YAKEEN NEET 2.0

2026

Motion in a Straight Line

Physics | Lecture - 14

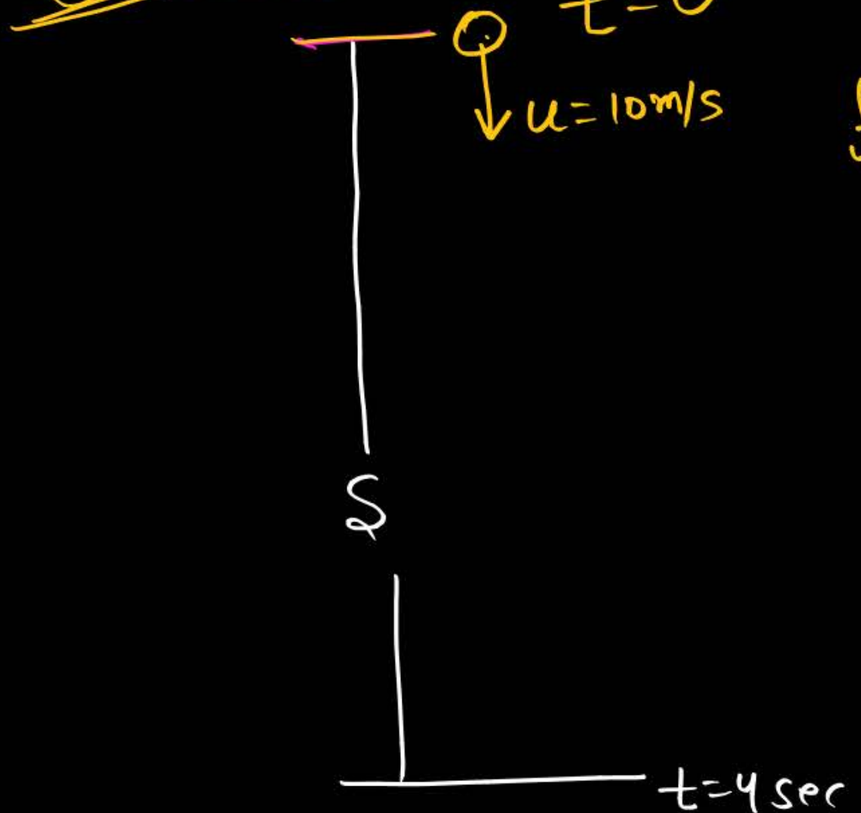
By- Manish Raj (MR Sir)

Topics to be covered

1. # Ram-lal Scam
2. Reaction time, Balloon Probm, air resistance.
3. Juggler Propn, Rocket engine off.
4. all PYQ on Motion under P.Y.Q.

Question on Motion Under Gravity

Q) Likhna hai



find disp^{m} in $t=4$ sec.

$$S=\frac{1}{2}at^2$$ X

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

$$=10\times4+\frac{1}{2}\overset{5}{\cancel{10}}(4)^2$$

$$=40+5\times16$$

$$=40+80$$

$$=120m$$

Ans

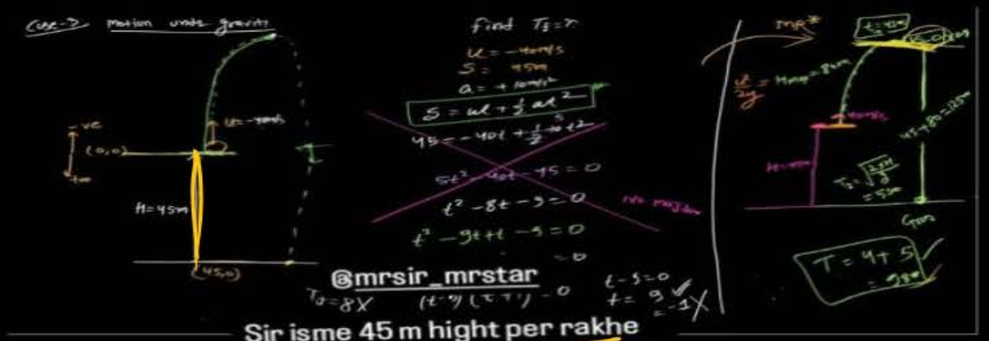
Ans → 80m. Scam ae E!

