YAKEEN NEET 2.0

2026

(One Shot)

Motion in a Straight Line

Physics | Summary Lecture

By- Manish Raj (MR Sir)

Distance & Displacement

Avg speed & Avg velocity.

Speed & Inst velocity

* Acceleration.

Variable acc^{n}.

Constant acceleration.

eqn of motion

Graph. x/t v/t a/t

v/x v^2/x a/x

v^2/t

motion under gravity

air friction / Juggler / water tap

Balloon Rocket.

Frame of refrence → A place from where we take observation.

→ Observer → who take observation.

moving frame

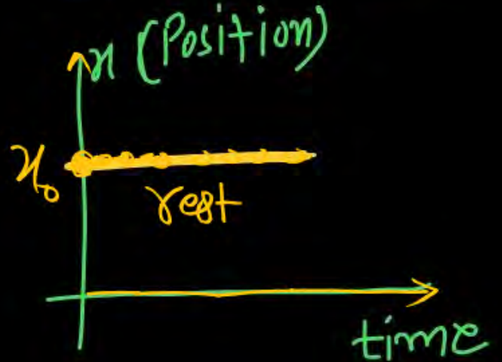
Position →

Motion in straight line :- Rest and motion are relative term depends on frame of refrence.

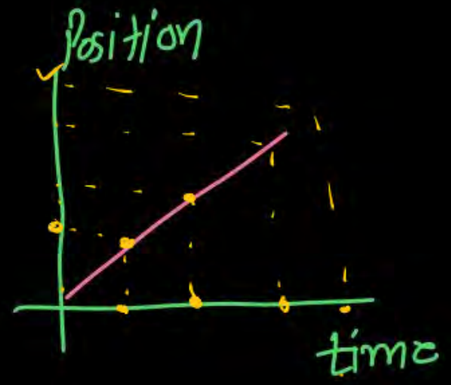
Position → Location of object w.r.t. frame of reference.

Position is changing with time → motion

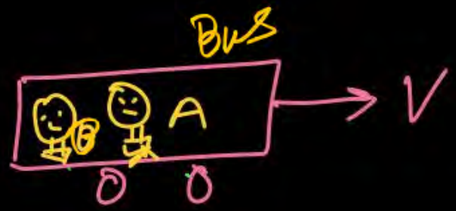
Position is not changing with time → Rest



Rest

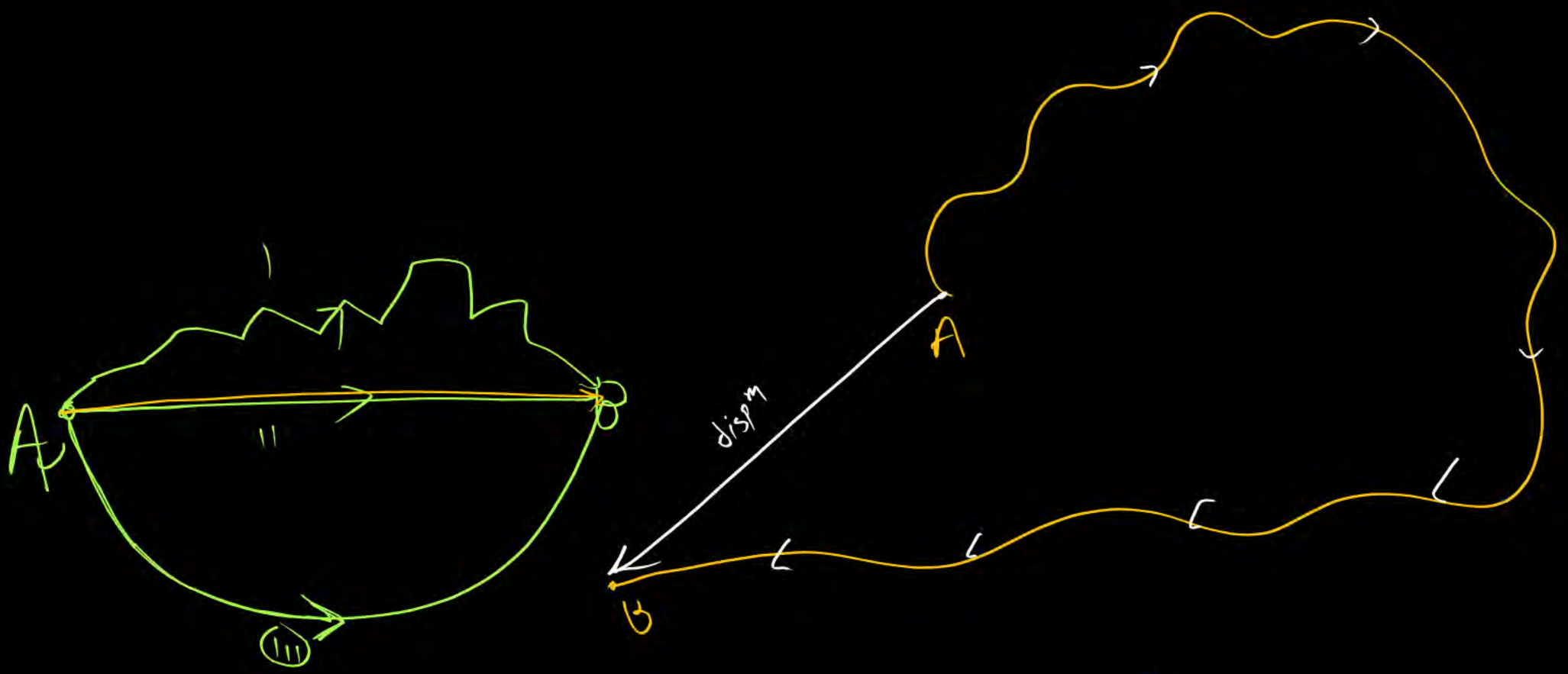


Motion



A is in motion w.r.t → C

A is at rest w.r.t 'B'



$disp^n$ is Same in all three Path.

$\Rightarrow$ $dist^n$ is $diff^n$ on three Path

Distance

⇒ Actual Path length when object is in motion.

⇒ Scalar, How far you moved (where does not matter)

⇒ Depends on Path taken B/W two Position.

⇒ Can't decrese with time.

⇒ always +ve. Never -ve

* Position change Karte time Sach me Kiya gya Sangharsh. (Path length) Distance

Displacement

⇒ Shift in Position $= \vec{x}_f - \vec{x}_i$

⇒ Vector, dirⁿ towards final position from initial.

⇒ Shortest distance B/W initial and final Position.

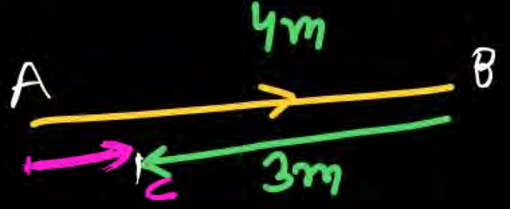
⇒ How far and where Position is Shifted.

⇒ Between two Point does not depends on Path.

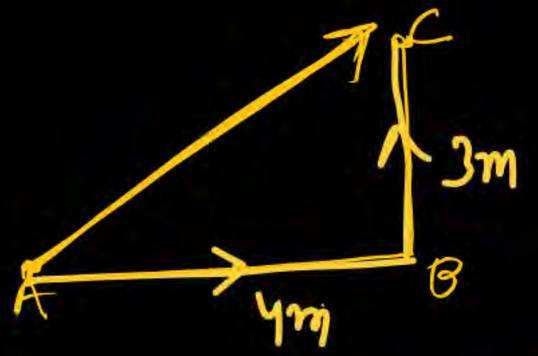
⇒ Can decrese with time.

MR* Box Jab tak Actual Path Nahi Pata, distance nahi Nikal Skte.

$[dist^n = 7m$
$Disp^n = 7m$



$dist^n = 7m$
$disp^m = +1m$



$disp^m = 5m$
$dist^n = 7m$

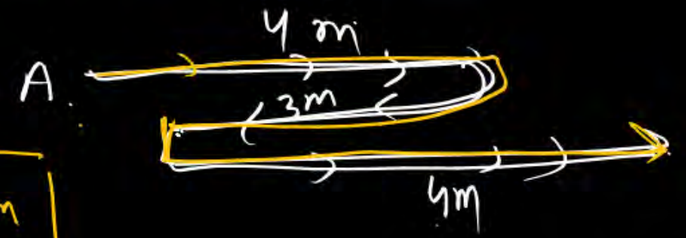
Object is moving without change in direction :-

$dist^n = |disp^m|$

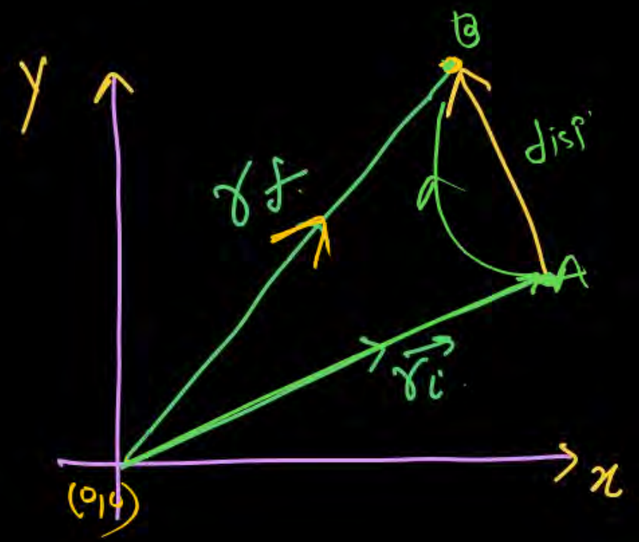
$\frac{dist^n}{|disp^m|} = \frac{1}{1}$

$dist^n \geq disp^m$

always Valid
(Nothing is given)



$disp^n = 5m$
$dist^n = 11m$



Displacement $= \vec{r}_f - \vec{r}_i$

$\text{disp}^m = \vec{r}_f - \vec{r}_i$

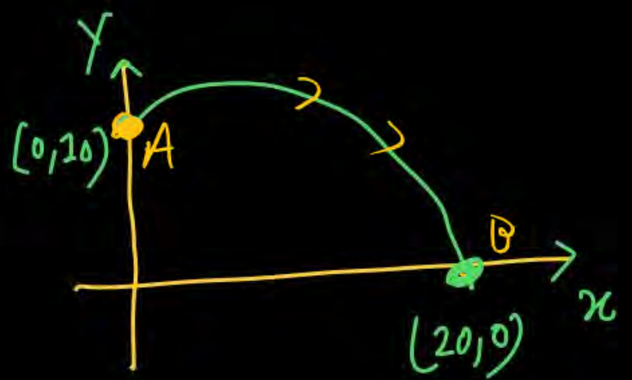
$= (x_f\hat{i} + y_f\hat{j} + z_f\hat{k}) - (x_i\hat{i} + y_i\hat{j} + z_i\hat{k})$

(Q) Initial Position $(2, 3, -3)$ and final Position $(6, 6, 2)$ then find distance & displacement.

→ distⁿ can't be find because Path is not known

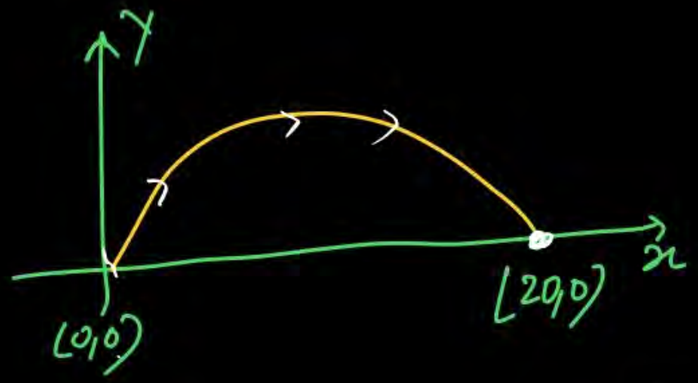
$\text{disp}^m = (6-2)\hat{i} + (6-3)\hat{j} + (2+3)\hat{k}$

$\boxed{\text{disp}^m = 4\hat{i} + 3\hat{j} + 5\hat{k}}$

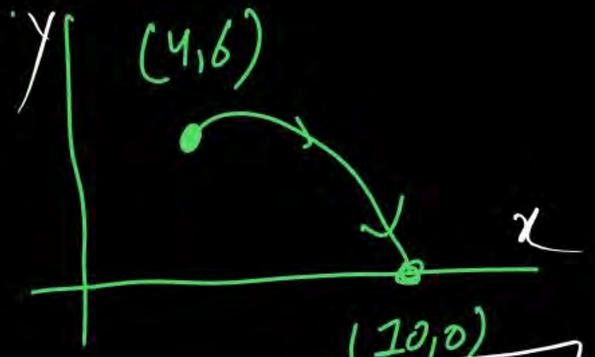


$$disp^m = (20\hat{i}+0\hat{j}) - (0\hat{i}+10\hat{j})$$

$$\boxed{disp^m = 20\hat{i} - 10\hat{j}}$$



$$disp^n = 20\hat{i} - 0\hat{i} - 0\hat{j}$$
$$= 20\hat{i}$$

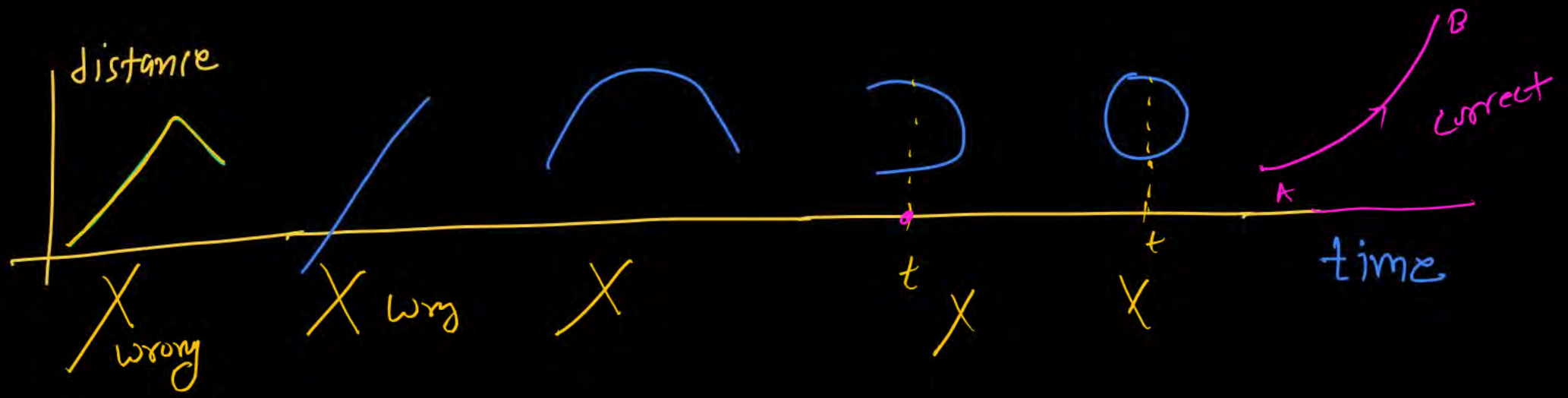


$$\boxed{disp = 10\hat{i} - 4\hat{i} - 6\hat{j}}$$
$$= 6\hat{i} - 6\hat{j}$$

U-turn

$$disp^m = 15 - 10 = 5\hat{i}$$

$$\boxed{dist = 45m}$$


distance
B
correct
A
t
t
time
X
wrong
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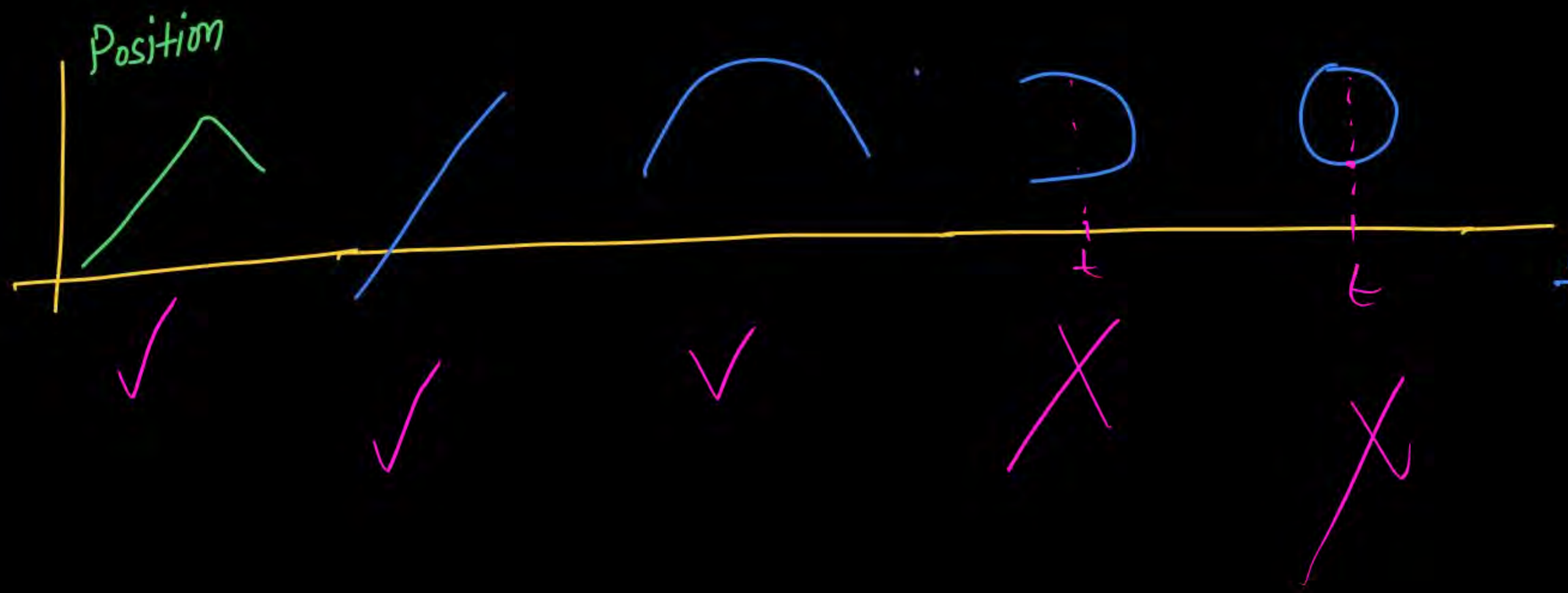
wrg
X
X
X


Position
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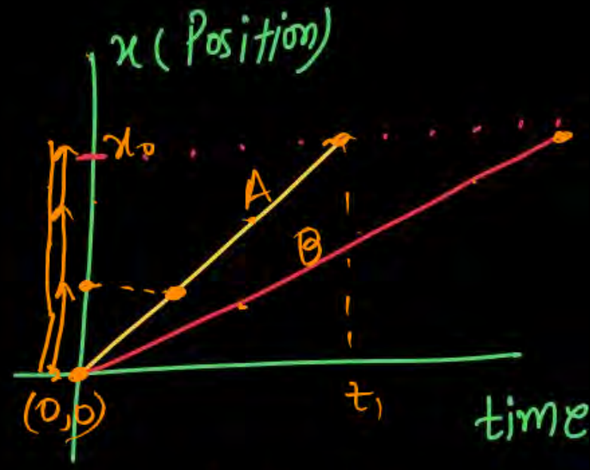
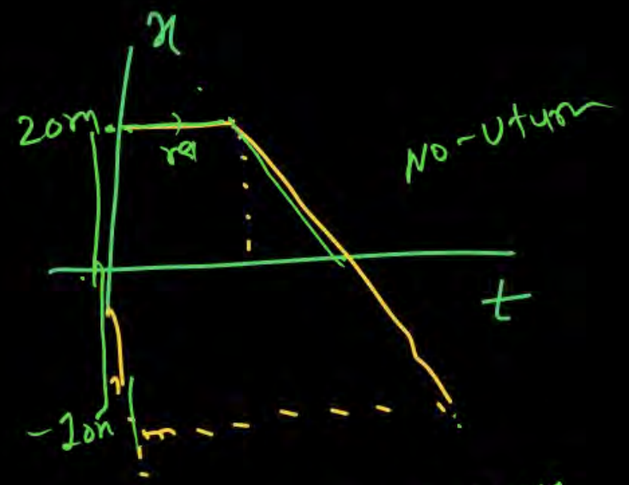


