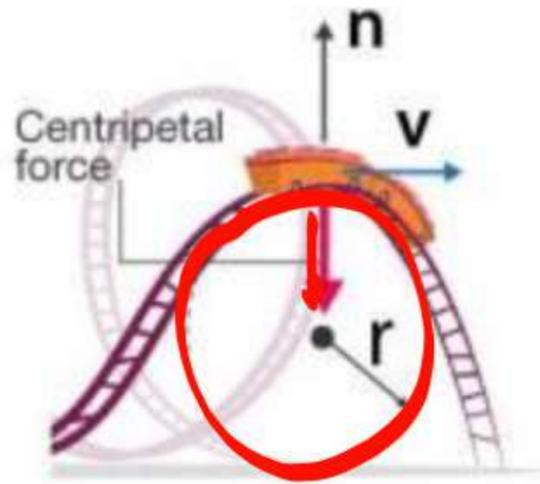
अपकेन्द्रीय centrifugal



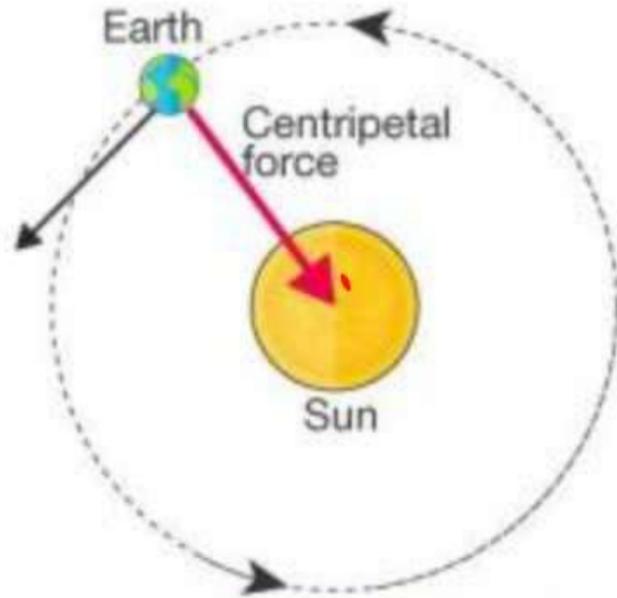
(a) Spinning a ball on a string or twirling a lasso