(a) 80m

(b) Nahi a

Mentions · ahad00068 2h

See translation >

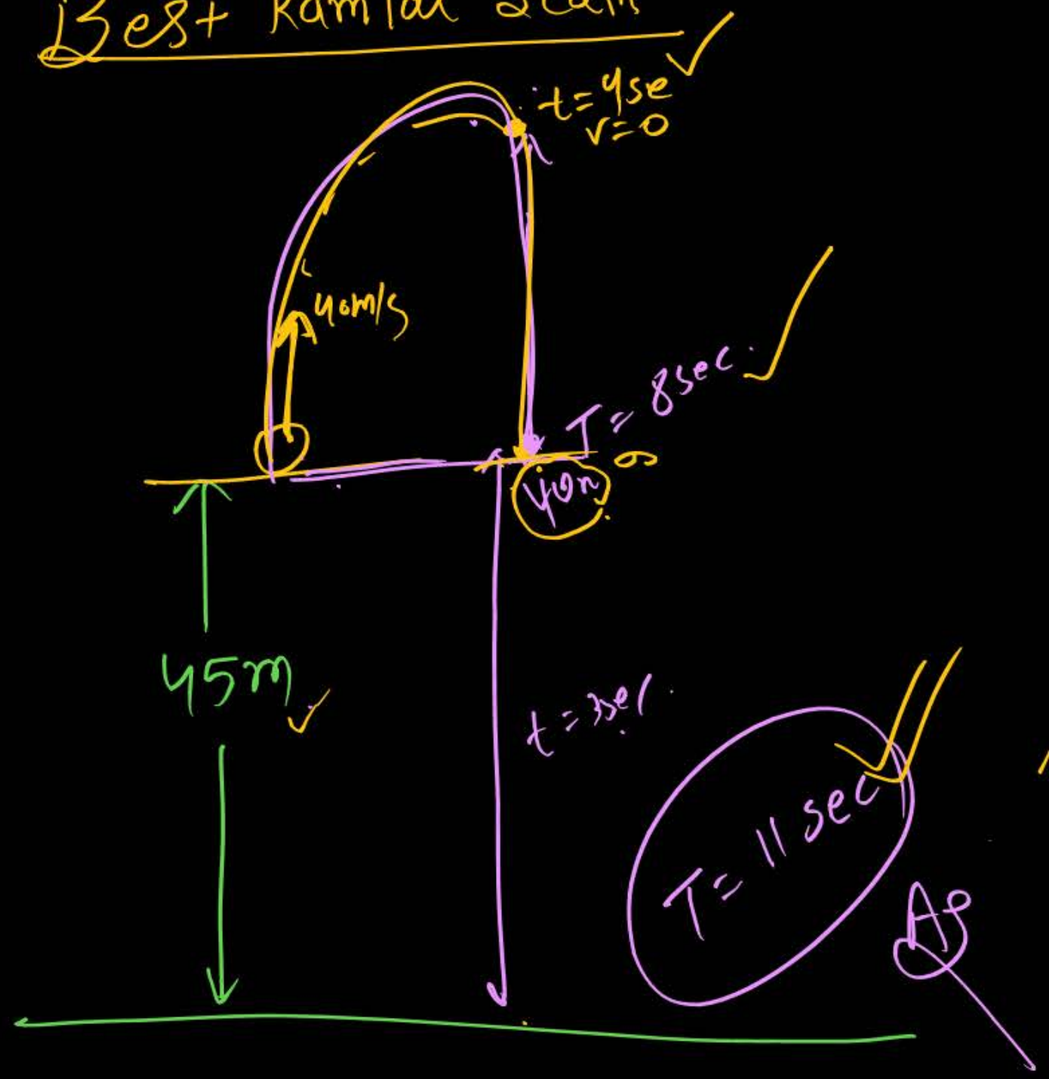


Sir isme 45 m hight per rakhe object ko 40m/s se uper fenka jab wo maximum hight per jave ga to velocity zero hogi zero velocity per time 4 sec hoga fir jab wo wapas aayega jaha se hamne fenka tab use utna hi time lage kga jitna uper jane me laga matlb 4 sec or jab ground per aayega to uska time 3 sec hoga because 45m per time 3 sec hota hai to tatal time to 4+4+3 = 11sec hona chahiye

Add to your story