$|disp^m|_A = |disp^m|_B$

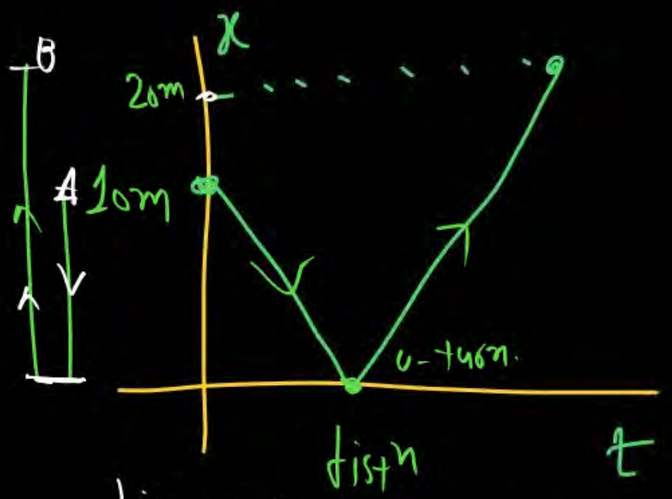
$disp^m = 0$

$dist^n = 20m$

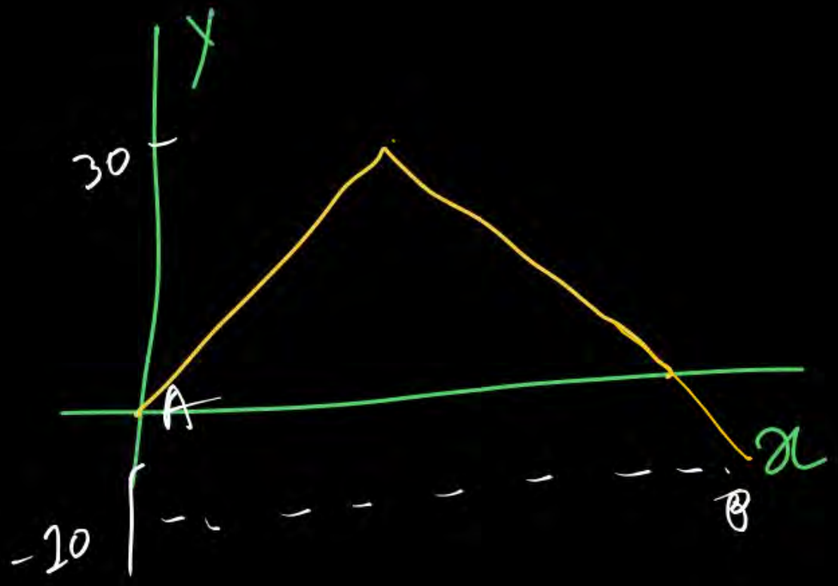


$dist^n = 30m$

$disp^n = 30m$



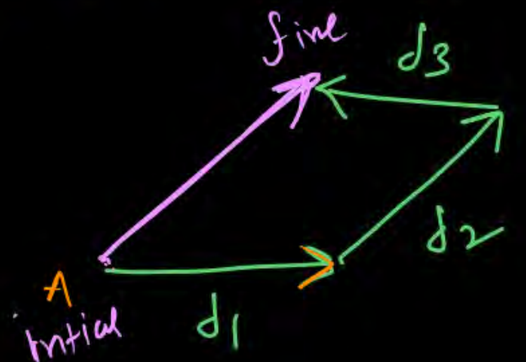
$dist^n = 30m$ $dist = 10m$



$dist^n =$

$disp^m =$

(8) Ramlal moves a length $\vec{d_1}$, $\vec{d_2}$, $\vec{d_3}$ as shown in figure then find distance and displacement :



$$\text{distance} = |\vec{d_1}| + |\vec{d_2}| + |\vec{d_3}|$$

$$\underline{\text{disp}^n} = \vec{r}_f - \vec{r}_i = \vec{d_1} + \vec{d_2} + \vec{d_3}$$

Kallu moves 10m north, 10m east climb 10m on pole then find displacement:-

$$d_1 = 10\hat{j}$$

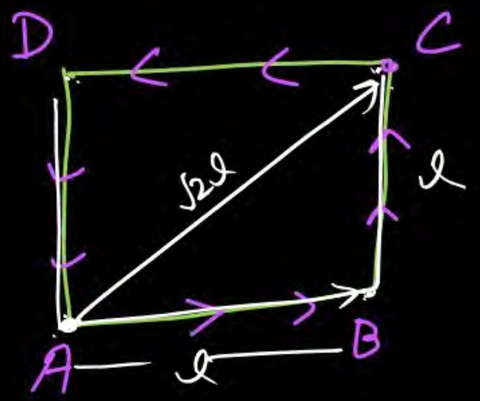
$$d_2 = 10\hat{i}$$

$$d_3 = 10\hat{k}$$

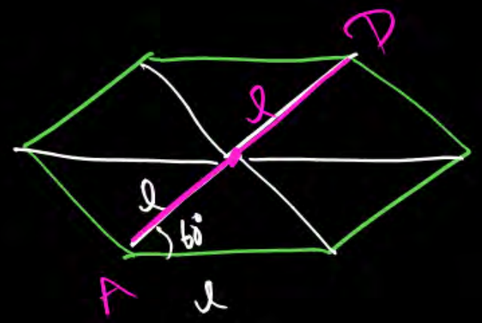
$$\text{disp}^n = 10\hat{i} + 10\hat{j} + 10\hat{k}$$

$$|d| = 10\sqrt{3}$$

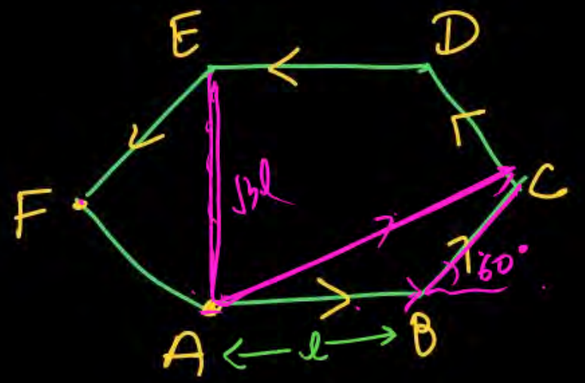
Object is moving on square Park of side l :-



Motion	Distance	Displ^{n}
$A \to B$	l	l
$A \to C$	$2l$	$\sqrt{2}l$
$A \to D$	$3l$	l
$A \to A$	$4l$	0

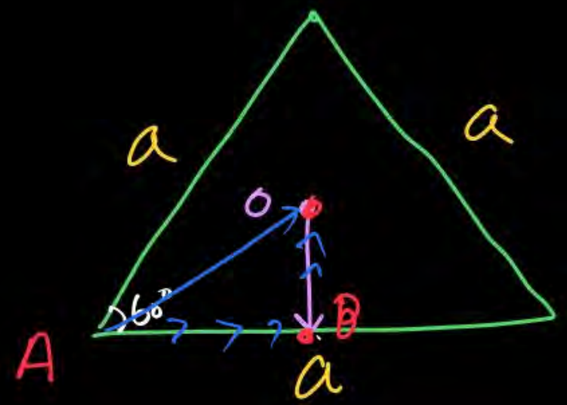


⊛ Object is moving on hexagonal Path.

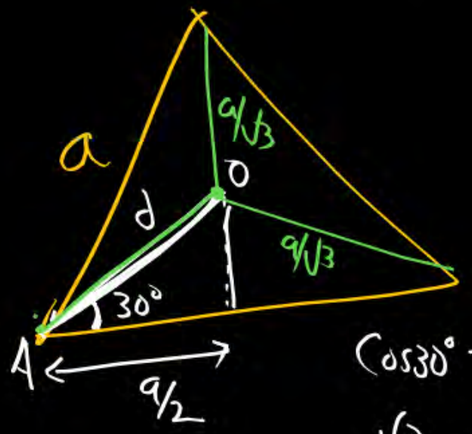


Motion	Distance	Displ^{n}
$A \to B$	l	l
$A \to C$	$2l$	$\sqrt{3}l$
$A \to D$	$3l$	$2l$
$A \to E$	$4l$	$\sqrt{3}l$
$A \to F$	$5l$	l
$A \to A$	$6l$	0

equilatral Triangle of side a, then find dist^n & disp^m when object moves A to B to O.



$$(\text{disp}^n)_{AO} = \frac{a}{\sqrt{3}}$$

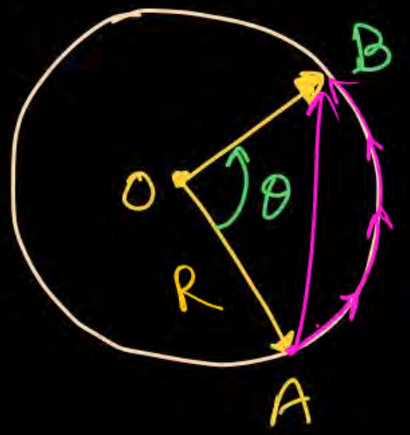


$\cos 30° = \frac{a}{2d}$

$\frac{\sqrt{3}}{2} = \frac{a}{2d}$

$d = \frac{a}{\sqrt{3}}$

Object is moving on circular Path :-

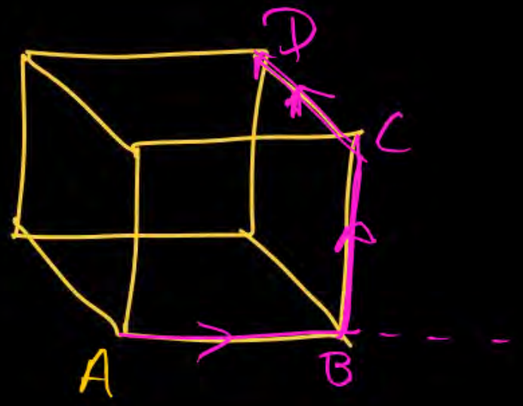


$(\text{disp}^n)_{AB} = \text{Arc} = R\theta$

$\text{disp}^n = 2R\sin(\theta/2)$

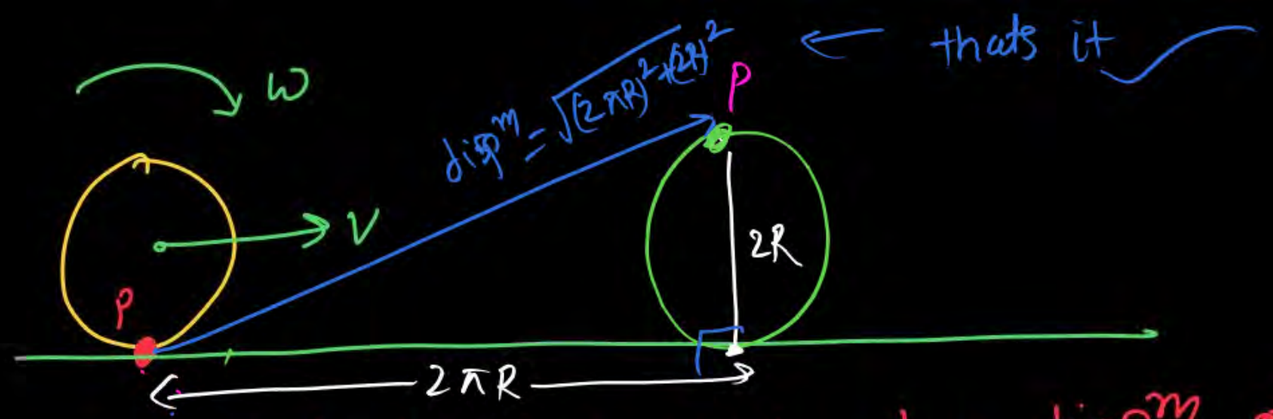
↳ If Angle is very Small

$\text{dist}^n = \text{disp}^m = R\theta$



disⁿ = 3l

dis^{r} = $\sqrt{3}$l



$disp^{m} = \sqrt{(2\pi R)^2 + (2R)^2}$ ← thats it

Wheel is in Pure Rolling then $disp^{m}$ of Point of Contact after half Rotation.

Avg speed (In time interval)

* **Avg speed = $\frac{\text{Total distance}}{\text{total time}}$**

- Scalar ✓
- Not always magnitude of Avg. velocity.
- does tells us speed at any instant → No.

MRP Box

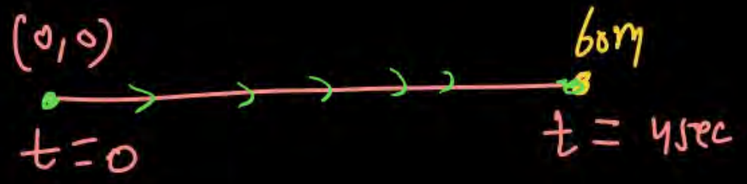
$v_{min} < v_{Avg\ Speed} < v_{max}$ ✓

Avg velocity (#)

Avg velocity = $\frac{\text{Total displ}^m}{\text{total time}}$

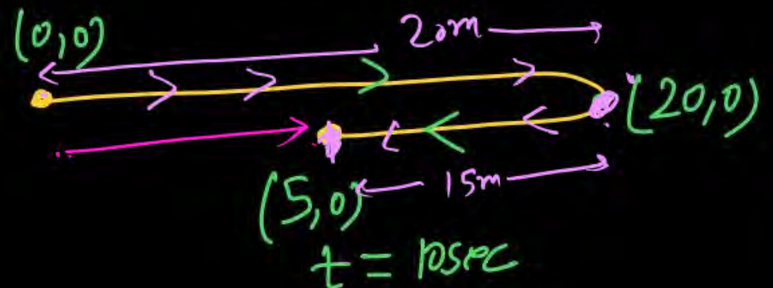
- vector ✓
- direction along displ^m ✓
- If direction is not changing |Avg velocity| = Avg speed.

* If Avg. velocity is always equal to Avg. speed.
  - → No.



$$\text{Avg speed} = \frac{60}{4} = 15\ m/s$$

Avg velocity



$$\text{Avg speed} = \frac{35}{5} = 7\ m/s$$

$$\text{Avg velocity} = \frac{5}{5} = 1\ m/s$$

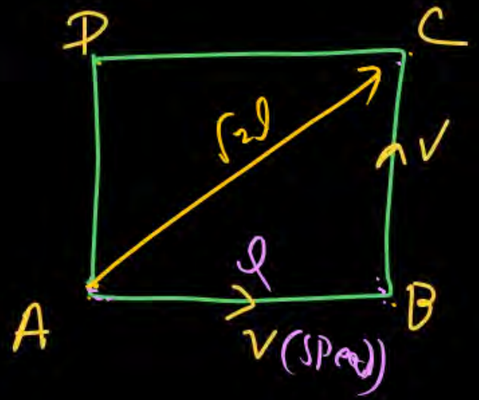
(a) Object is moving on square path with constant speed then Avg. speed and Avg. velocity will be :-

$$t_{AB} = \frac{l}{v}$$

$$t_{AC} = \frac{2l}{v}$$

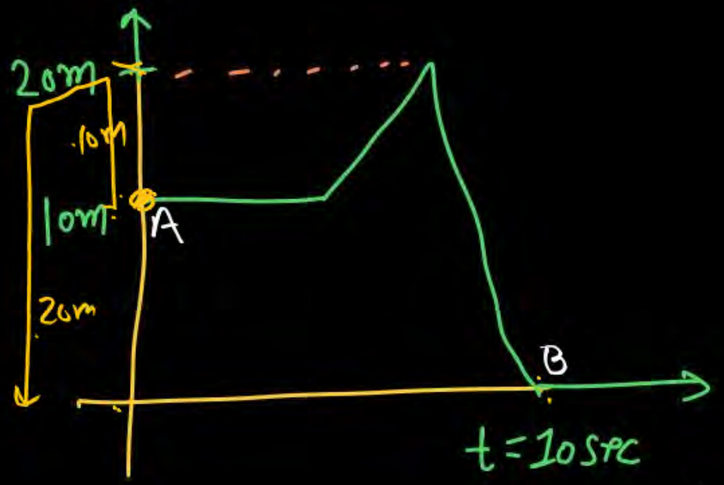
$$t_{AD} = \frac{3l}{v}$$

$$t_{AA} = 4l/v$$



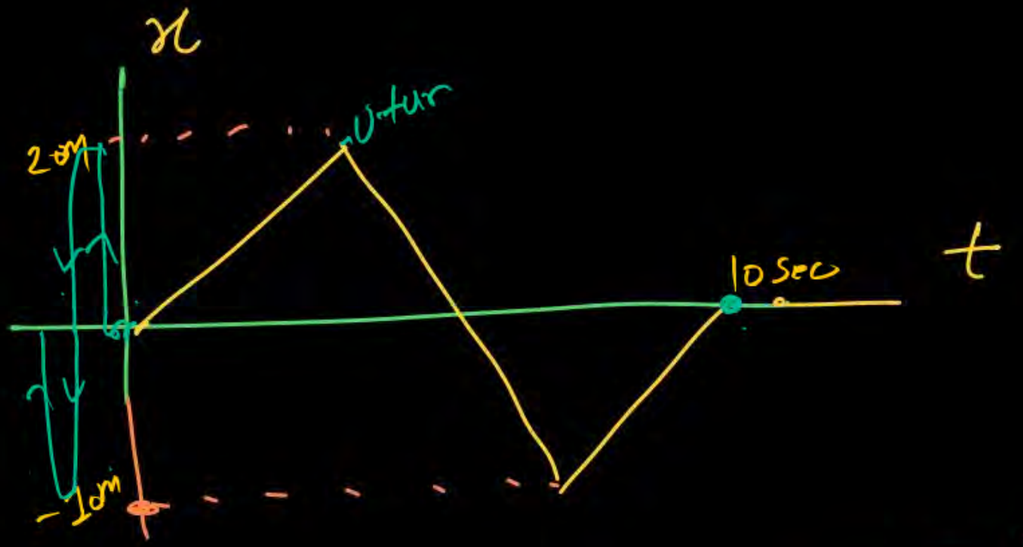
$$(\text{Avg velocity})_{AC} = \frac{\sqrt{2}l}{2l/v} = \frac{v}{\sqrt{2}}$$ Ans

$$(\text{Avg. velocity})_{AD} = \frac{l}{3l/v} = \frac{v}{3}$$ Ans



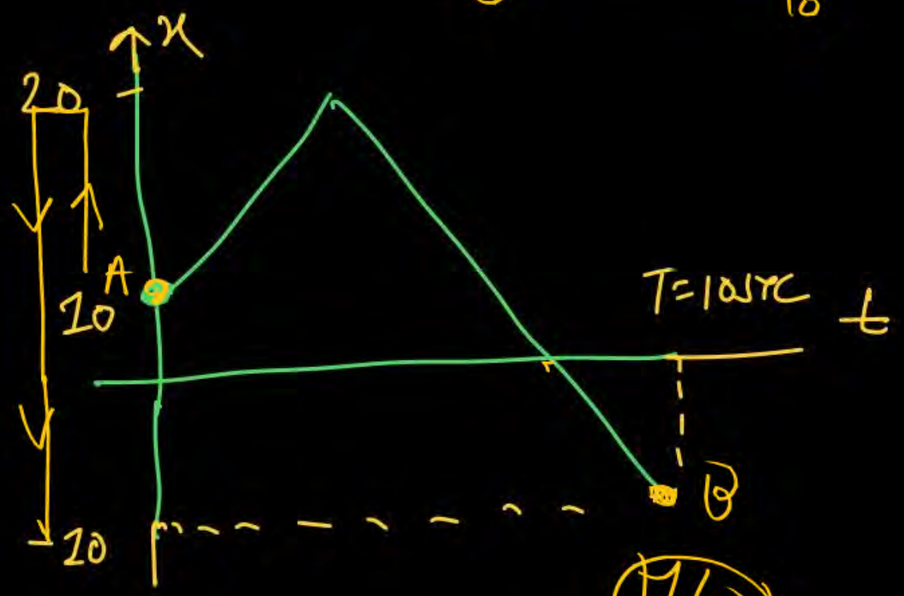
$$\text{Avg speed} = \frac{\text{total dist}^{n}}{\text{total time}} = \frac{30}{10}$$

$$\text{Avg velocity} = \frac{0-10}{10} = -\frac{10}{10}$$



$$\text{Avg speed} = \frac{60}{10}$$

Avg velocity = 0



M/W

object moves d_1 distance with speed v_1 and d_2 distance with speed v_2 then find Avg. speed.

$$\text{Avg speed} = \frac{d_1+d_2}{t_1+t_2} = \frac{d_1+d_2}{\frac{d_1}{v_1}+\frac{d_2}{v_2}}$$

→ equal distⁿ intraval

$$\text{Avg speed} = \frac{2v_1v_2}{v_1+v_2}$$

→ for 3-equal distⁿ Intraval $\text{Avg spm} = \frac{3}{1/v_1+1/v_2+1/v_3}$

$$\text{Avg spm} = \frac{2}{1/v_1+1/v_2}$$

object moves with v_1 speed for time t_1 then moves with v_2 speed for time t_2, then find Avg. speed.

$$\text{Avg speed} = \frac{d_1+d_2}{t_1+t_2} = \frac{v_1t_1+v_2t_2}{t_1+t_2}$$

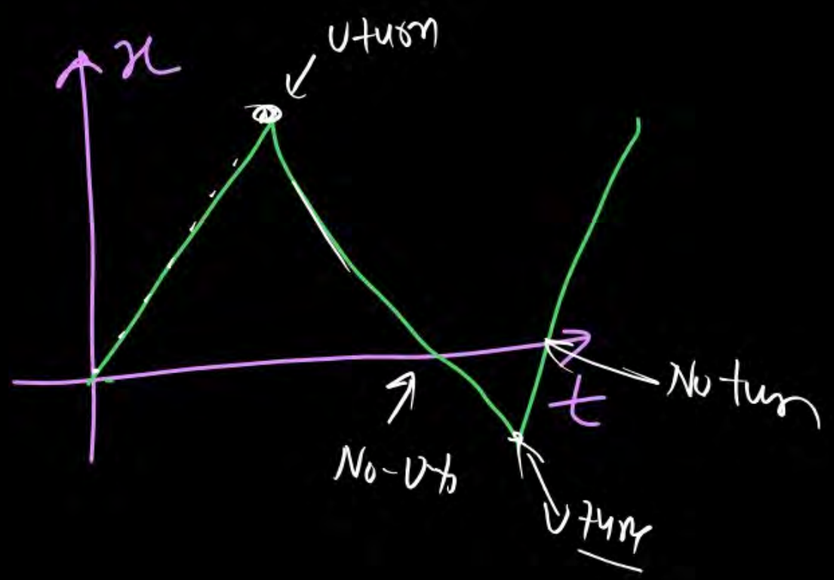
→ for Two equal time-traval ($t_1=t_2=t$)

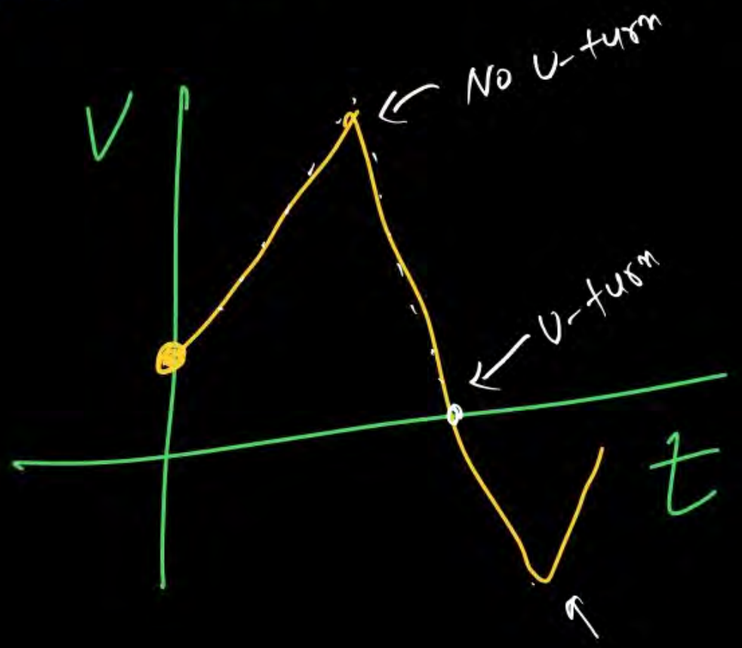
$$\text{Avg speed} = \frac{v_1+v_2}{3}$$

3-equal time intvls
Avg speed = $\frac{v_1+v_2+v_3}{3}$

x/t graph me U-turn waha hota hai Jaha Position Increasing se decreasing or decreasing to Increasing ho Jay.

v/t graph me U-turn waha hota hai Jaha velocity apna direction (sign) change Kare +ve to -ve or -ve to +ve.