(b) Turning a car

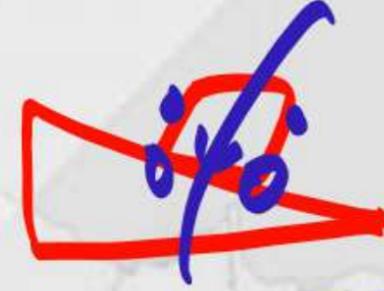


(c) Going through a loop on a roller coaster

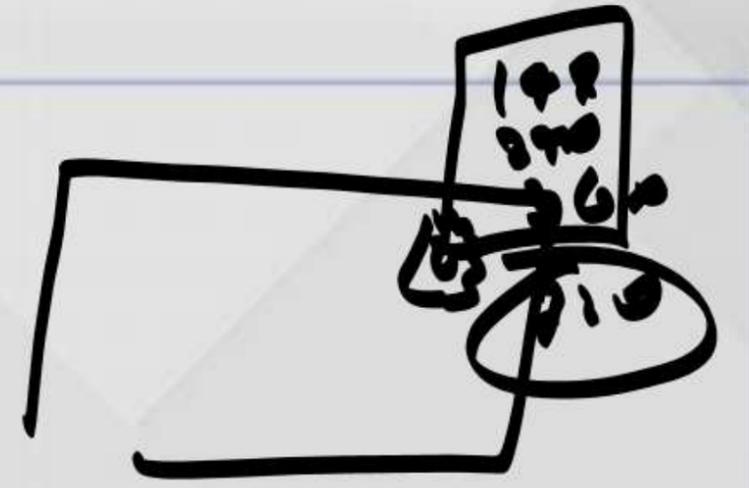