Instantaneous speed

- How fast, object is moving (direction → ignored)
- The Rate of change in distance w.r.t. time
- Slope of distance-time graph
- $s = \frac{dx}{dt}$ Scalar
- (can't be -ve, always +ve.

(Q) Is instantaneous speed alway equal to magnitude of inst. velocity ??

↳ Yes

In very small time interval dist^n = disp^n

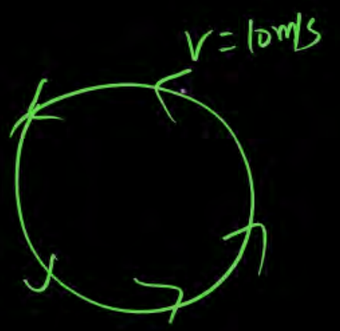
Instantaneous velocity

- How fast & where (object)
- * direction of velocity along motion
- $\vec{v} = \frac{d\vec{x}}{dt}$
- Slope of Position-time graph. is velocity.

$\vec{v} = V \times \text{dir}^n$

$|\vec{v}|$ = speed

$v_1 = 10\hat{i}$ $v_2 = 10\hat{j}$



mR* Box:-

velocity change karne ke 2-method, dir^{n} change kar ke ya speed chaye.

but speed sirf magnit change kar ke hoga

Object is accelerating then which of the following may be constant ??

✓(a) speed

✓(b) dir^{n}

✓(c) both a & b

✗(d) velocity

If speed is uniform (constant) then velocity will be ??

↳ Ans → velocity may be variable

If speed is not uniform (not constant) then velocity will be ??

↳ velocity must be variable

If velocity is uniform (constant) then what about speed ??

↳ must be const

If velocity is not uniform (variable) then what about speed

↳ Speed may or may not be const

(Q) If object is accelerating then what may be remains constant.

(a) speed (b) velocity (c) direction (d) Non of these.

(Q) If Position of object $x = \alpha t^3 + \beta t^2 + \gamma t + \delta$ find Position, velocity, acceleration at $t = 0$

$$\frac{dx}{dt} = \alpha\, 3t^2 + \beta(2t) + \gamma + 0$$

$$V = 3\alpha t^2 + 2\beta t + \gamma$$

$$a = 3\alpha(2t) + 2\beta$$

$(x)_{t=0} = \delta$ m

$(V)_{t=0} = \gamma$ m/s

$(a)_{t=0} = 2\beta$.

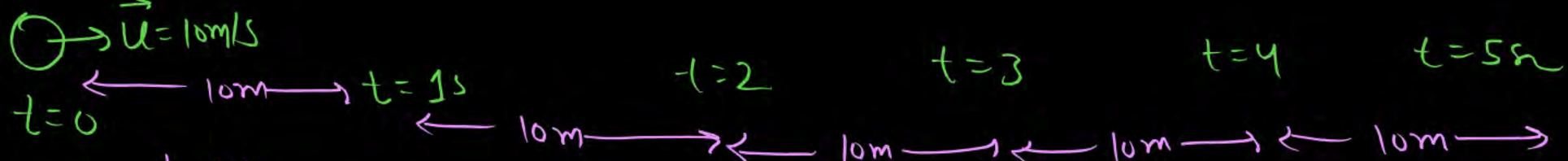
Uniform velocity → Bhot udas hai Jindagi → No change in speed and direction.

(Uniform Motion)

- equal distance in equal time intraval.
- Path must be straight line [No - uturn]
- Avg. velocity = Instantaneous velocity.
- acceleration = 0
- any time distance = distance = displacement.

No turn

$a = 0$



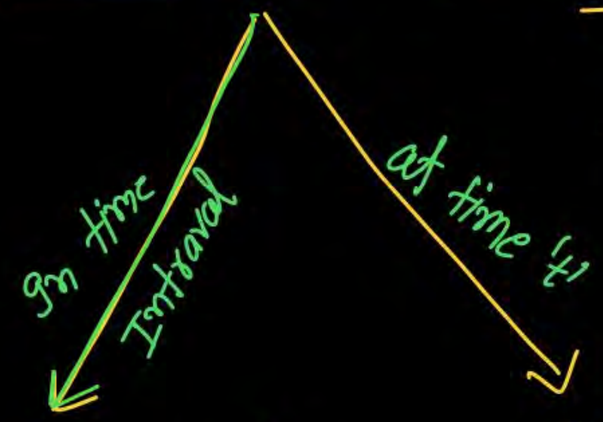
$d = ut$

$= 10 \times 1$

Acceleration :→ ye velocity change karne ka kam karta hai :-

→ How fast velocity is changing ka feel hai

→ Direction along change in velocity.
→ $\vec{a}$ always along Force



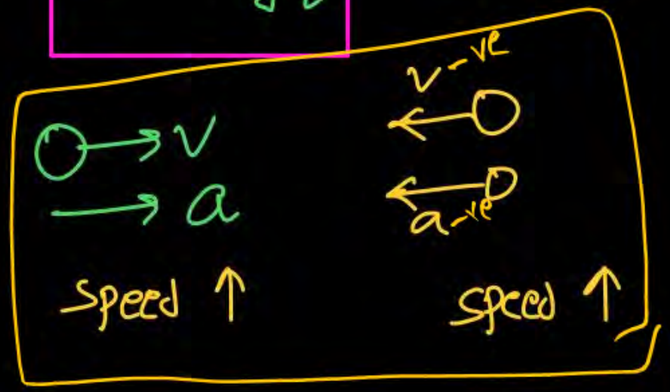
Instant. acc^{n} = The rate of change in velocity with time

$$\vec{a}_{Avg} = \frac{\vec{v}_f - \vec{v}_i}{\Delta t}$$

$$\vec{a}_{Avg} = \frac{\int a\,dt}{\int dt}$$

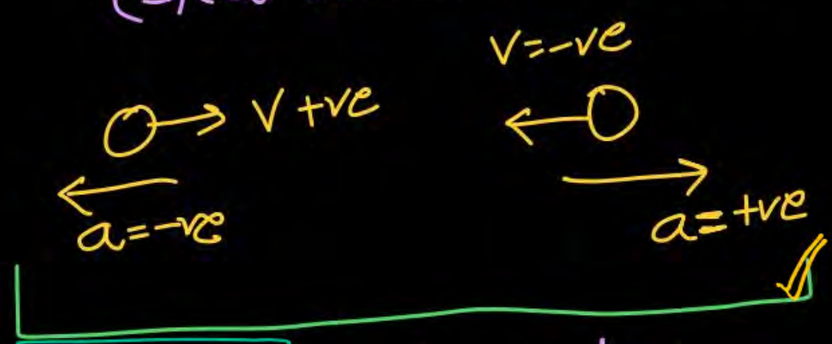
⊛ Slope of v/t graph

$$\vec{a} = \frac{d\vec{v}}{dt}$$

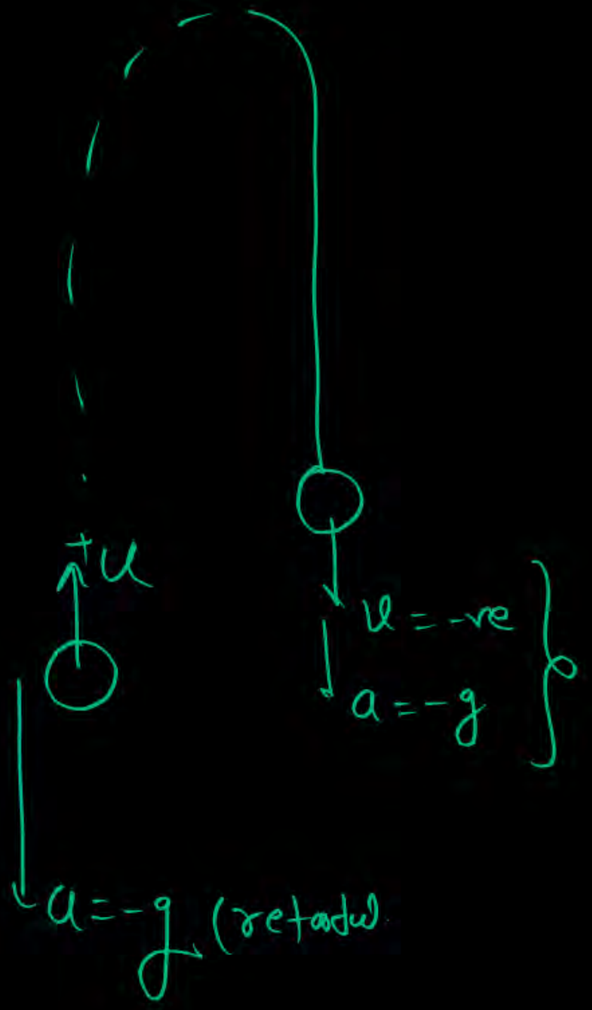


$$\langle v_{Avg} \rangle = \frac{\int v\,dx}{\int dt} \qquad \langle P \rangle = \frac{\int P\,dx}{\int dt}$$

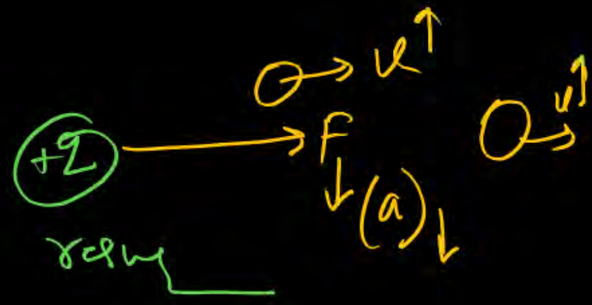
(speed decrees in both case)



Retardation → Acceleration opposite to velocity is called retardation.



Now this is not retardation



which of the following option is correct for velocity and acceleration.

(a) $v\uparrow$ $a\downarrow$

(b) $v\downarrow$ $a\uparrow$

(c) $v\uparrow$ $a\uparrow$

(d) $v\downarrow$ $a\downarrow$

(e) $v=0$; $a\neq 0$ (# at max^m height of motion under gravity. $v=0$ instant)

(f) $v\neq 0$ $a=0$ (Uniform motion)

(g) $v\neq 0$ $a\neq 0$

(h) $v=+ve$ $a=-ve$

(I) $v=-ve$ $a=+ve$

(J) $v=-ve$ $a=-ve$

(K) $v=$ const^n $a\uparrow$

(L) $v\uparrow$ $a=0$

(m) $v=$ const^n $a=0$

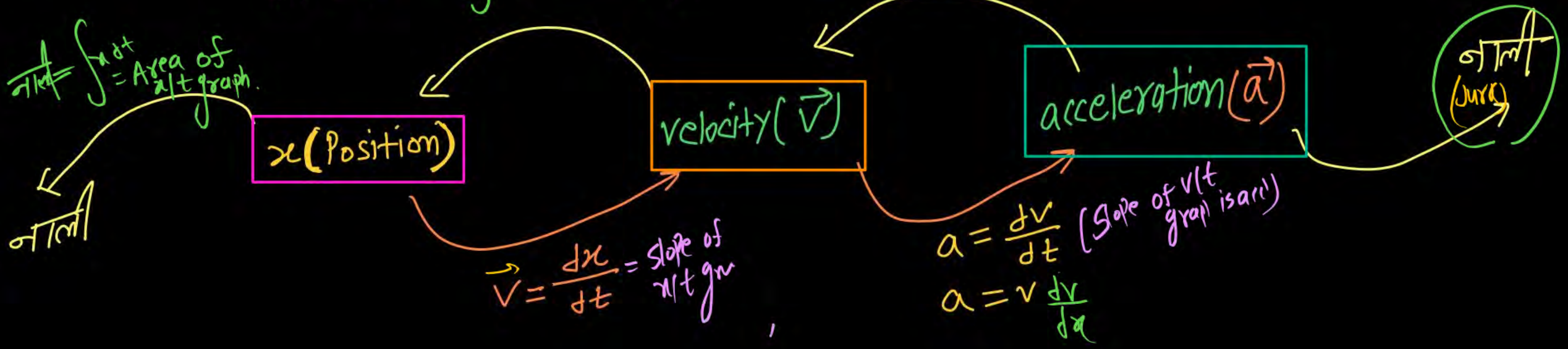
Acceleration :-

$$a = \frac{d\vec{v}}{dt} = \frac{d^2x}{dt^2} = v\frac{dv}{dx}$$

Nali Concept :-

$\Delta x = \int v\,dt$ = Area of v/t graph

$\Delta v = \int a\,dt$ = Area of a/t graph.



MR* Box –

(1) Pahle dekho question me given kya hai.

(2) find kya karna hai

(3) given & find karne wale P.Q. me kya relation hai.

MR* Box :–

* Kinematics ka bhagwan acceleration hai

* question me a_{cc}^{n} ka → Nature decide karega question kaise solve karna hai

$a_{cc}^{n} = 0$	$a_{cc}^{n} =$ Const^{n}	a_{cc}^{n} variable
Uniform Motn $r =$ Const^{n} $disp = v \times t$	# use eqn of motn. $\vec{v} = \vec{u} + \vec{a}t$	do not use eqn of Motn ↓ Integrate & diff.

NEET- 2012

(Q) x (Position) $= 8 + 12t - t^3$ find retardation of Particle when velocity becomes zero.

$$x = 8 + 12t - t^3$$

$$* \quad v = \frac{dx}{dt} = 12 - 3t^2$$

$$V = 12 - 3t^2 = 0$$

$$12 = 3t^2$$

$$t = 2 \text{ sec}$$

$$a = \frac{dv}{dt} = -3(2t)$$

$$a = -6t$$

$$a = -6 \times 2$$

$$a = -12 \text{ m/s}^2 \quad \text{Ans}$$

NEET-2016

(Q) Velocity $V = At + Bt^2$ where A & B are constant, then distance between 1S and 2Sec

$$V = At + Bt^2$$

$$\int dx = \int_1^2 At\, dt + \int_1^2 Bt^2\, dt$$

$$\int \quad dx$$

(Q) If $v = 2x$ find acc^n.

$\frac{dv}{dx} = 2$

$acc^n = \frac{dv}{dt} \times$

$a = v\frac{dv}{dx}$

$a = 2x(2)$

$a = 4x$ m

(Q) If $x = at^2 - bt^3$

↳ find acc^n

$v = \frac{dx}{dt} = a2t - b3t^2$

$a = 2a - 3b(2t)$

(Q) $x = A\sin(\omega t)$

↳ $v = A\cos(\omega t) \times \omega$

↳ $a = A\omega(-\sin\omega t)\times\omega$

$a = -A\omega^2 \sin(\omega t)$ ✗

(Q) $t = x^2 + x$ find acceleration.

↳ diff^n wrt 't'

$1 = \frac{dx^2}{dt} + \frac{dx}{dt}$

$1 = 2x\frac{dx}{dt} + \frac{dx}{dt}$

$\frac{dx}{dt}(1+2x) = 1$

$V = \frac{1}{1+2x}$

$\frac{dv}{dx} = \frac{-2}{(1+2x)^2}$

$a = v\frac{dv}{dx}$ ✗

NEET - 2015

(Q) velocity $V = \beta x^{-2n}$ then find **acceleration** as function of x,

$V = \beta x^{-2n}$

$\frac{dV}{dx} = \beta(-2n) x^{-2n-1}$

$a = V\frac{dV}{dx} = \beta x^{-2n}(-2n\beta) x^{-2n-1}$

$= -2n\beta^2 x^{-4n-1}$

Always for const acc^n

$$\vec{v} = \vec{u} + \vec{a}t$$

$$\vec{s} = \vec{u}t + \frac{1}{2}\vec{a}t^2$$

$$v^2 - u^2 = 2as$$

→ acc^n = const

$$v_{Avg} = \frac{\vec{u} + \vec{v}}{2}$$

$$s_{nth} = u + \frac{a}{2}(2n-1)$$

MR*

(1) If time is given or asking then use eq^n ① or ②

(2) If time is not given or asking then use 3rd eq^n of motion.

Object starts his motion from rest $u=0$ and constant acceleration then find in displacement :-

$$\{S_{(1s)} : S_{(2s)} : S_{(3s)} = x : 4x : 9x : 16x\}$$

$$S_t : S_{2t} : S_{3t} = x : 4x : 9x$$

$$S_{1^{st}\,sec} : S_{2^{nd}\,sec} : S_{3^{rd}\,sec} = x : 3x : 5x$$

$$S_{t\,sec} : S_{next\,t} = x : 3x$$

Object starts his motion from rest & const^n acc^n moves 80m in 1st 3sec then find disp^m in 6-sec and next 3-sec.

$80 \times 4 = 320m$

$3 \times 80 = 240m$

Ans

Object starts his motion with 10m/s and const^n accn moves 40m in 2-sec then find dispm in 4-sec.

Soln

$u = 10 m/s$
$t = 2 s$
$S = 40 m$
} find accn

$S = ut + \frac{1}{2}at^2$

$40 = 10 \times 2 + \frac{1}{2}a(2)^2$

$20 = \frac{1}{2} \times a(4)$

$10 = a$ m/s^2

$u = 10 m/s$
$t = 4 s$

$S = ut + \frac{1}{2}at^2$

$= 10 \times 4 + \frac{1}{2} \times 10 (4)^2$

$= 40 + 5 \times 16$

$= 80 + 40 = 120 m$

(Q) Object moving with const^n accn moves 40m in 4-sec and 100 m in next 4-sec then find dispm in next 4-sec.

Soln Let $u_{(t=0)} = u$

$S = ut + \frac{1}{2}at^2$

$40 = u \times 4 + \frac{1}{2}a(4)^2$

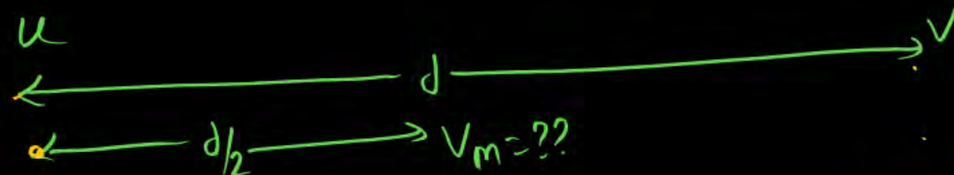
$\Rightarrow 40 = 4u + 8a \quad -(1)$

$140 = 8u + \frac{1}{2}a(8)^2$

$140 = 8u + 32a \quad -(11)$

→ find u & a using these two eq^n

② Object starts his motion with u and constant acceleration after some distn its velocity v then find velocity at mid point.



Use 3rd eqn of motn

$v^2 - u^2 = 2ad$ — (i)

$V_m^2 - u^2 = 2a\,d/2$ — (ii)

→ after sol $V_m = \sqrt{\frac{u^2+v^2}{2}}$

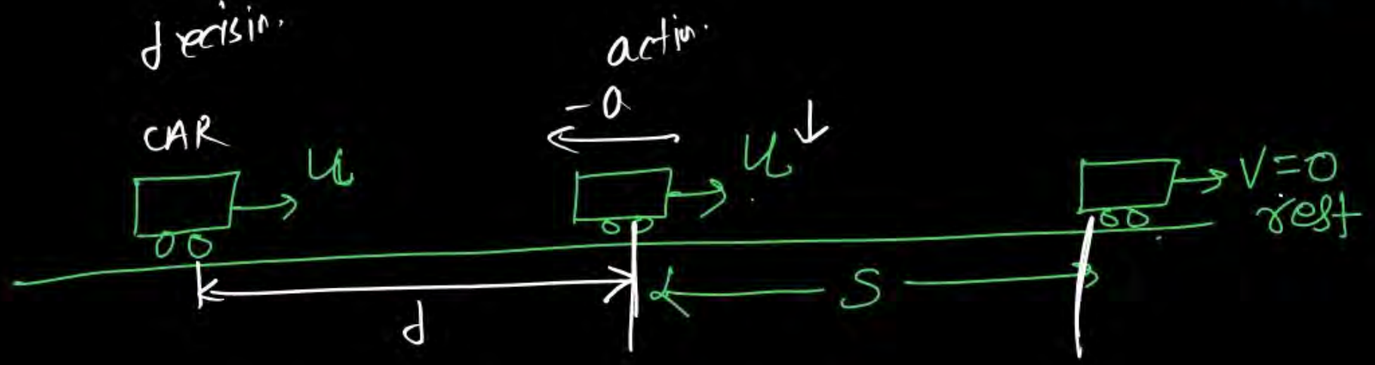
③ Object starts his motion from rest and constant acceleration then find ratio of time in equal distance intraval.

$t_1 : t_2 : t_3 : t_4 = 1 : \sqrt{2}-1 : \sqrt{3}-\sqrt{2} : \sqrt{4}-\sqrt{3}$ ..

Stopping Distance and Reaction time

→ Break lagane ka decision lene and actual me Break lagane me Jo time gap hai.

⇒ Jabtak Break apply Nahi ho Jata tabtak velocity Constant rahega.



$$v^2 - u^2 = 2aS$$

$$0 - u^2 = 2aS$$

$$S = \frac{-u^2}{-2a}$$

$$S = \frac{u^2}{2a} \#$$

* $t = \frac{d}{u}$

$u = 50 m/s \longrightarrow S = 40m$

$u_1 = 25 m/s \longrightarrow S' = \frac{40}{4} = 10m$

$u = 100 m/s \longrightarrow S' = 160m$

$S \propto u^2$

CAR is moving with speed 55 m/s and retardation $-10 m/s^2$, then distance moved by object in 6-sec.

$$S = ut + \frac{1}{2}at^2$$

$$S = 55 \times 6 - \frac{1}{2}10(6)^2$$

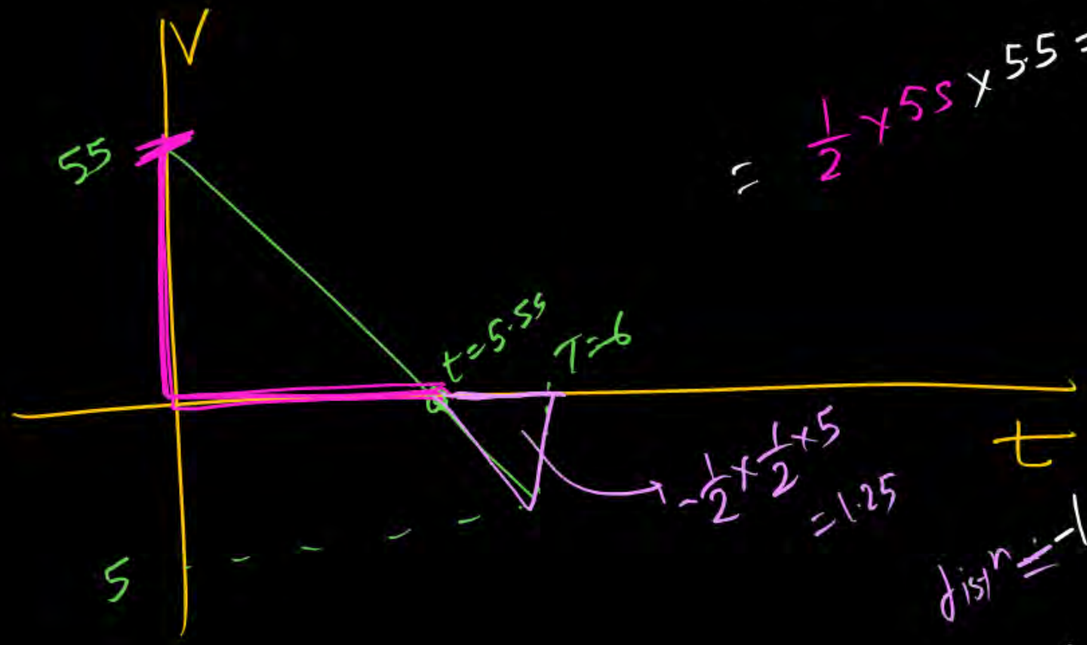
$$= 330 - 5(36)$$

$$= (330 - 180)m$$

$v = u + at$

$0 = 55 - 10t$

$t = 5.5$



$= \frac{1}{2} \times 55 \times 5.5 = 151.25$

$-\frac{1}{2} \times \frac{1}{2} \times 5 = 1.25$

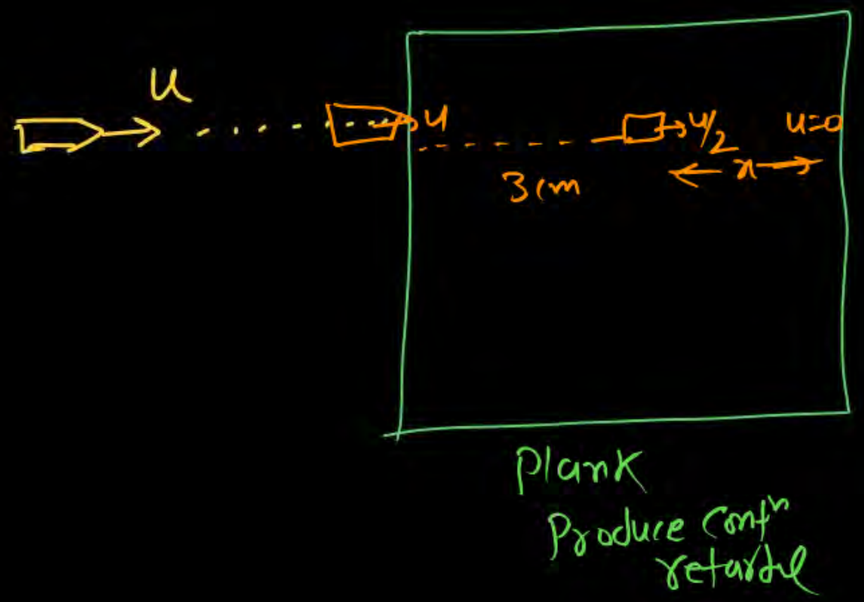
disp^n $= -1.25$

disp^n $= 151.25 - 1.25$

$= 150m$

disp^n $= 151.25 + 1.25$

$= 152.5m$

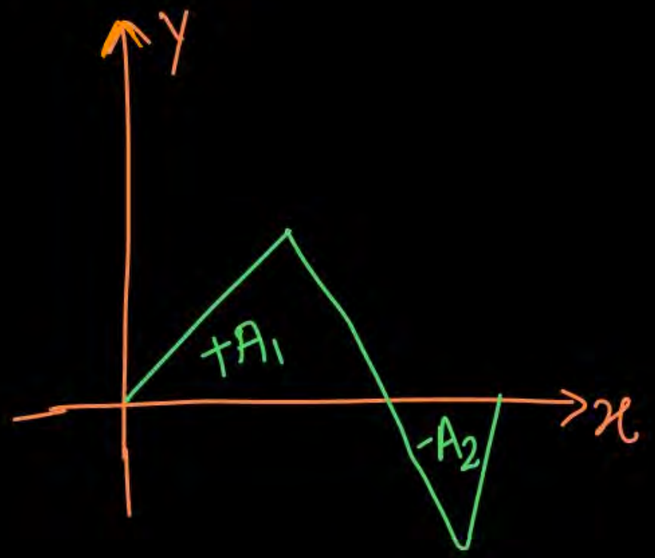


Produce confⁿ retarding

speed after 3cm becomes half then find find How much distance bullet will stop.

use 3rd eqⁿ of motⁿ

Graph :→



MR* Box

(1) Kisi bhi graph se y-P.Q ka pata chalta hai direct :-

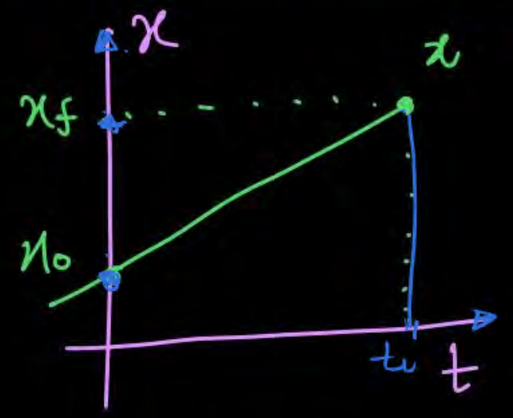
→ yth co-ordinate se y-axis pe jo P.Q hai ✓

→ xth co-ordinate se x-axis pe jo P.Q. hai ✓

→ slope se $\left(\frac{dy}{dx}\right)$ se jo P.Q define hoga.

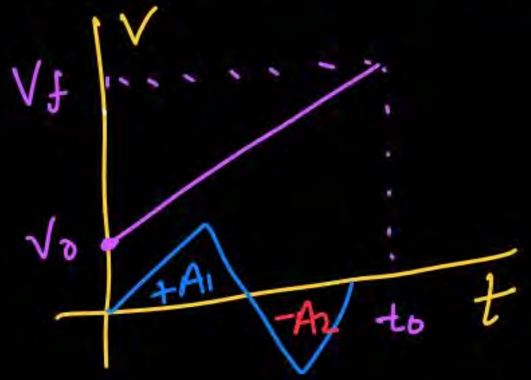
→ Area se $\int y\,dx$ se jo P.Q. define hoga ✓

Position time Graph



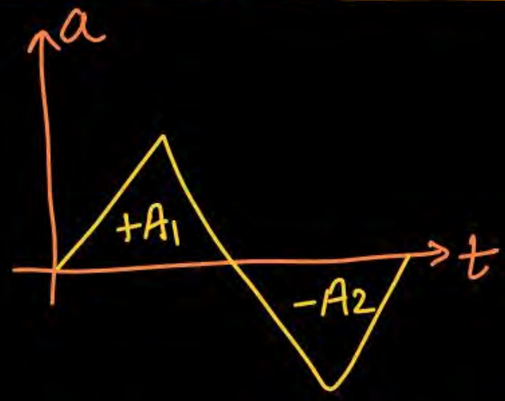
- Value of y^{th} co-ordinate = gives Position
- Value of x^{th} co-ordinate = gives time
- Slope = Instantaneous velocity at a Point $= \left(\frac{dx}{dt}\right)$ ✓
- Slope B/w Two Point = Average velocity $= \frac{y_2 - y_1}{x_2 - x_1}$ ✓
- Area $= \int x\,dt$ = No P.Q.

Velocity- time Graph



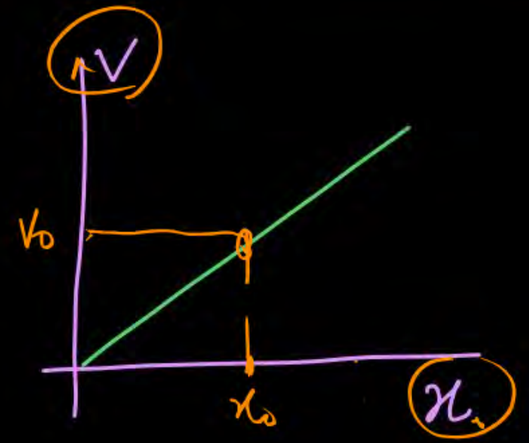
- y^{th} Co-ordinate = velocity ✓
- x^{th} Co-ordinate = time ✓
- Slope at a Point = Instt. acceleration ✓
- Slope B/w Two Point = Avg. acc^n ✓
- Area = Displacement $= A_1 - A_2$ ✓✓
- Distance $= A_1 + A_2$ ✓

Acceleration - time graph



- y^{th} Co-ordinate = acceleration
- x^{th} Co-ordinate = time
- Slope = Not any P.Q.
- Area = change in velocity $= A_1 - A_2$
- Avg. Acc^n $= \frac{\text{total Area}}{\text{total time}}$ ✳

⊙ velocity - Position Graph :-



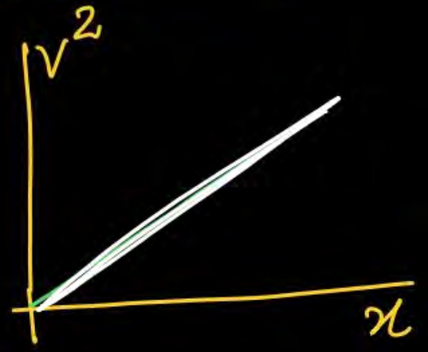
$\text{Slope} = \frac{dv}{dx}$

$v\,\text{slope} = \left(v\frac{dv}{dx}\right)$

Acceleration = v × slope

- Area Not any ~~use~~.

⊙ v^2/x Graph :



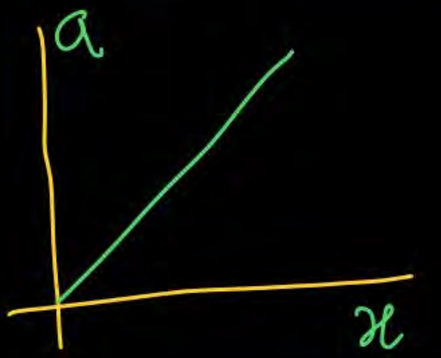
$\text{Slope} = \frac{dv^2}{dx}$

$\text{Slope} = 2v\frac{dv}{dx}$ *

$\text{acc}^n = \frac{\text{slope}}{2}$ *

Area ~~X~~

acceleration - Position Graph :-

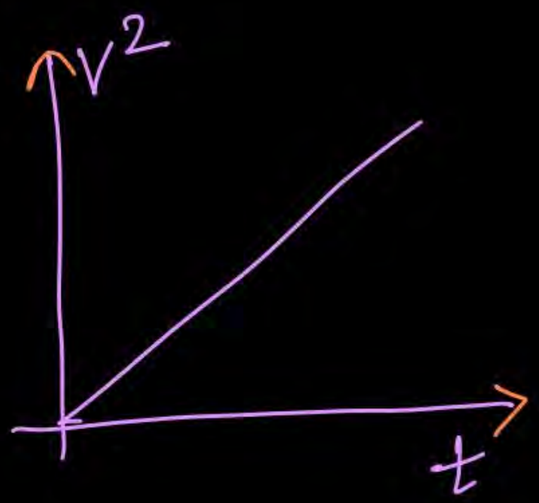


Slope = dq/dx ~~X~~

$\text{Area} = \int a\,dx$

$\text{Area} = \frac{v^2-u^2}{2}$

slope → ~~X~~



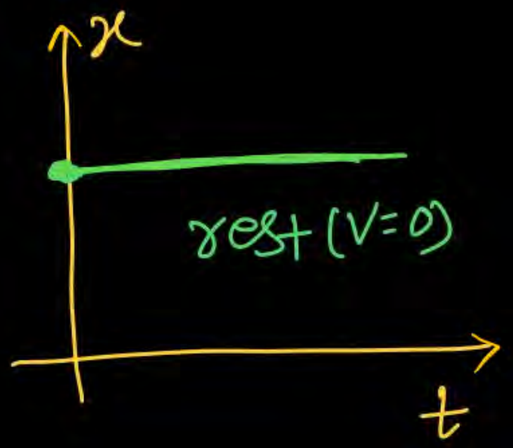
$$\text{slope} = \frac{dv^2}{dt}$$

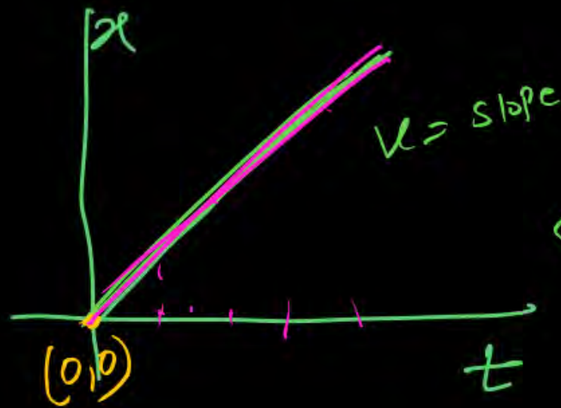
$$\text{slope} = 2v\frac{dv}{dt}$$

$$\boxed{\text{Slope} = 2va}$$

Think Kar Ke 😊

(Slid → 44)

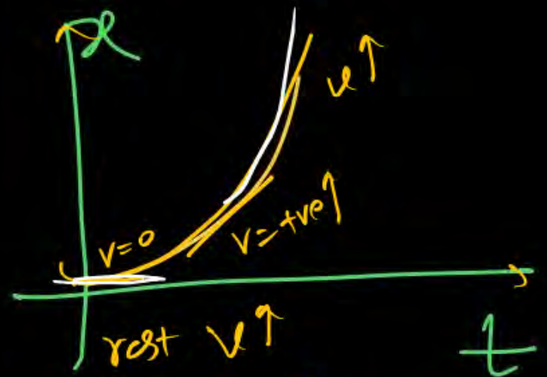




Velocity at t=0
$v \neq 0$
$V = \text{slope}$

v = -ve ←

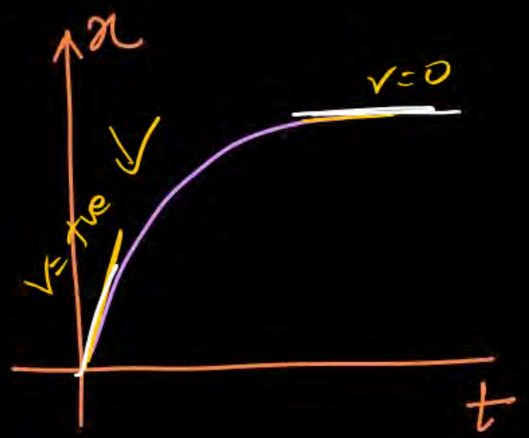
object पीछे जाता

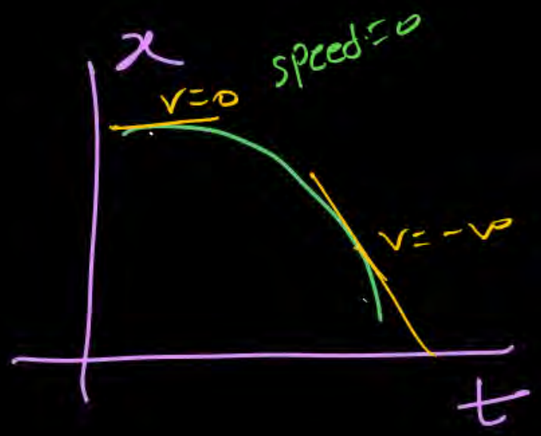


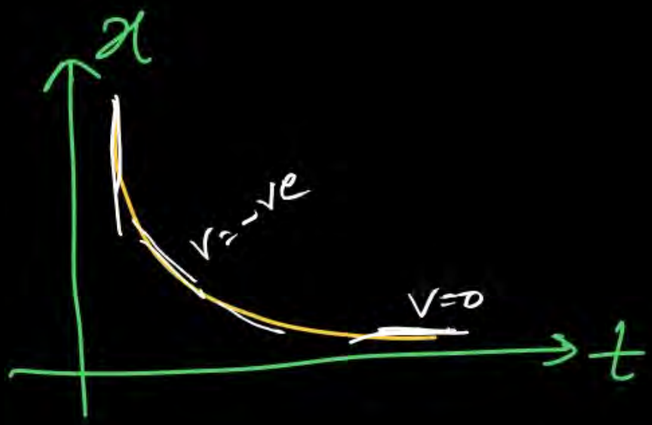
a = +ve

v = +ve ↑

v +ve ↑ a =+ve.







$v \rightarrow +ve \downarrow$

$a = -ve$

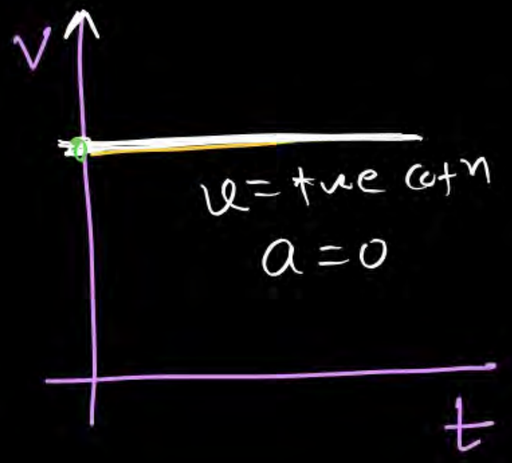
$v = 0$

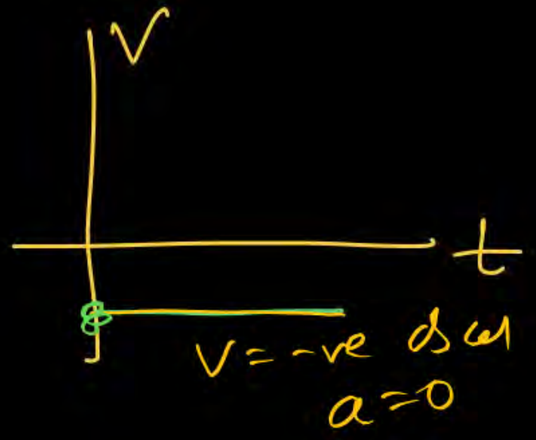
$v = -ve$ (speed ↑)