(d) Planets orbiting around the Sun

Road



Banking of Road



Newton 3 नियम → Principia

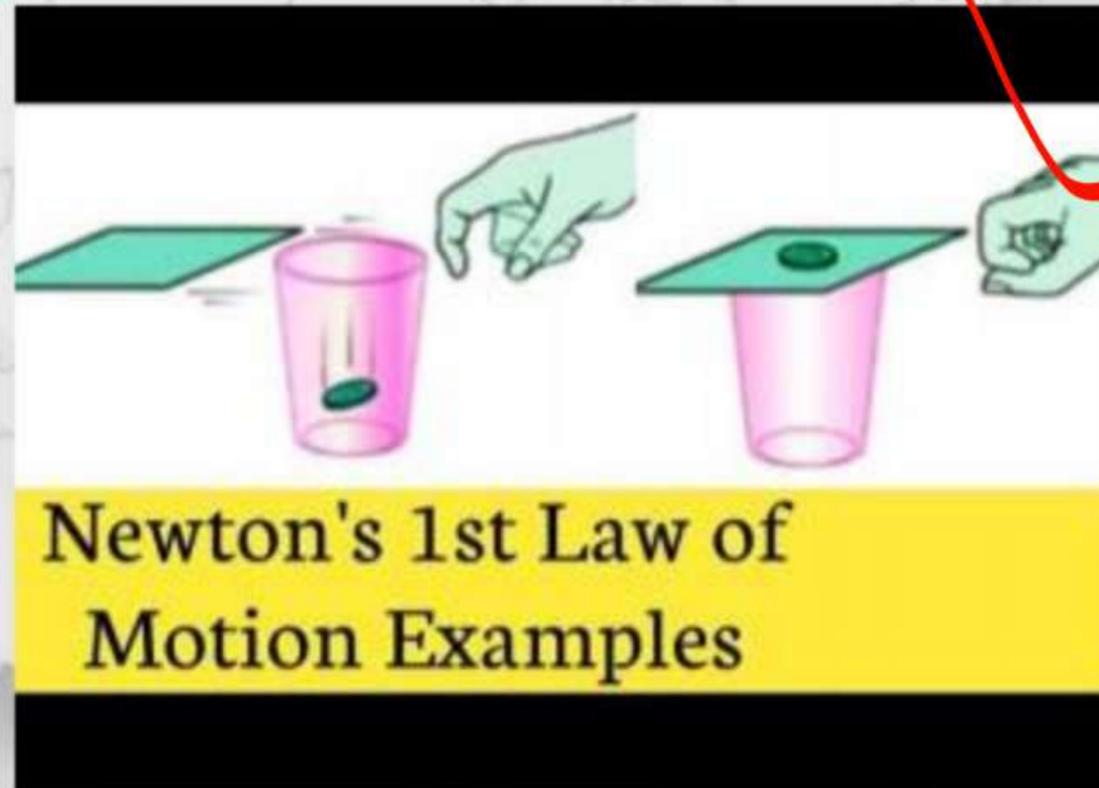
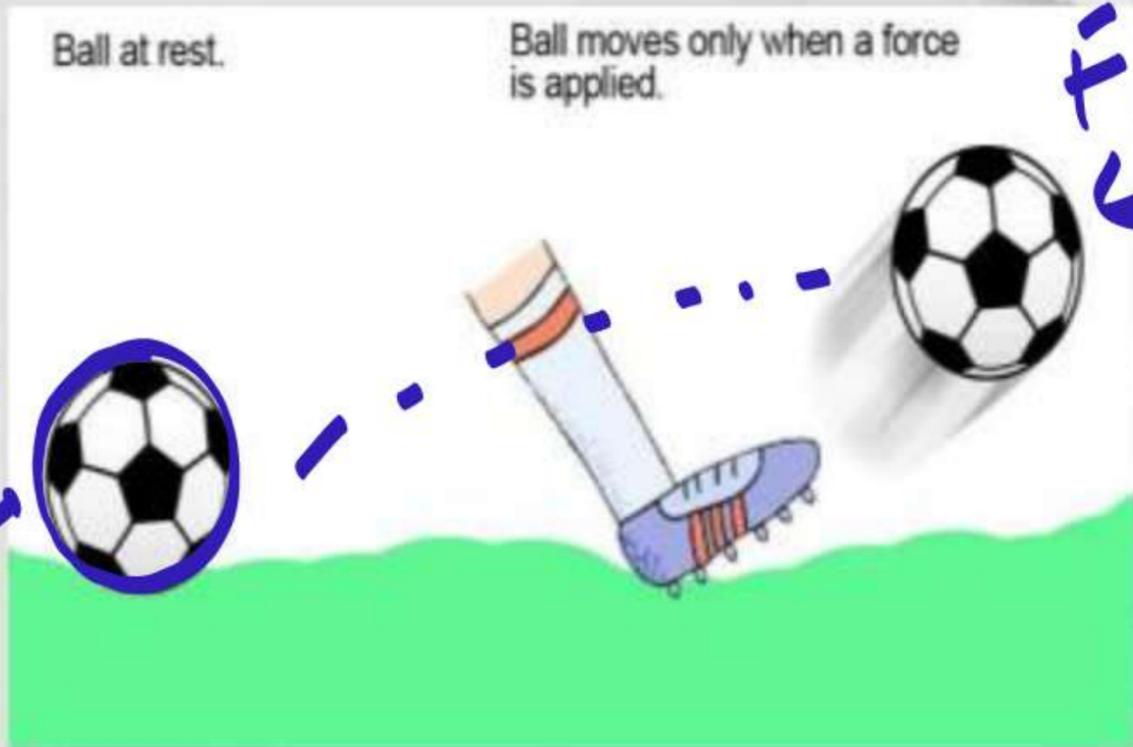
The first law