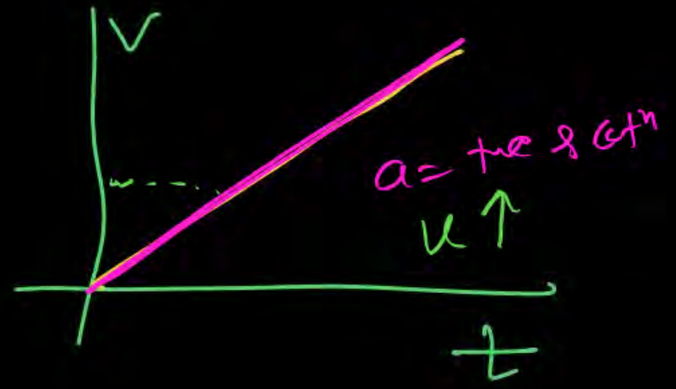
$a = -ve$

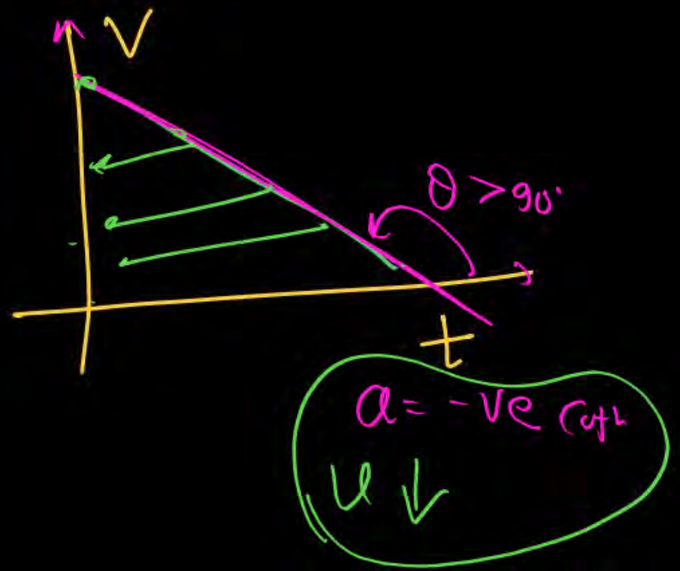
$\leftarrow 0$

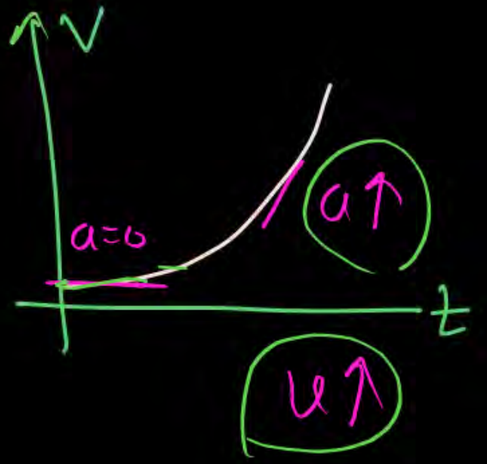
$v = -ve \rightarrow a = +ve$

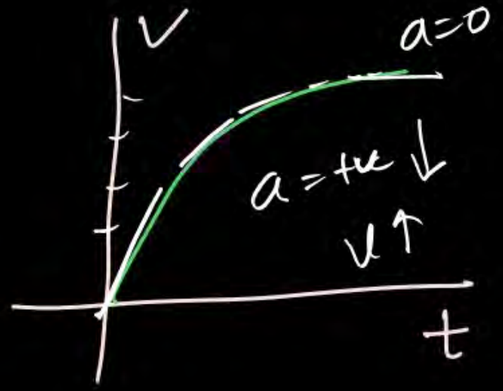

v
v = +ve const
a = 0
t

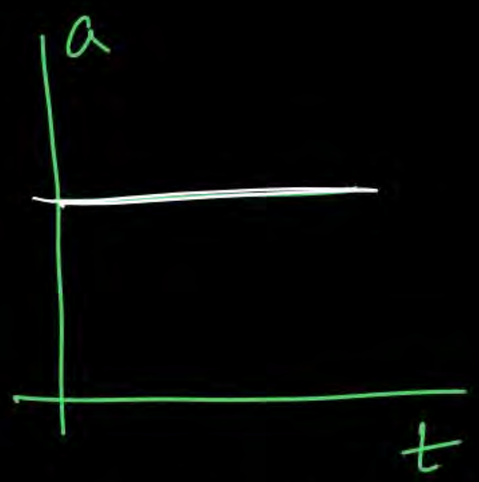

v
t
v = -ve const
a = 0


v
a = +ve & const
v ↑
t

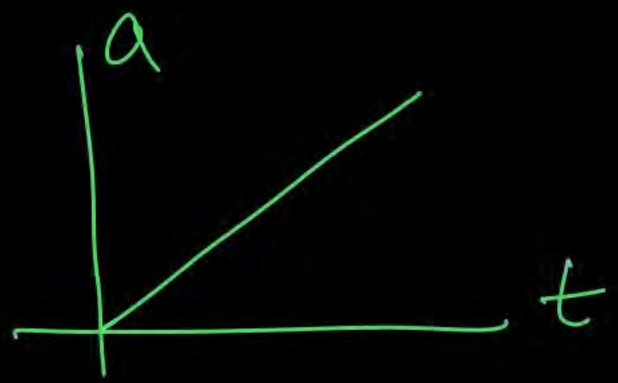

v
θ > 90°
t
a = -ve const
v ↓


v
a = 0
a ↑
t
v ↑

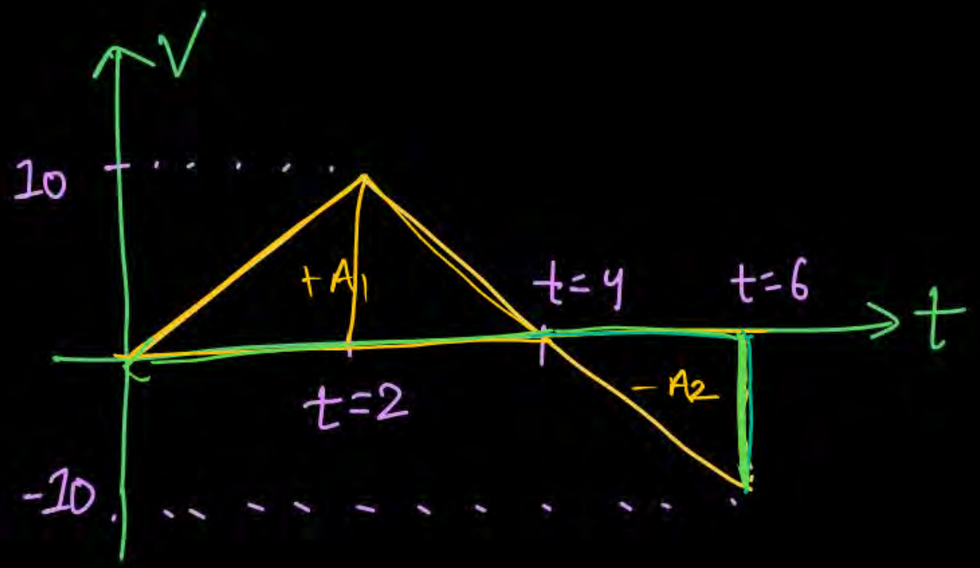

v
a = 0
a = +ve ↓
v ↑
t

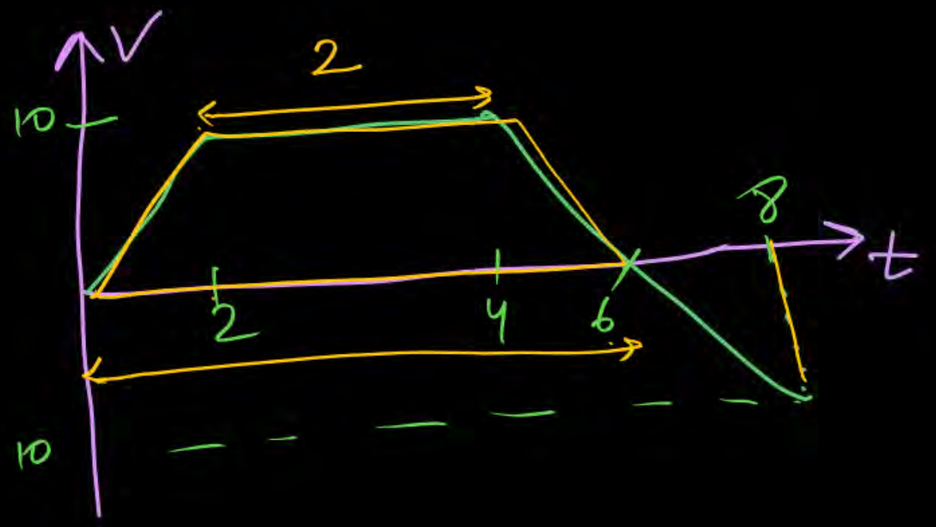


acc^n = +ve



a = +ve ↑





$A_1 = \frac{1}{2}(6+2) \times 10$

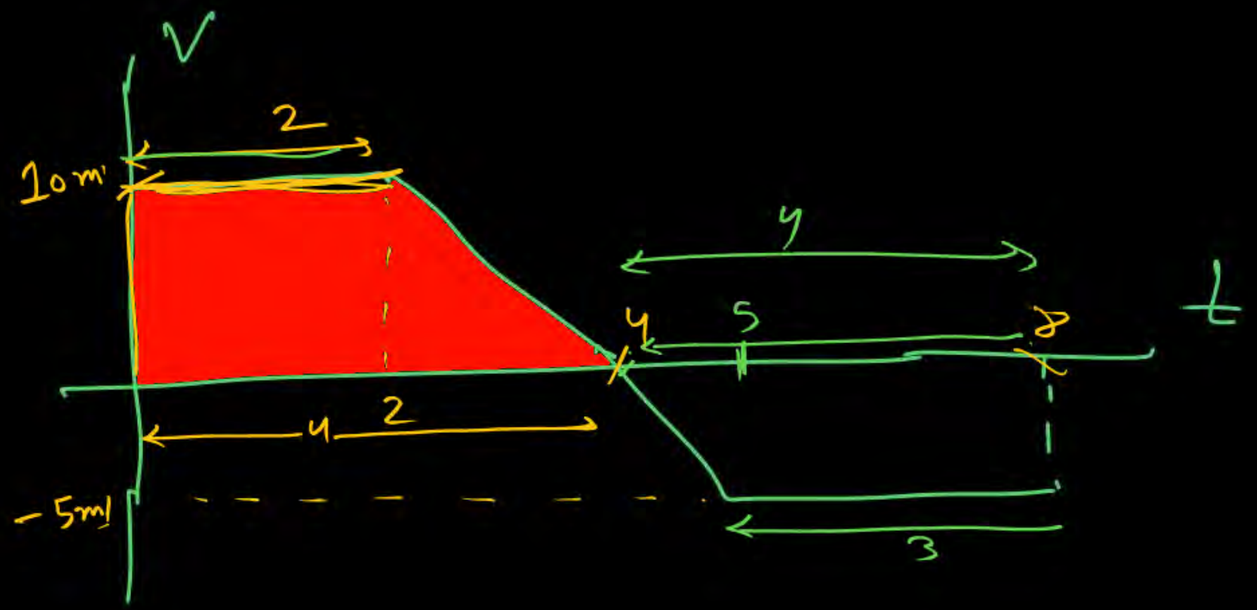
$A_2 = \frac{1}{2} \times 2 \times 10$

$\text{Area} = A_1 - A_2 = \text{disp}^n = \frac{1}{2} \times 4 \times 10 - \frac{1}{2} \times 10 \times 2$

$= 20 - 10$ 10m

$\text{dist}^n = A_1 + A_2$

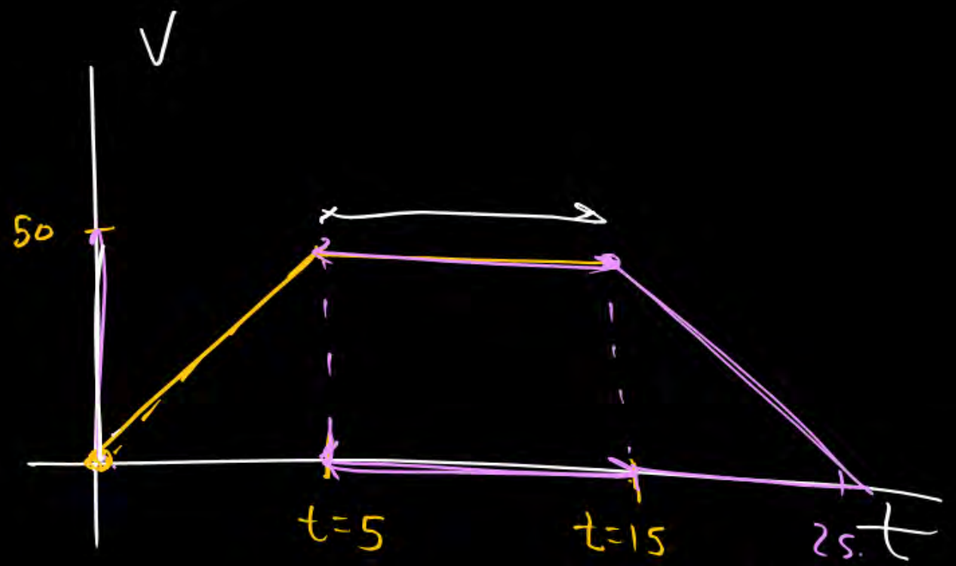
$= 20 + 10 = 30m$



$$A_1 = \frac{1}{2}(2+4) \times 10$$

$$A_2 = \frac{-1}{2}(3+4)\,5$$

Object starts his motion from rest and constant acceleration (10m/s²) for t = 5 sec after that moves with constant velocity for next 10-sec, after that retards and comes to at rest in next - 10 sec. then find displacement.

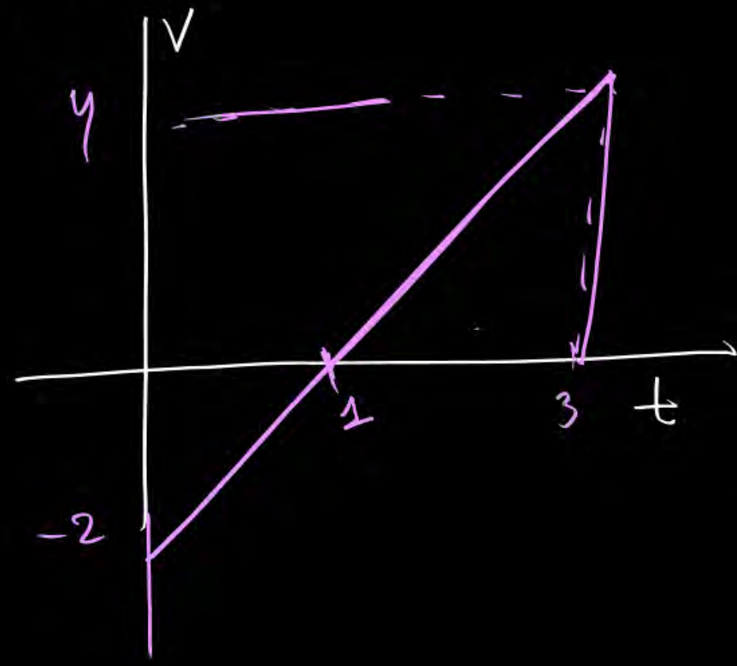


$$\text{Ans} = \frac{1}{2} \times [10+25] \times 50 = (35 \times 35)\,m.$$

position of object $x = t^2 - 2t + 4$ find distance and displ^m in $t = 3$sec

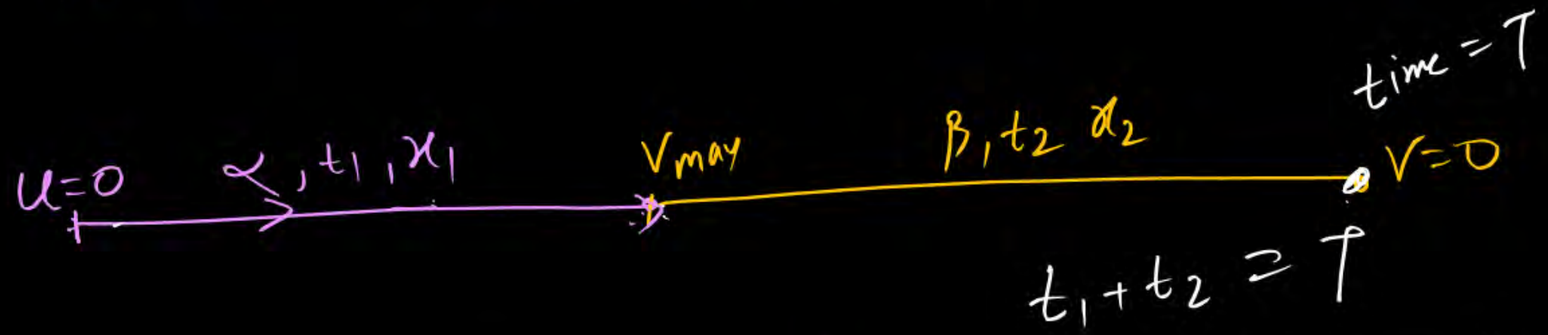
$v = 2t - 2$

draw v/t



Rest to Rest

Object starts his motn from rest and constn accn α for time t_1 and retards with β for t_2 time and comes to at rest then find V_{max}, S (Totel).



$t_1 + t_2 = T$

$V_{max} = \alpha t_1 = \beta t_2$

$\frac{\alpha}{\beta} = \frac{t_2}{t_1} = \frac{x_2}{x_1}$

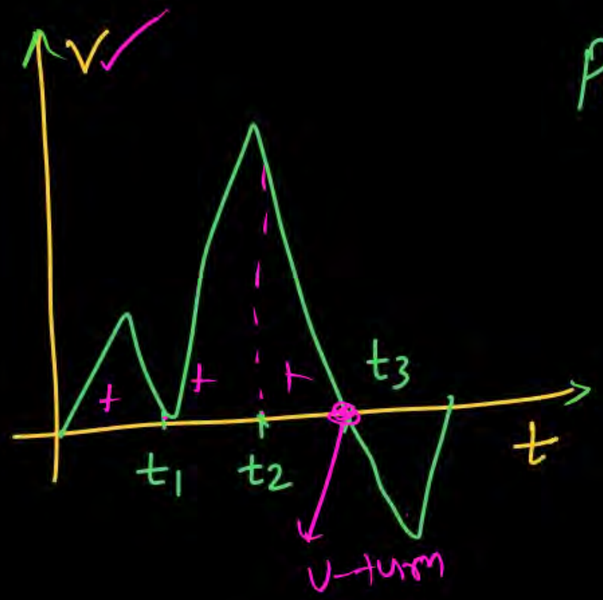
$V_{max}^2 = 2\alpha x_1$

$V_{max}^2 = 2\beta x_2$

$\alpha x_1 = \beta x_2$

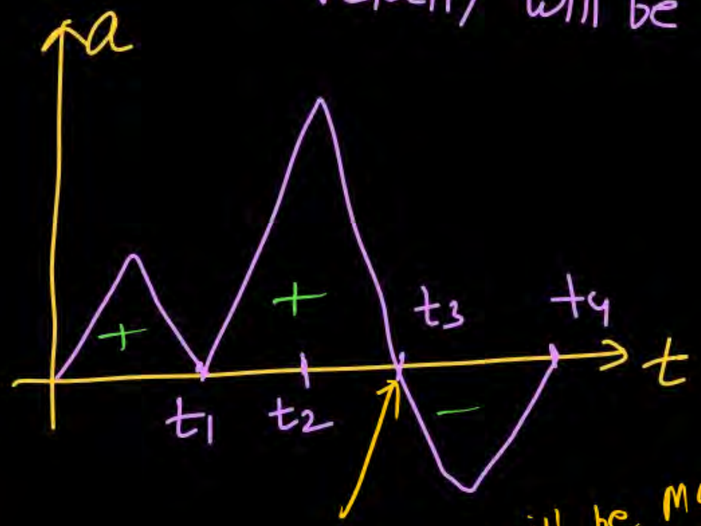
$V_{max} = \frac{\alpha\beta}{\alpha+\beta} T$

$S = \frac{1}{2} \frac{\alpha\beta}{\alpha+\beta} T^2$



Position will be maximum at time 't'

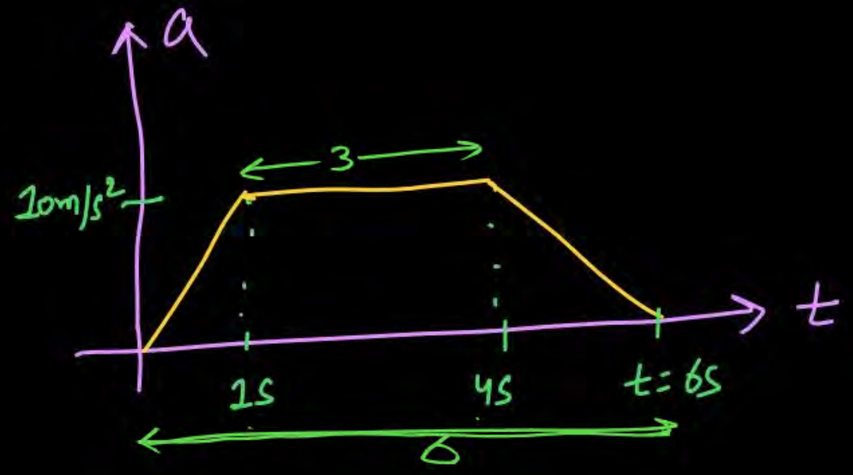
at t_3 = Positn will be Maxm



velocity will be Maximum at :-

Velocity will be Maxm = t_3

- Area of a/t graph = change in velocity



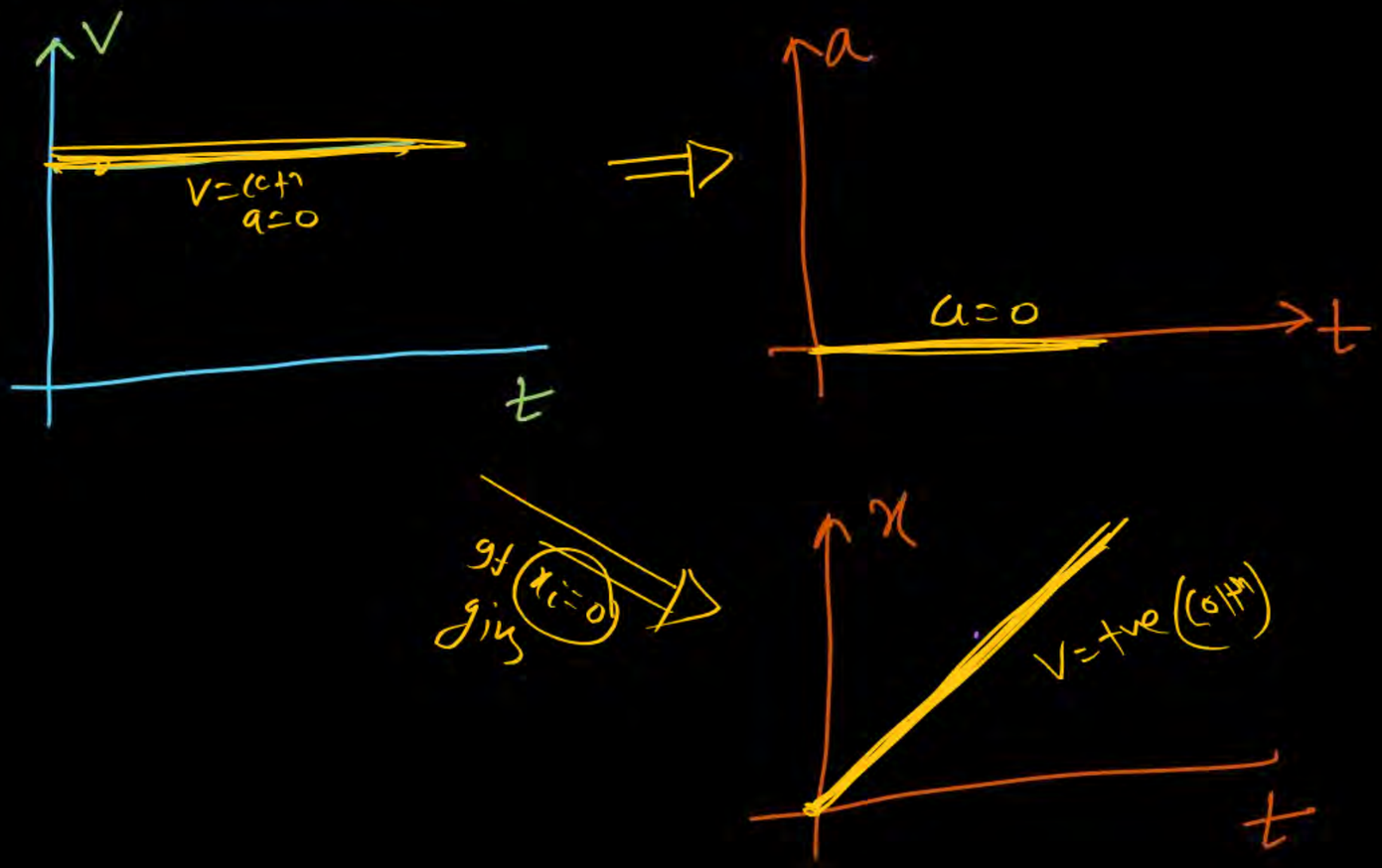
find velocity at $t = 6$sec if itial velocity 10m/sec.

$$\text{Area} = \frac{1}{2} \times [6+3] \times 10^{5} = \bar{V}_f - \bar{V}_i$$

$$9 \times 5 = V_f - 10$$

$$V_f = 45 + 10 = 55 \text{ m/s}$$

Graph Conversion →



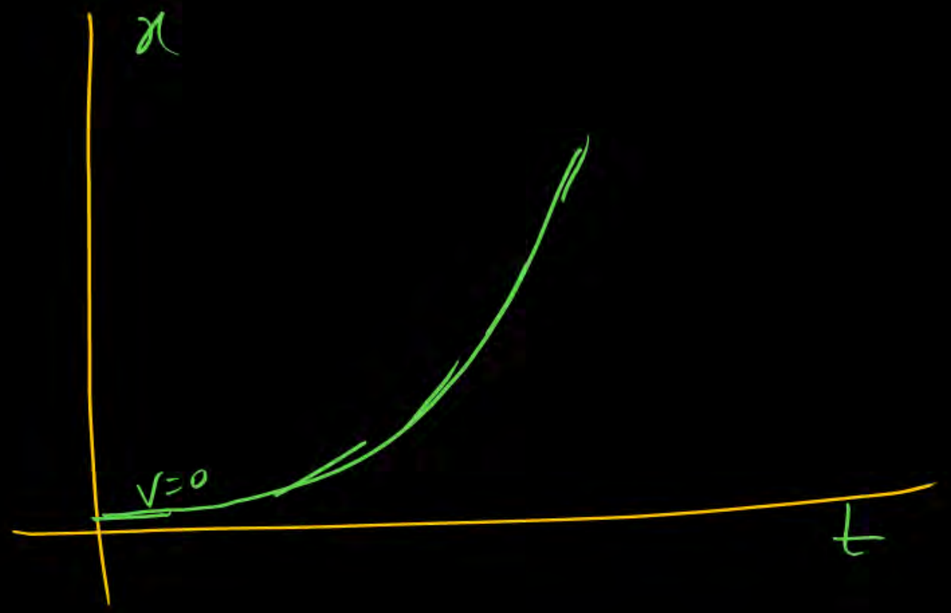
MR* Box

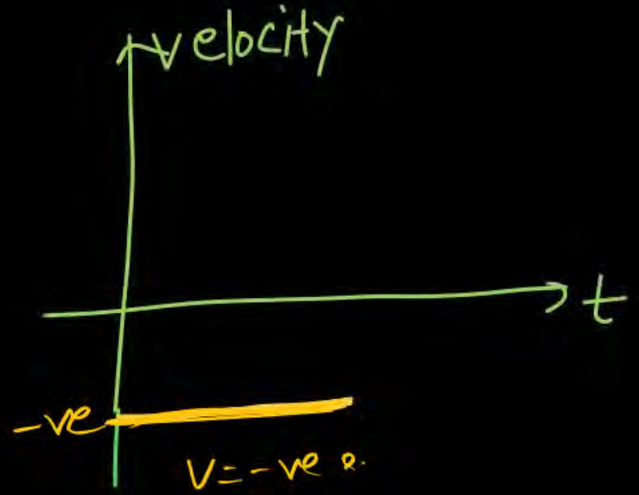
graph Conversion me slope dekho Jisko Convert Karna hai ya Jo Convert karke aayga graph ✓

Convert v/t graph into x/t graph and a/t graph

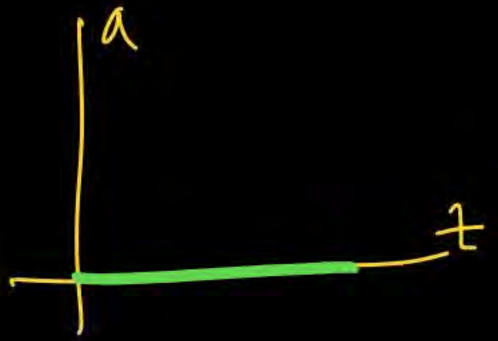
initial: $u_i = 0$

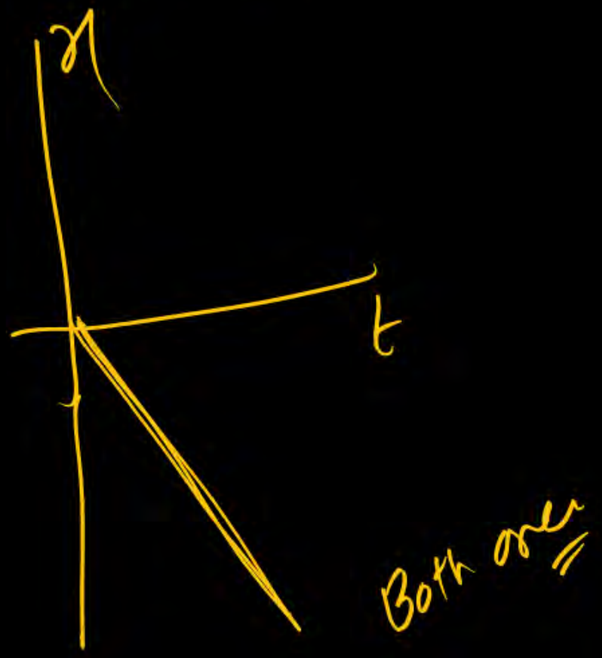
x +ve ↑

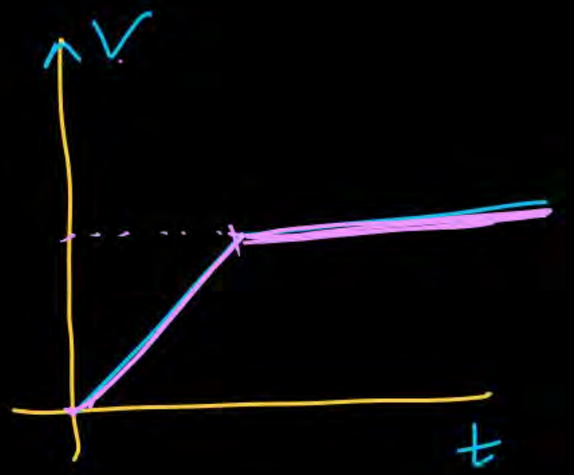


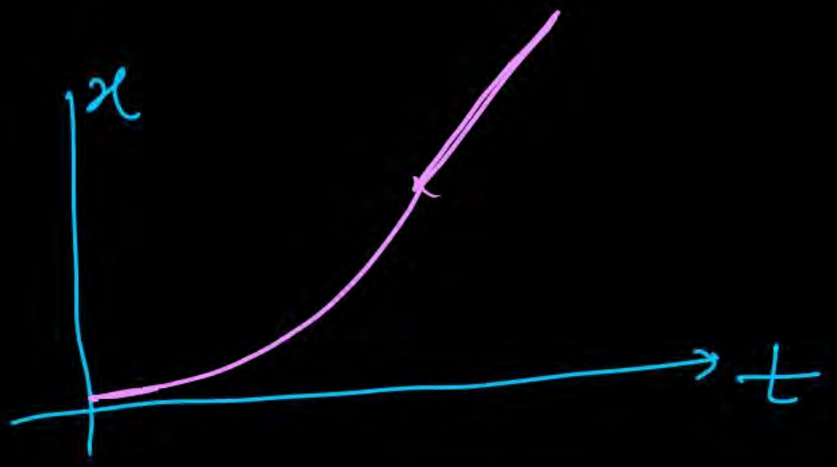

velocity
t
-ve
V=-ve

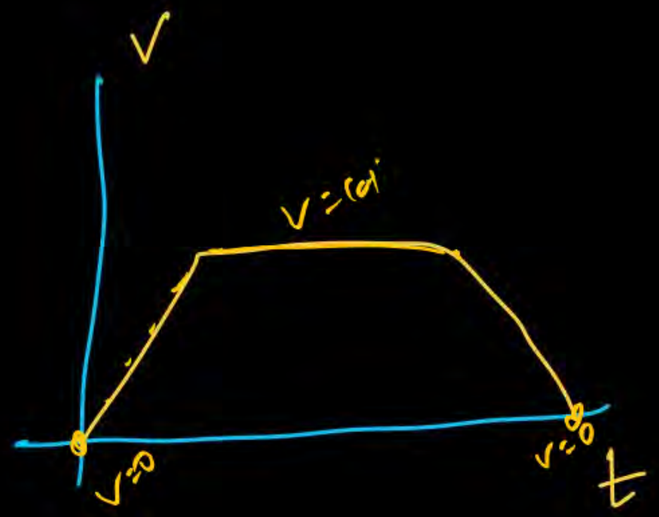

ve
t

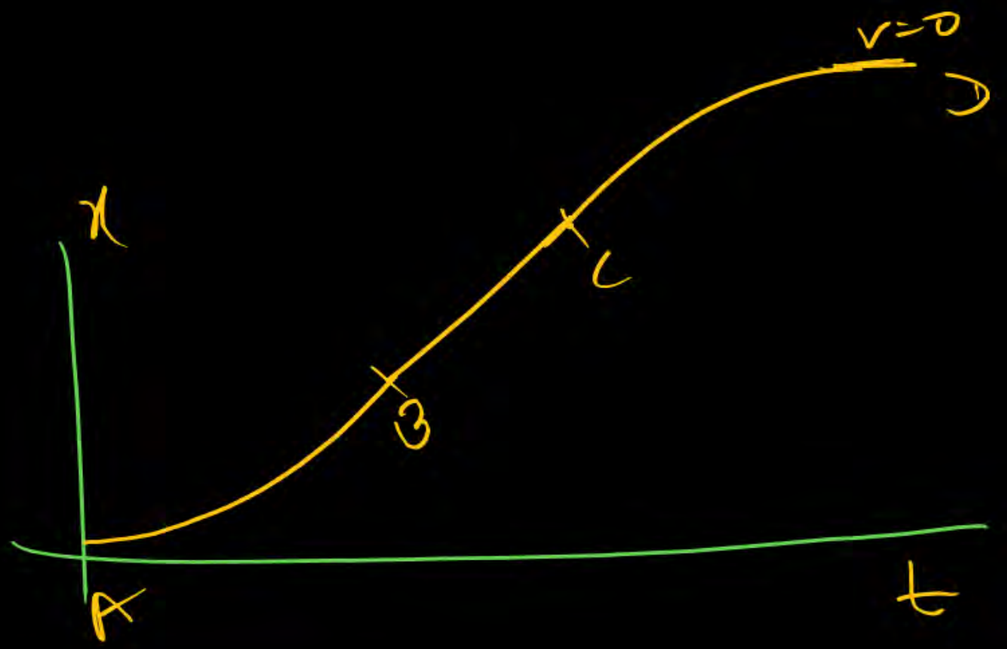

a
t


x
t
Both are -ve

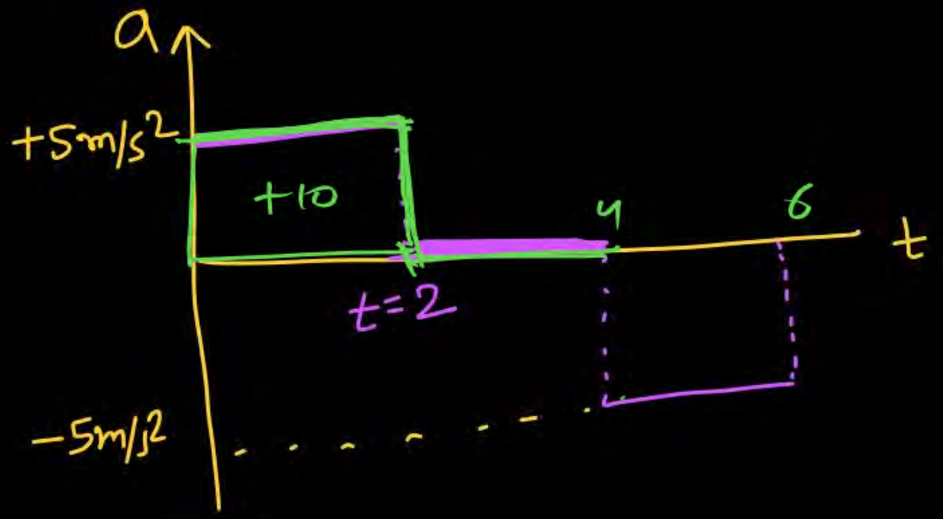

V
t

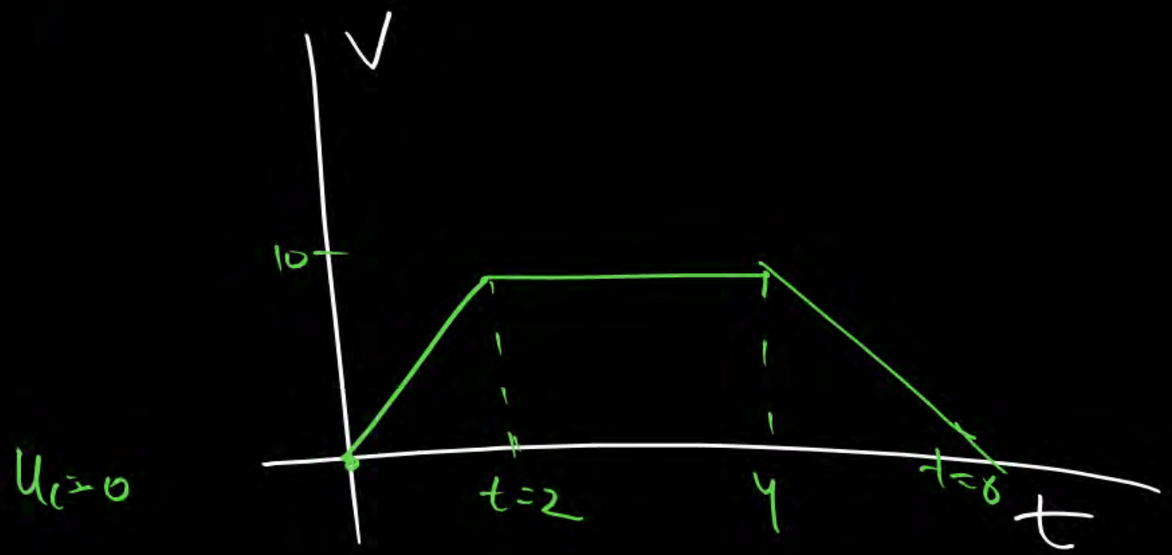

x
t

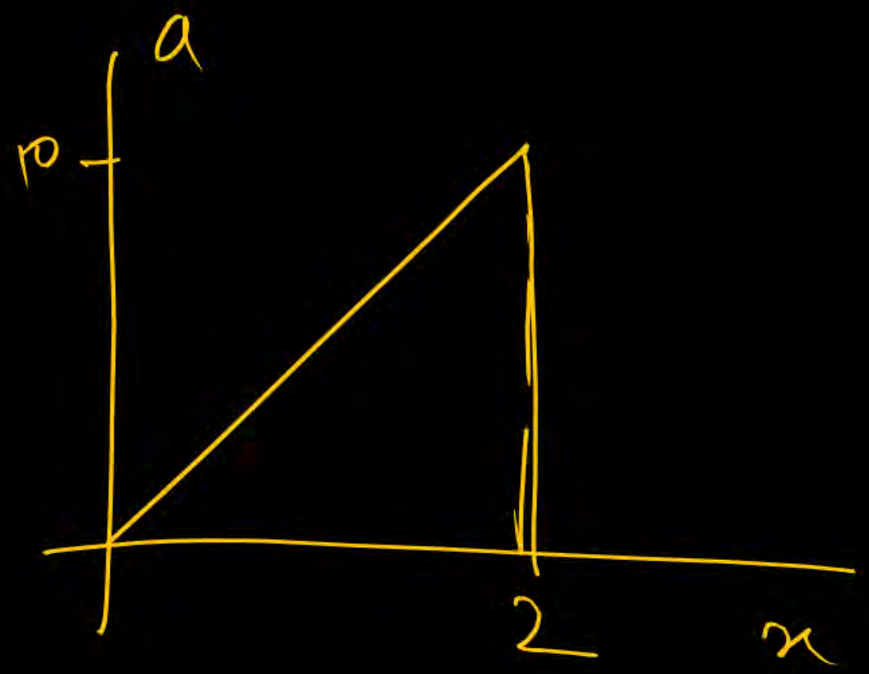

V
V=cst
V=0
V=0
t


x
V=0
D
C
B
A
t

If initial velocity is zero then find total distance travelled by object.







if $u=0$ at $x=0$

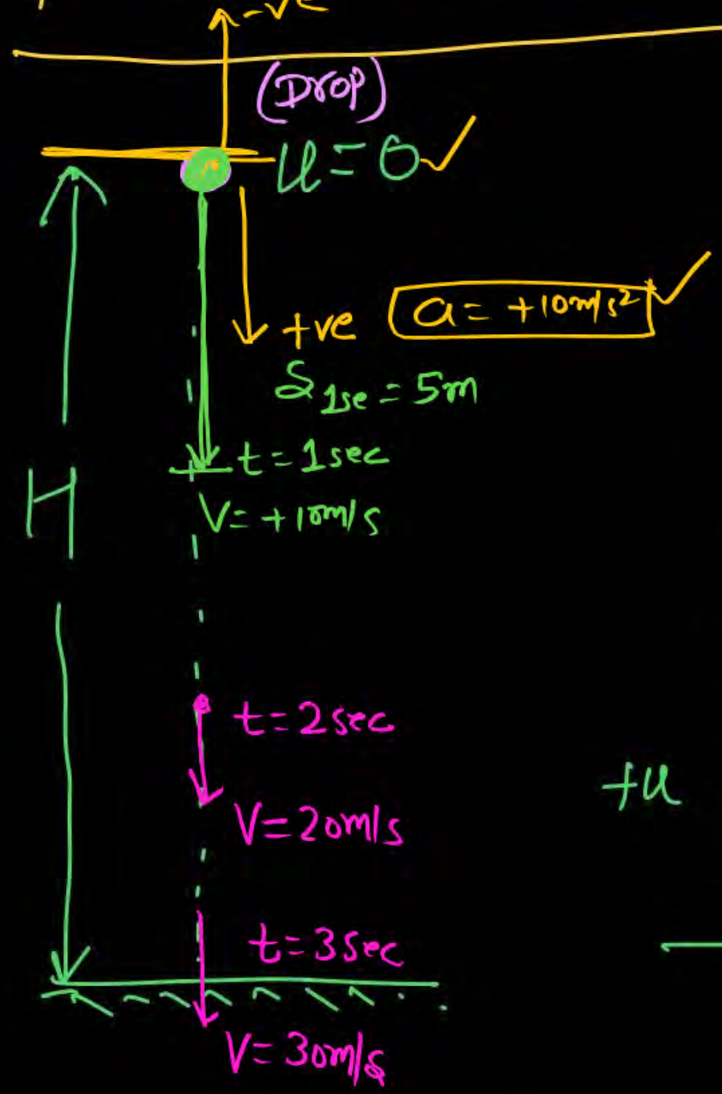
find V at $x=2$

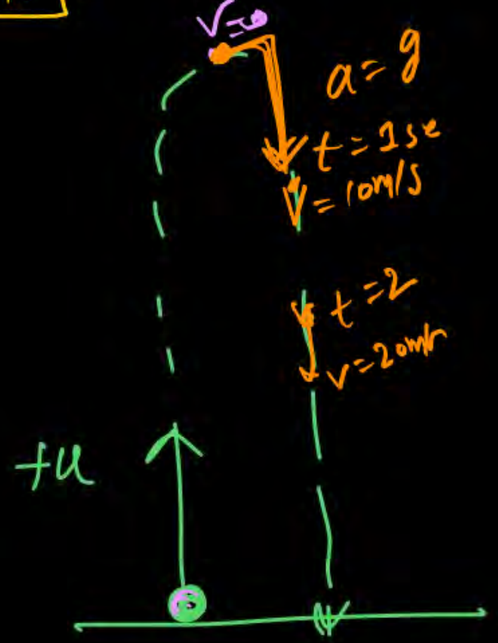
Ans $= \frac{v^2-u^2}{2}$

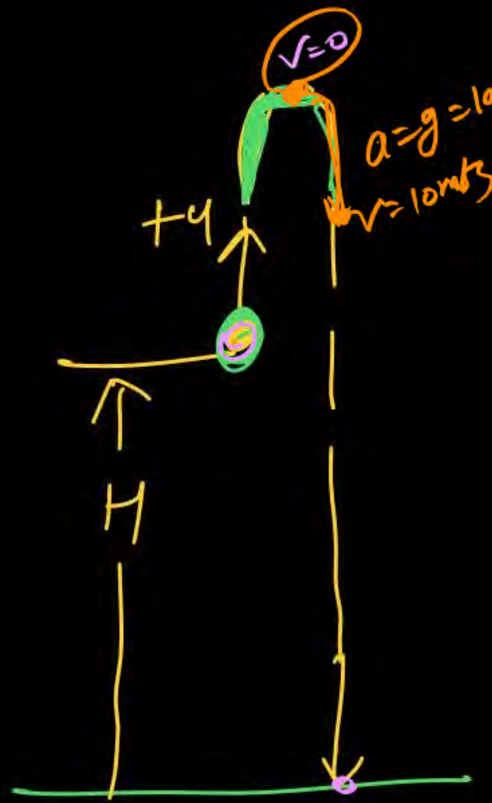
Motion under Gravity :—

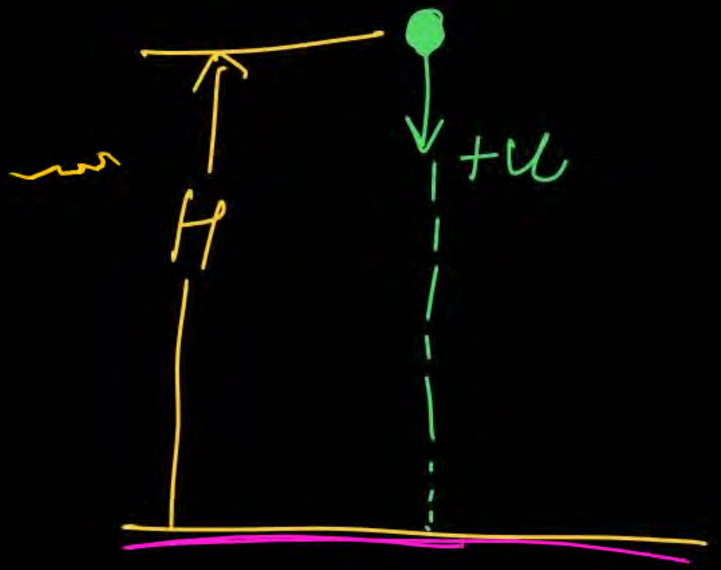
acc^{n} = g (downward) (col)