- states that a body remains at rest or in uniform motion in a straight line unless acted upon by a force

-पहला नियम कहता है कि कोई पिंड तब तक स्थिर अवस्था में या एक सीधी रेखा में एकसमान गति में रहता है जब तक उस पर कोई बल न लगाया जाए

known as the Law of Inertia/जड़त्व के नियम के रूप में जाना जाता है,,

जड़त्व
Inertia



The second law of motion

Describes the relationship between the force acting on a body and the resulting acceleration. According to Newton's second law, the force acting on an object is equal to the product of its mass and acceleration/Rate of change of linear momentum is directly proportional to the applied force and it will act in the direction of force applied.

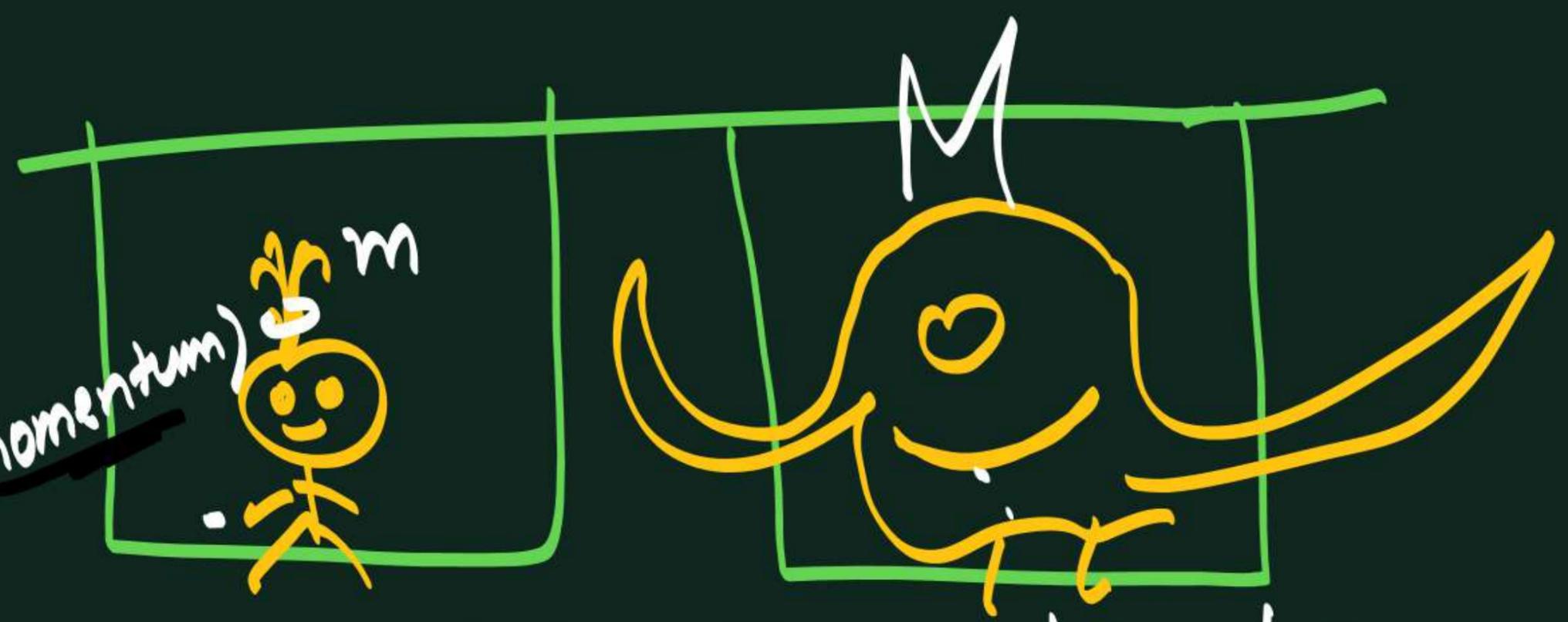
रेखिक संवेग में परिवर्तन की दर लगाए गए बल के समानुपाती होती है और यह लगाए गए बल की दिशा में कार्य करेगी।