↳ all eqn of motion are valid ✓





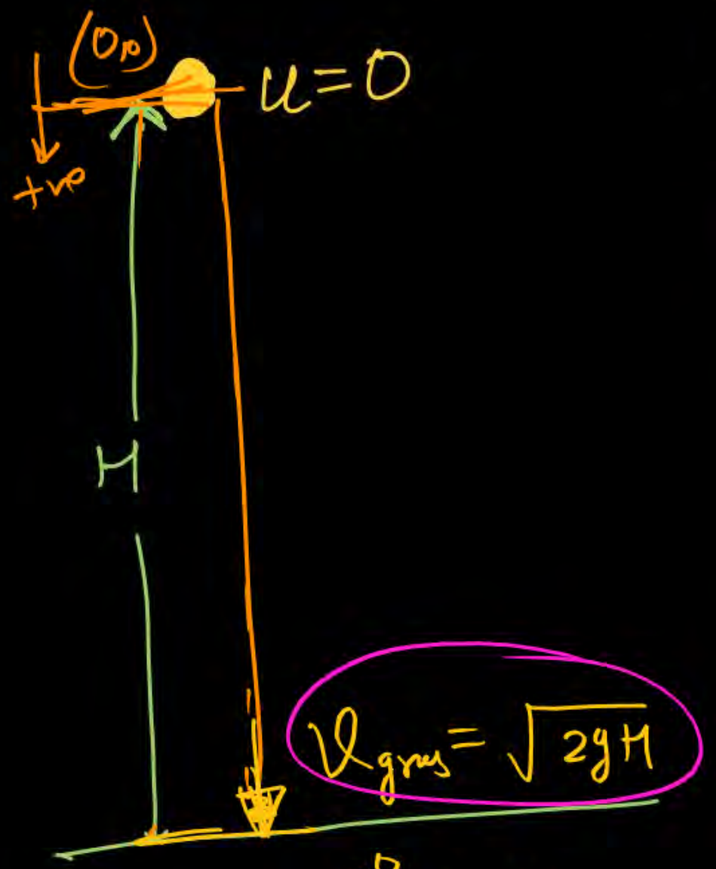




Drop from Height 'H' :

(1) Time of flight (2) velocity at ground (3) disp^m in 4-sec

(4) Disp^m in 6th sec.



$v_{gnd} = \sqrt{2gH}$

$S = \cancel{ut}^{0} + \frac{1}{2}at^2$

$H = \frac{1}{2}gT^2$

Drop

$T = \sqrt{\frac{2H}{g}}$

$S_{4sec} = \cancel{u}^{0}t + \frac{1}{2}at^2$

$S_{4s} = \frac{1}{2}10(4)^2$

$= 5 \times 16 = 80m.$

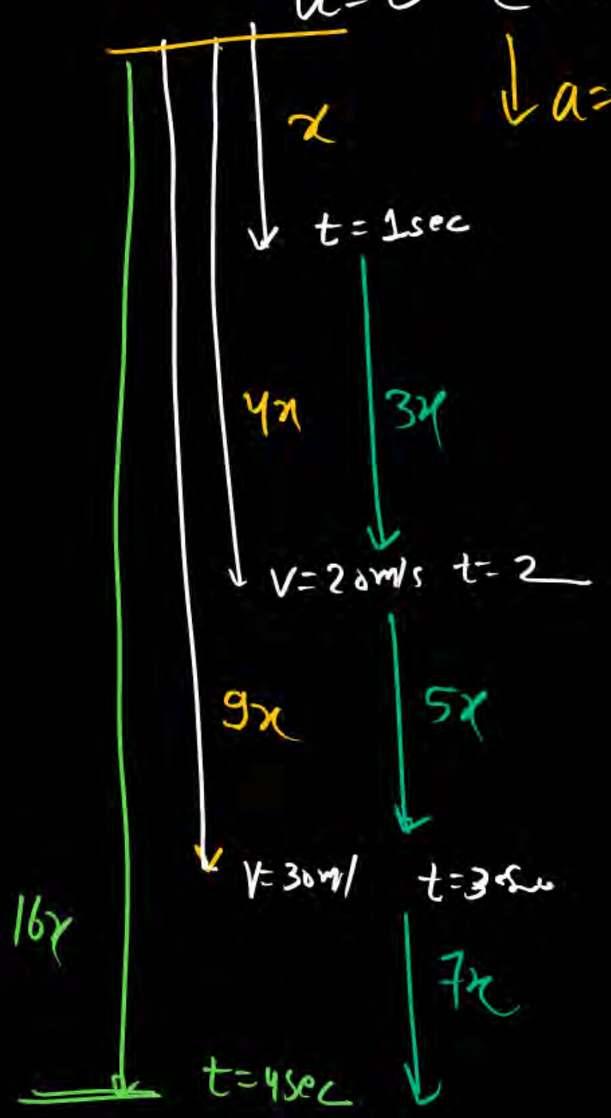
$\therefore$

$S_{nth} = \cancel{u}^{0} + \frac{a}{2}(2n-1)$

$S_{6th} = \frac{10}{2}(2\times6-1)$

$= 5(11)$

$= 55m$

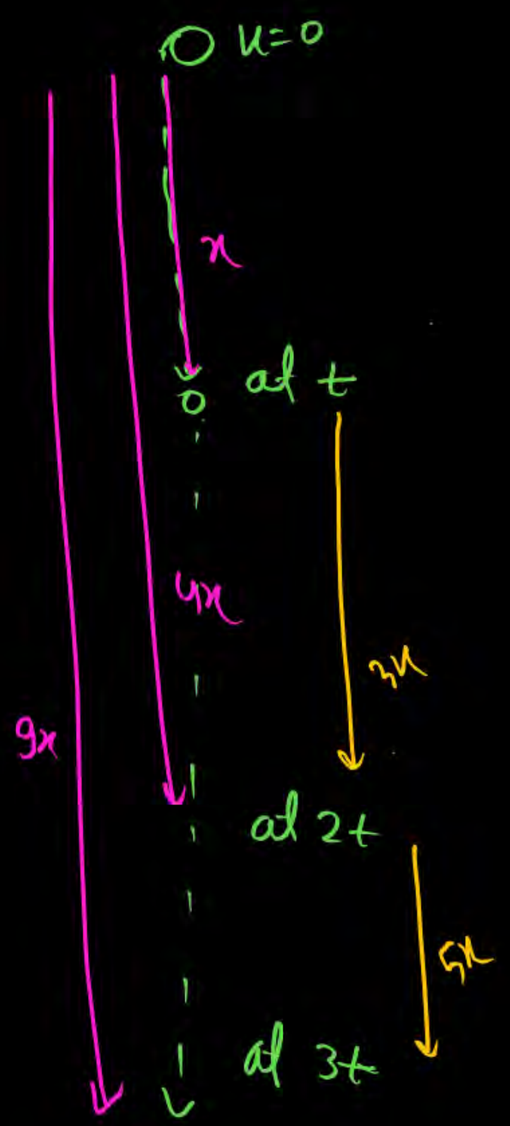


$S_{1s} : S_{2s} : S_{3s} : S_{4s} : S_{5s} = x : 4x : 9x : 16x : 25x : 36x$

$x = 5m$
$u = 0$
$a = 10 m/s^2$

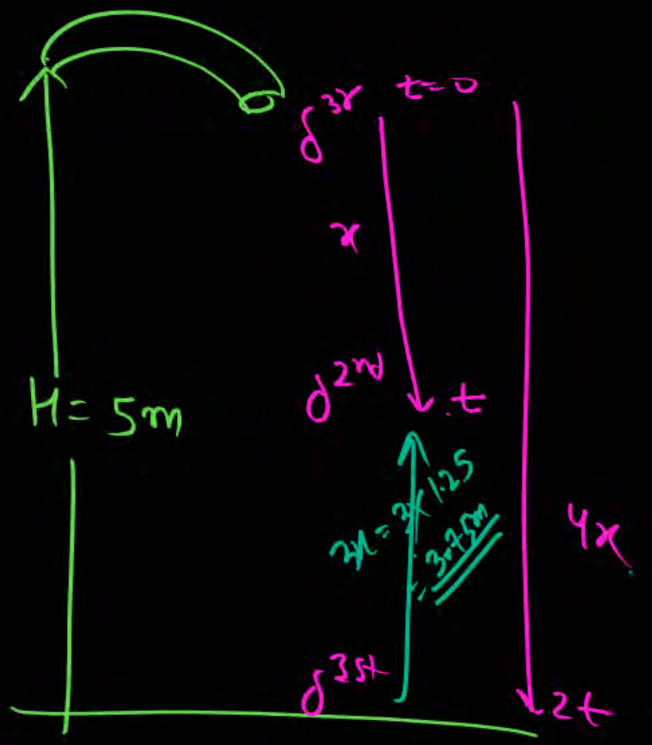
$S_{1st} : S_{2nd} : S_{3rd} : S_{4th} : S_{5th}$

$= x : 3x : 5x : 7x$


u=0
x
at t
4x
3x
9x
at 2t
5x
at 3t

water drop is falling in regular intaval then find height of 2nd drop from Ground if 3rd drop is about to fall.

$H = 5m$ | g



$4x = 5$

$x = \frac{5}{4} = 1.25m$

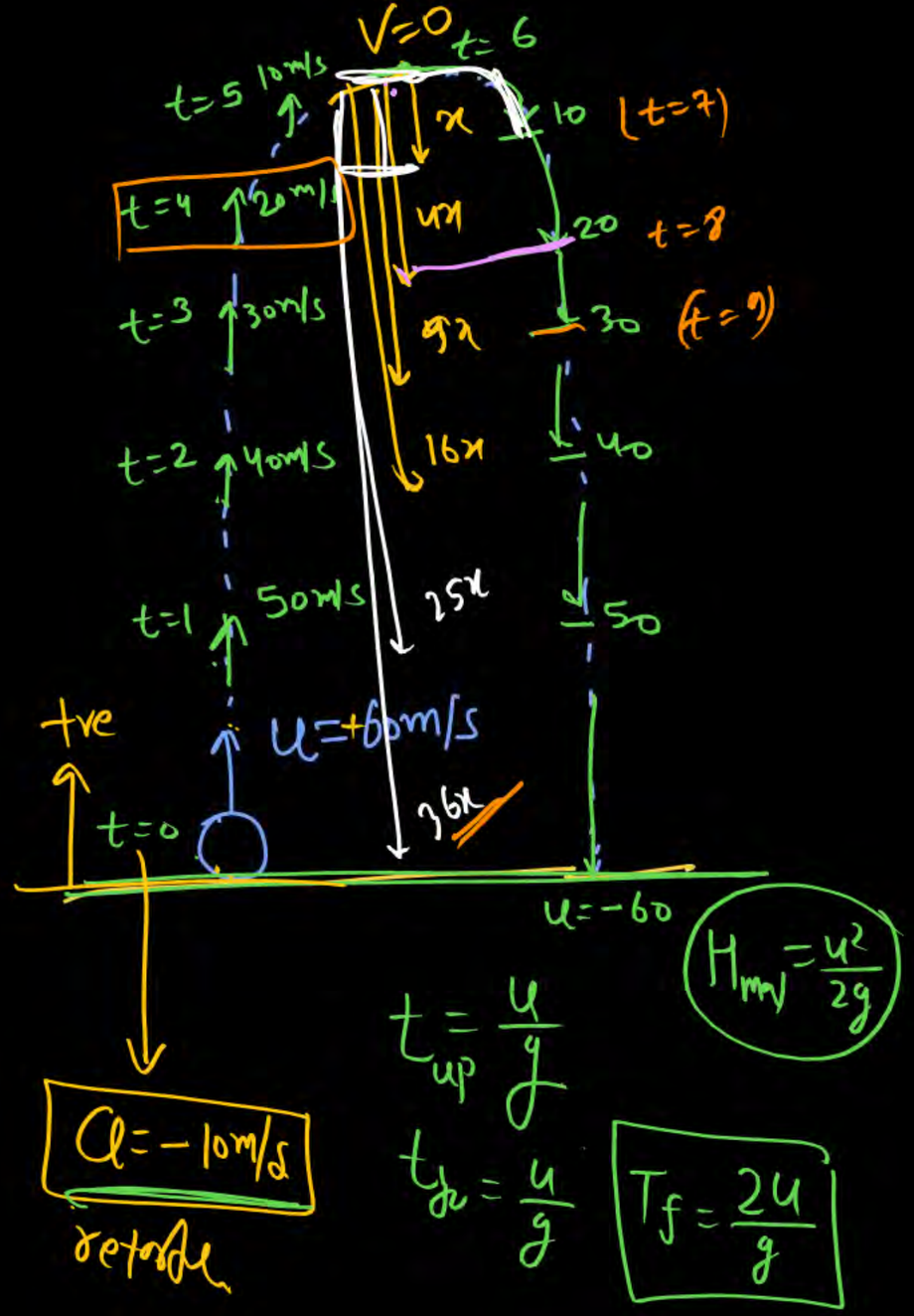
Displ^{m} in last one-sec is 45m then find T_f =??

Ball was dropped = 0

$$S_{nth} = u + \frac{a}{2}(2n-1)$$

$$45 = \frac{10}{2}(2n-1)$$

find (n)



(i) Time of upward Journey = 6sec

(ii) $T_f = 6+6 = 12$ sec

(iii) $H_{max} = \frac{u^2}{2g} = 180$m

(iv) velocity at t=4sec $\Rightarrow v_{t=4} = 20$m/s

(v) velocity at t=9sec ($v = 60 - 10\times9 = -30$)

(vi) Dispⁿ in 8-sec $S = ut + \frac{1}{2}at^2 = 60\times8 - \frac{1}{2}\times10\times(8)^2$

$= 480 - 5\times64$

$= 480 - 320$

$= 160$m

(vii) Distance in 8-sec → $2^{nd} = 180 - 20 = 160$m

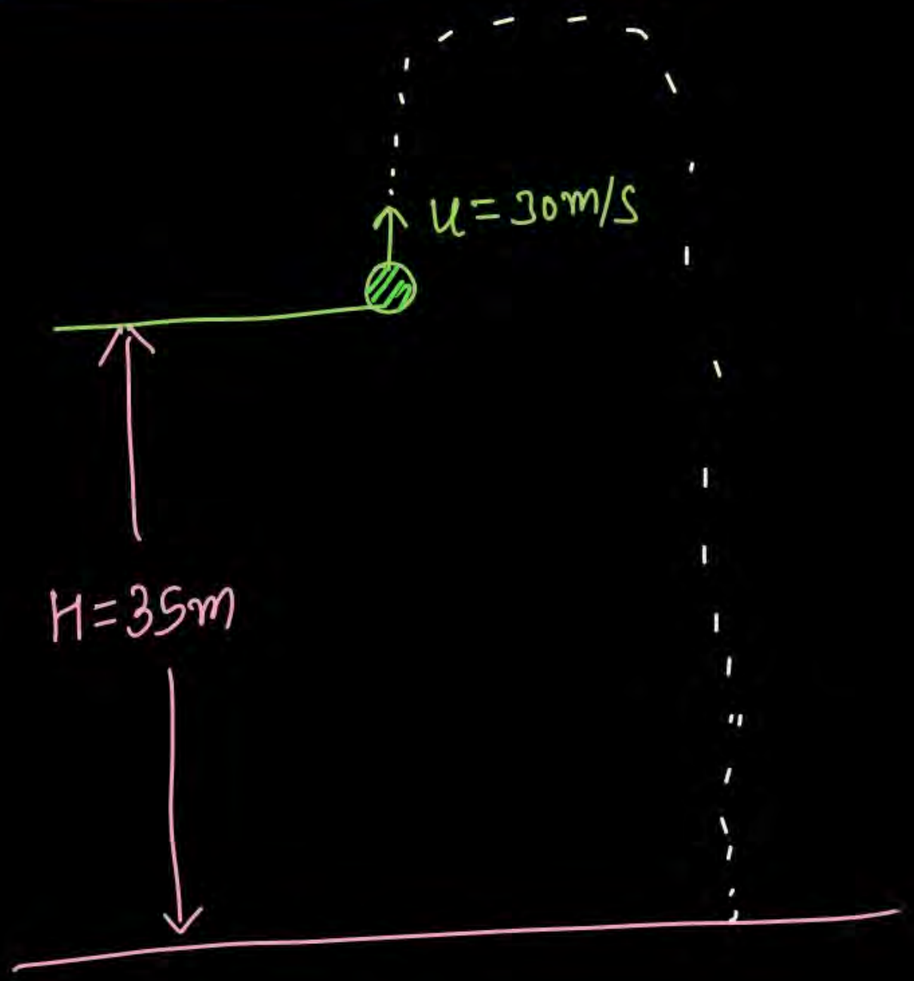
$180 + 20 = 200$m total.

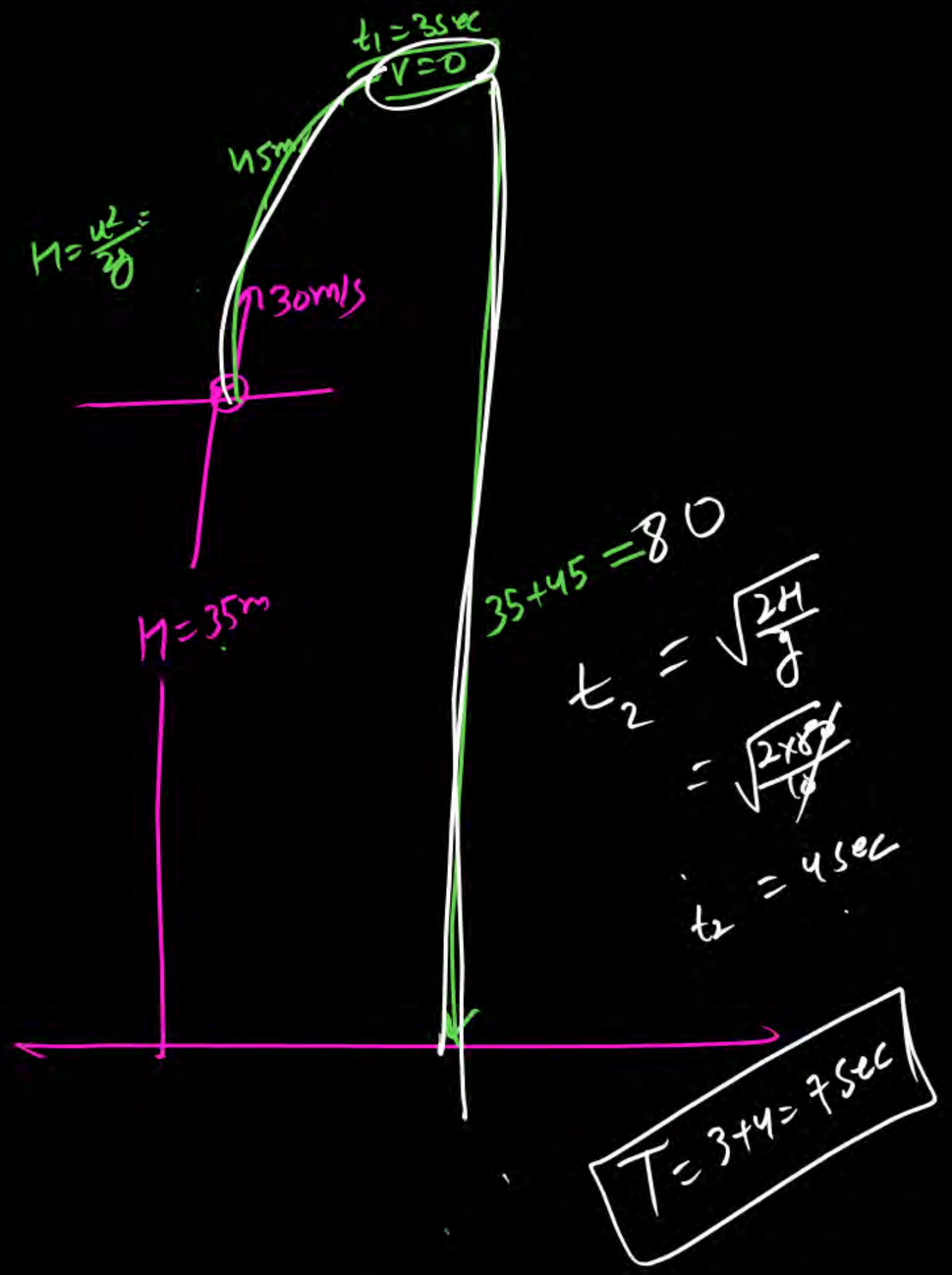
(ix) Dispⁿ in last sec of upward Journey = 5m