$u=0$
 v
 $(mv) - mu$
(momentum)

$= \frac{m(v-u)}{t}$

$F = ma$



$F = ma$

2nd Law

Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction

न्यूटन के गति के तीसरे नियम में कहा गया है कि प्रत्येक क्रिया के लिए एक समान और विपरीत प्रतिक्रिया होती है

For every action, there is equal and opposite reaction

Action
Accelerating force of
the bullet



Reaction
Recoil force
on the gun

Action
Fist Exert Force on
Jaw

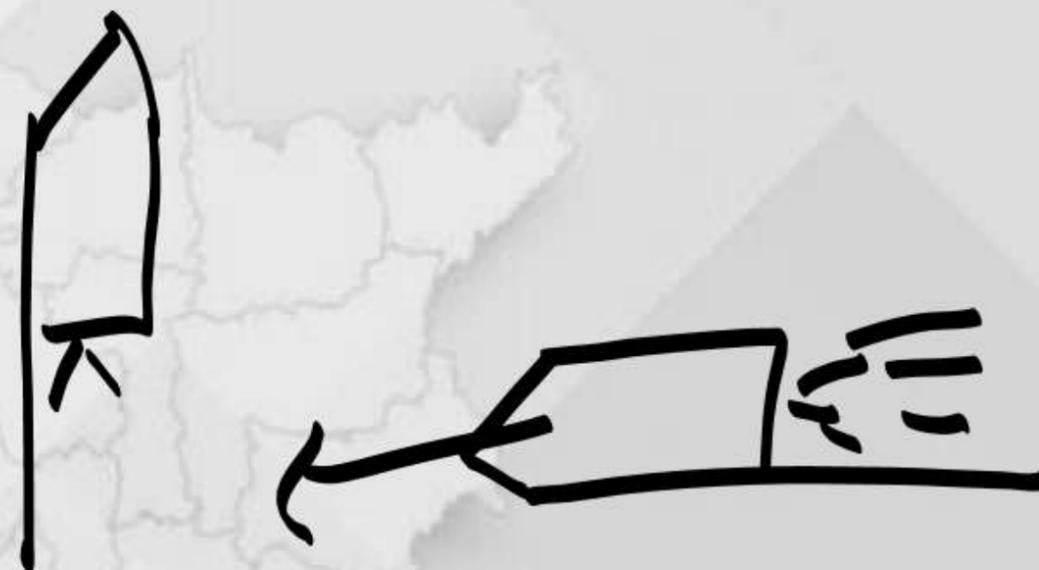


Reaction
Jaw Exert Force
on Fist

Action
Boy's feet exert
force on boat

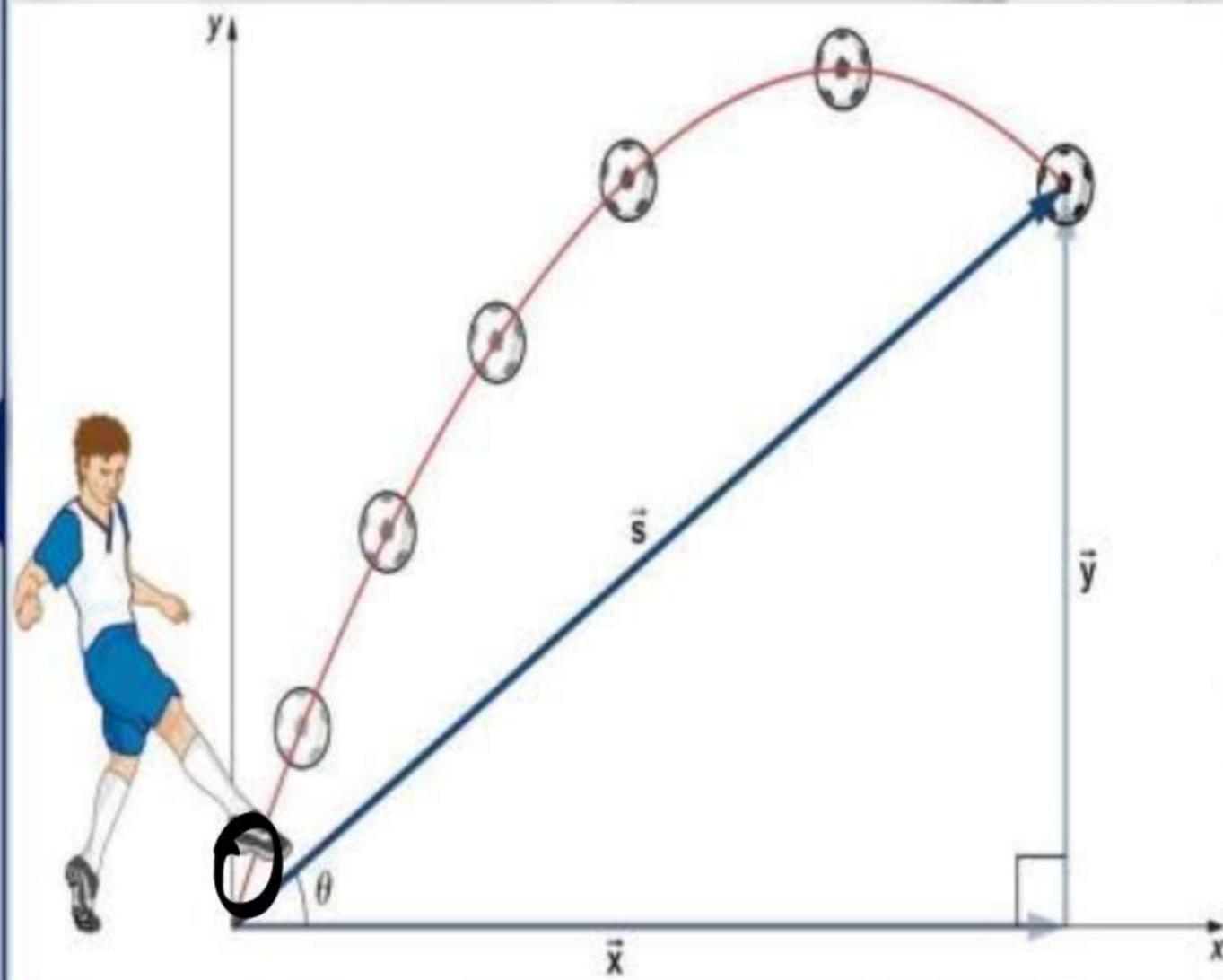