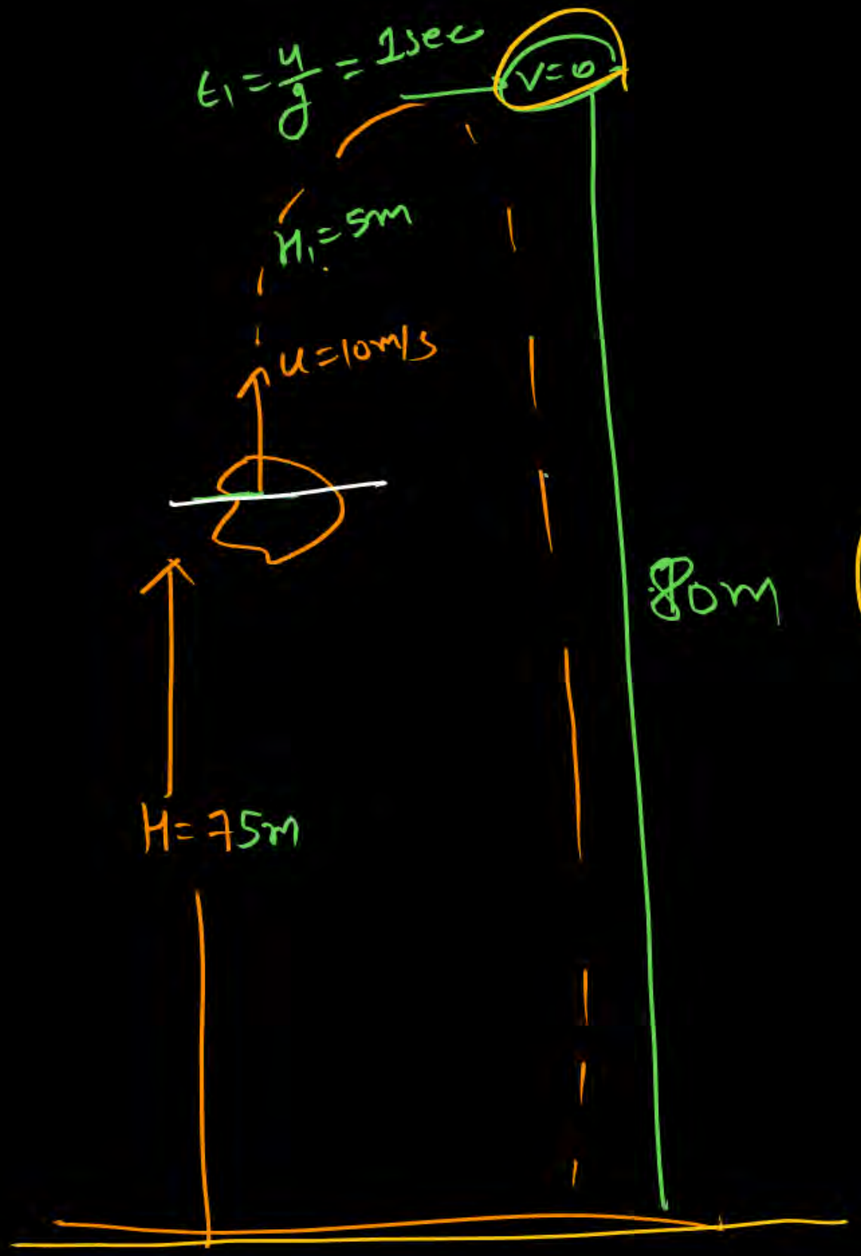
(x) Avg velocity in 10-sec

(xi) Avg speed in 7-sec

Projected from some Height :-

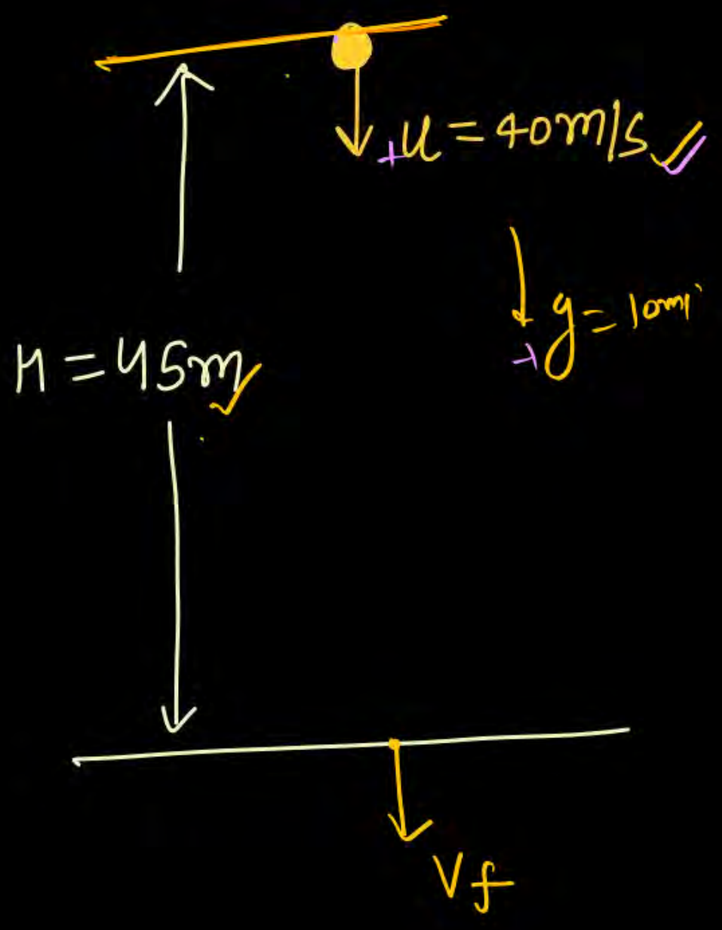






$$T = 4 + 1 = 5\,sec$$

find time of flight:-



$V = u + at$

$50 = 40 + 10t$

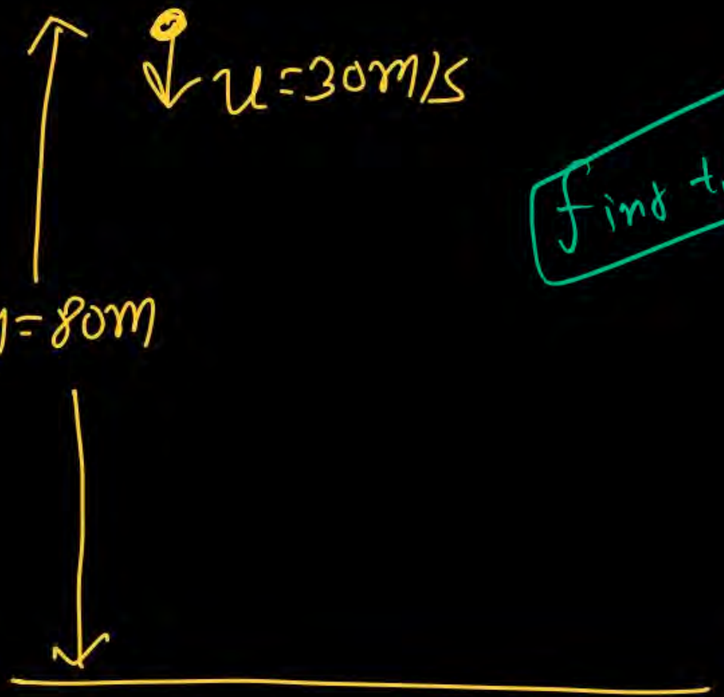
$t = 1s$

$V_f^2 - u^2 = 2as$ find V_f

$V_f^2 - (40)^2 = 2 \times 10 \times 45$

$V_f = \sqrt{900 + 1600}$

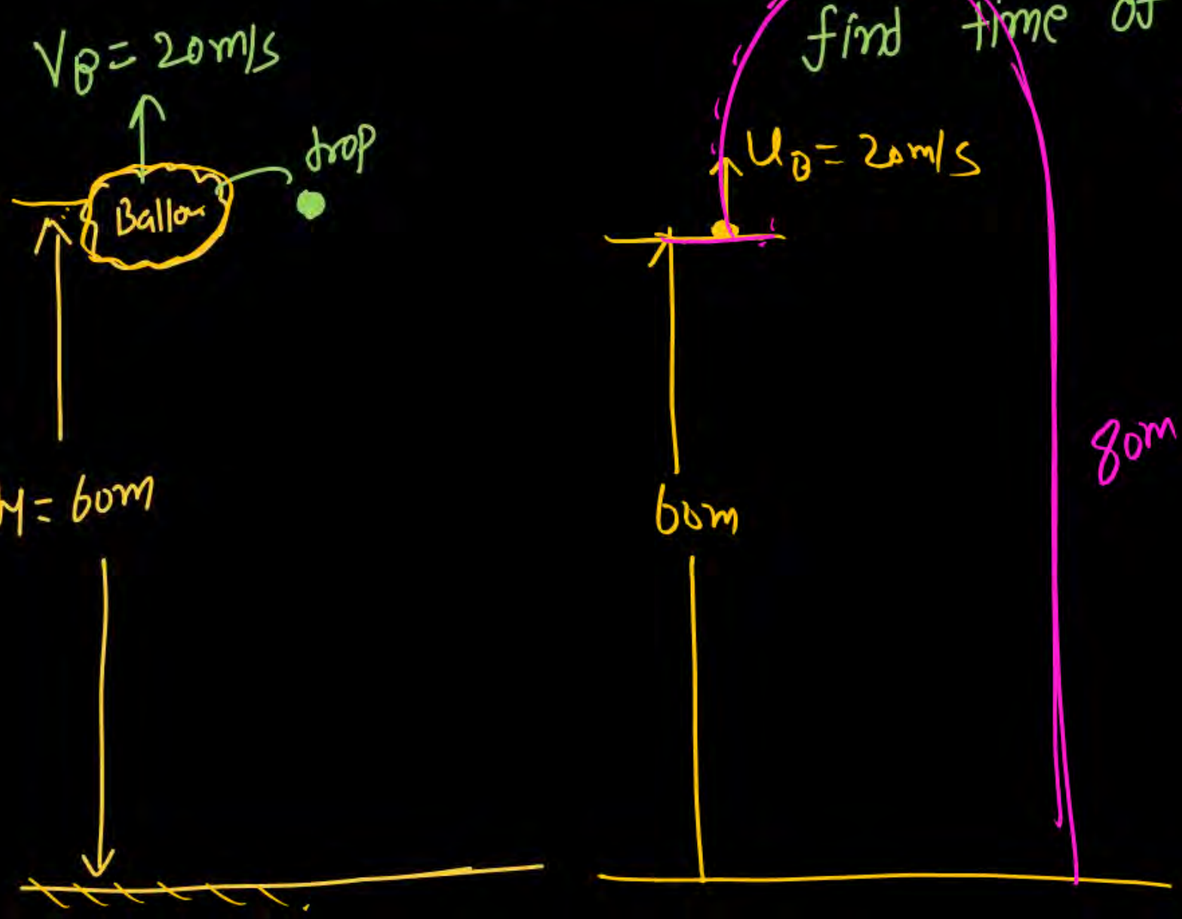
$V_f = 50 m/s$



find $t_f = ?$

MR* - BOX

Jab bhi object ko moving frame se drop kare hai to object moving frame ka velocity share kar leta hai but acceleration share nahi karta.



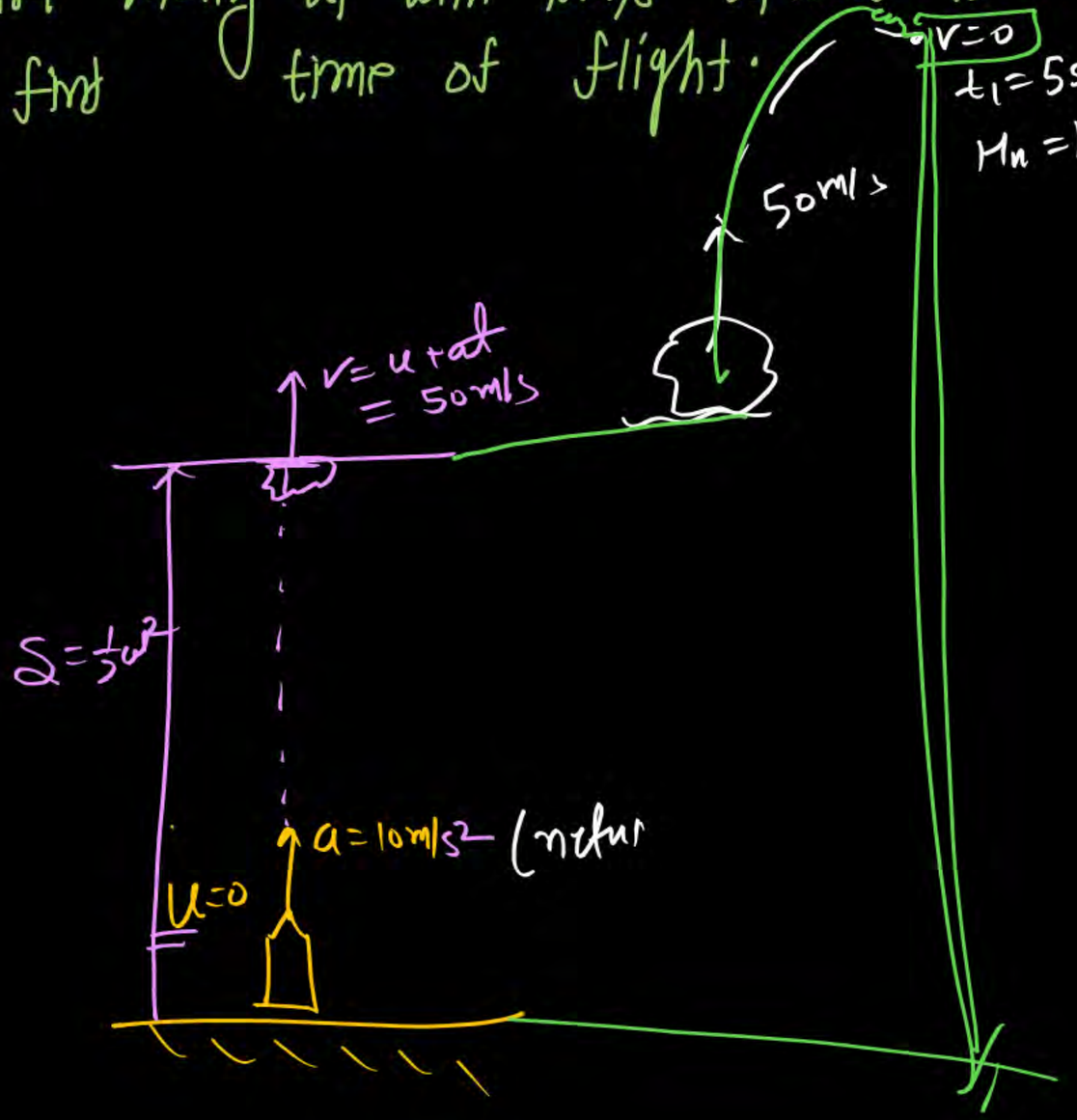
find time of flight of OBJECT

$t_1 = 2 sec.$

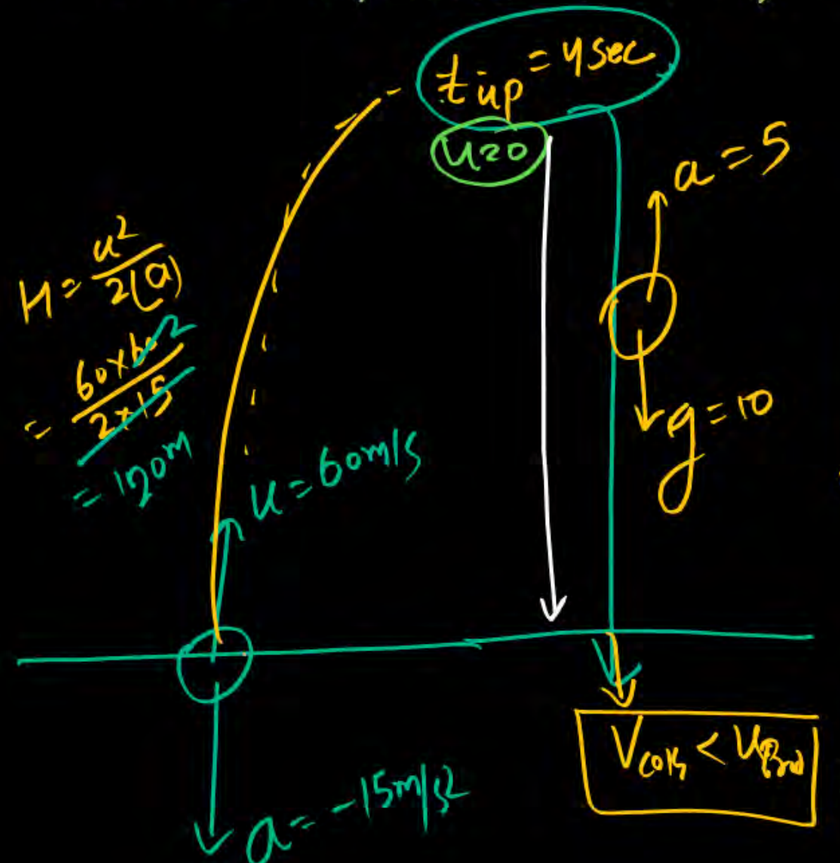
$H = \frac{u^2}{g} = 20m$

$T_f = 8 sec$

Rocket start moving up with 10m/s² upward from ground after 5-sec engine off then find time of flight.



Object is projected up with 60m/s and const air friction produce retardation 5m/s² then find Time of upward motion,

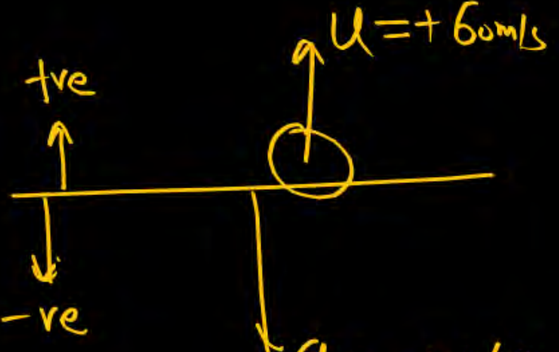


$S = ut + \frac{1}{2}at^2$

$120m = \frac{1}{2} 5 t^2$

$240 = 5t^2$

$t = \sqrt{\frac{240}{5}}$



$W_{net} = \Delta K.E$

$t_{up} < t_{down}$

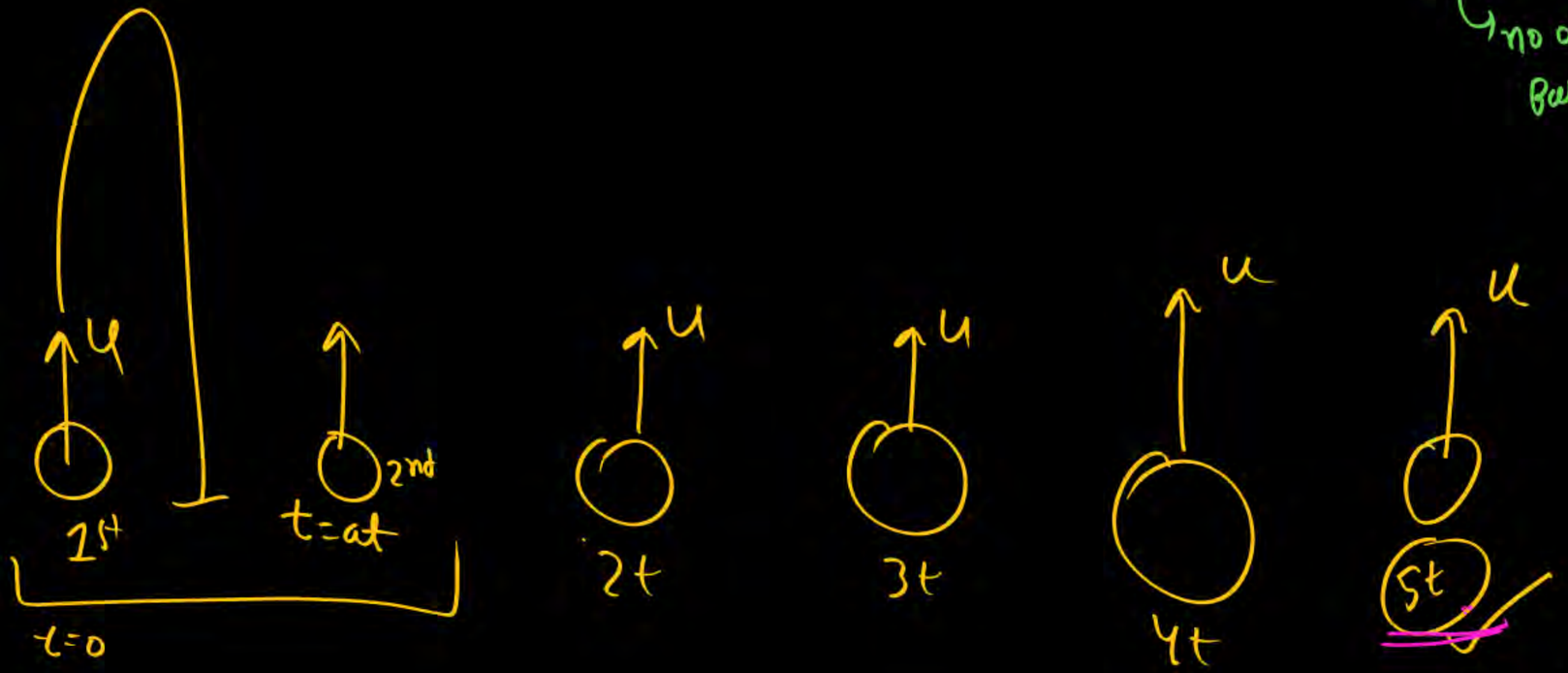
Juggler Problem

he wants to keep 5 - Ball in air :—

$$nt = \frac{2u}{g}$$

n → no of Ball in air

t → time of flight of 1st Ball



Jugglar wants to keep 5-Ball in air with time intraval of 2 sec, then find velocity of Projection of each Ball.

$n = 5$

$t = 2n$

$$nt = \frac{2u}{g}$$

$$5 \times 2 = \frac{2(u)}{g}$$

$$50m = u$$

6:31

@MRPHYSICSS

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THANK YOU