Reaction
Boat exerts
force on feet

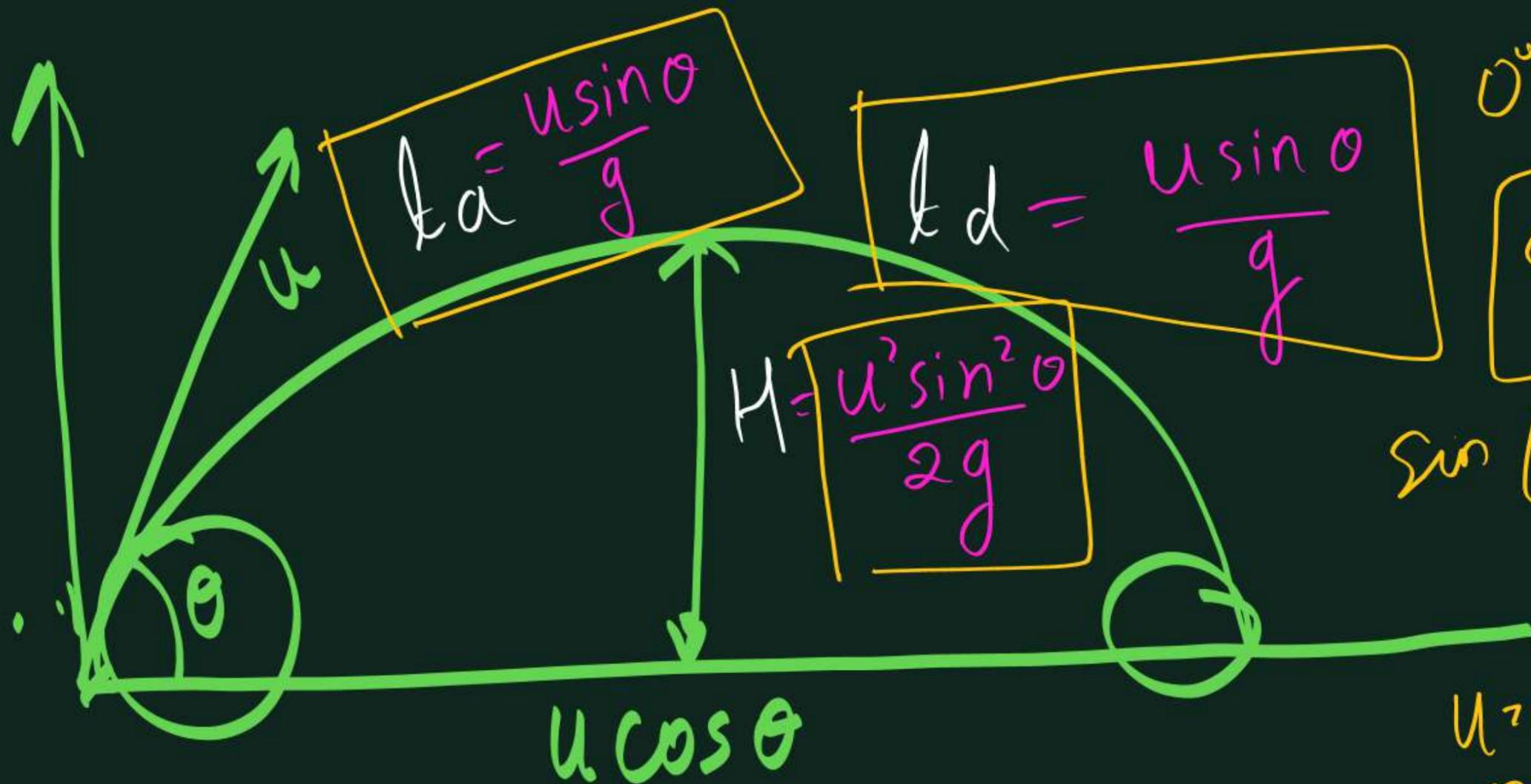


Projectile motion/प्रक्षेप्य गति

Projectile / प्रक्षेप्य



$u \sin \theta$



$0^\circ - 90^\circ = 0 - 1$

$\sin 90 = 1$

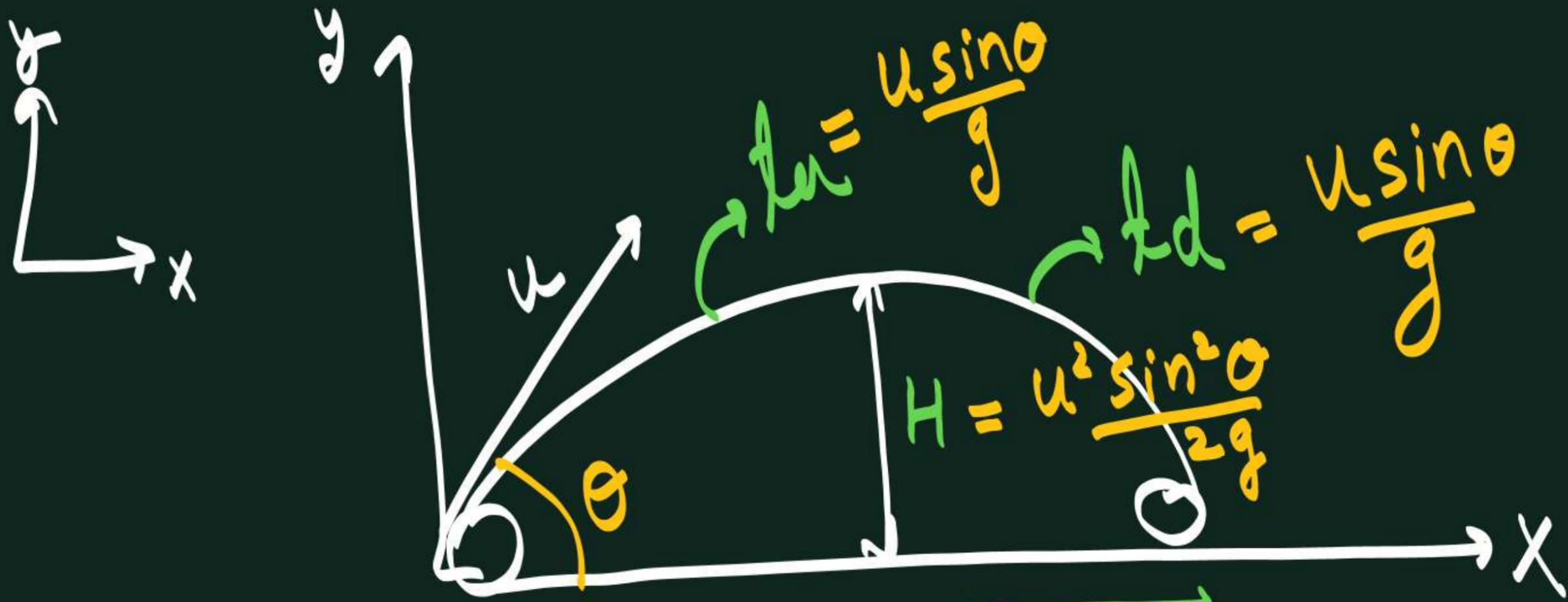
$\sin (2 \times 45) = 1$

$u \cos \theta$

max. $\theta = 45^\circ$

$R = \frac{u^2 \sin 2\theta}{g}$

\Rightarrow
 $u = 10 \text{ m/s}$
 $\theta = 45^\circ$
 $g = 10$
 $\frac{10 \times 10 \times (\sin 2 \times 45)}{10}$



$R = \frac{u^2 \sin 2\theta}{g} \Rightarrow \boxed{\text{max } \theta = 45^\circ}$

Angle	Sine Value
0°	0
30°	$\frac{1}{2}$
45°	$\frac{1}{\sqrt{2}}$
60°	$\frac{\sqrt{3}}{2}$
90°	1

Time of ascent(t_a)-Time taken by body to reach maximum height/शरीर द्वारा अधिकतम ऊंचाई तक पहुंचने में लिया गया समय ✓

$$t_a = \frac{u \sin \theta}{g}$$

Time of Descent-Time taken by body to reach the ground from maximum height/अधिकतम ऊंचाई से जमीन तक पहुंचने में शरीर को लगने वाला समय.

$$t_d = \frac{u \sin \theta}{g}$$

Maximum Height(H)/अधिकतम ऊंचाई(एच)

$$H = \frac{u^2 \sin^2 \theta}{2g}$$

Horizontal Range (R)/ क्षैतिज सीमा =

$$R = \frac{u^2 \sin 2\theta}{g}$$