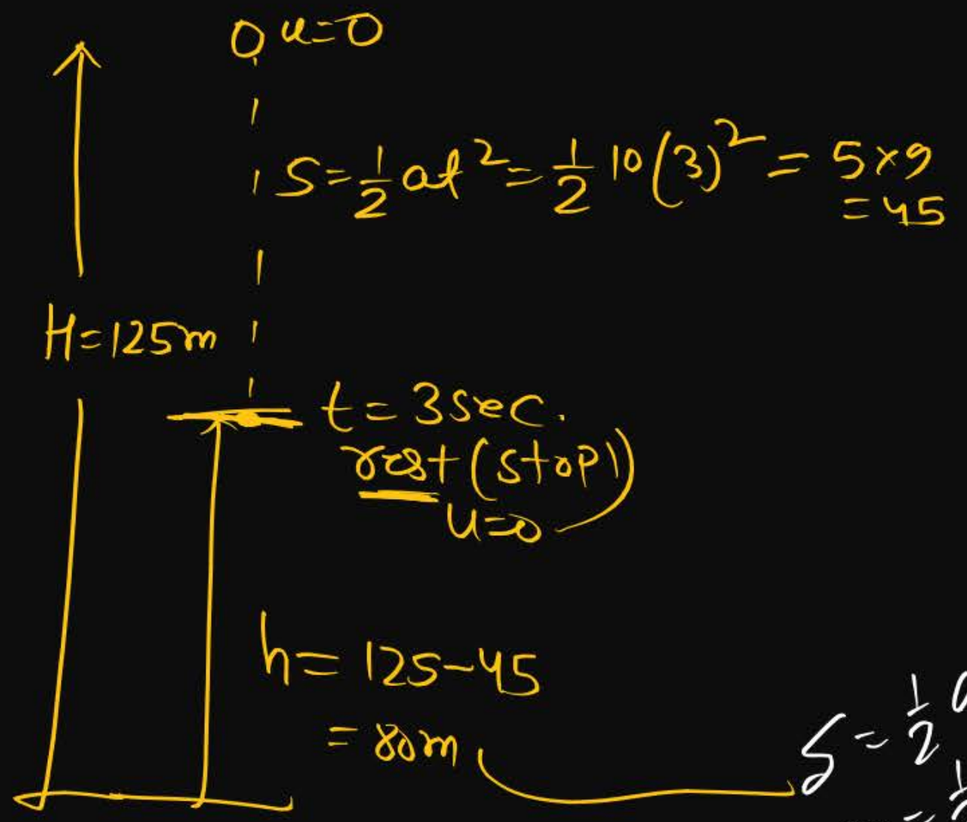
Send message...

Best Ramlal Scam



Question Likho C.

(8) Ball is dropped from height 125 m after 3 sec it stopped and released at same instant find total time of flight.



$S = \frac{1}{2}at^2 = \frac{1}{2}10(3)^2 = 5\times 9 = 45$

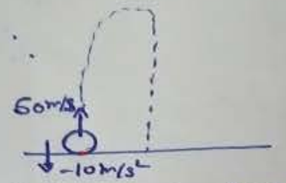
$S = \frac{1}{2}at^2$

$80 = \frac{1}{2}10t^2$ → $t = 4sec$

$T = 4 + 3 = 7_{sec}$

9:55

◄ Telegram



dist cover in 1 sec

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

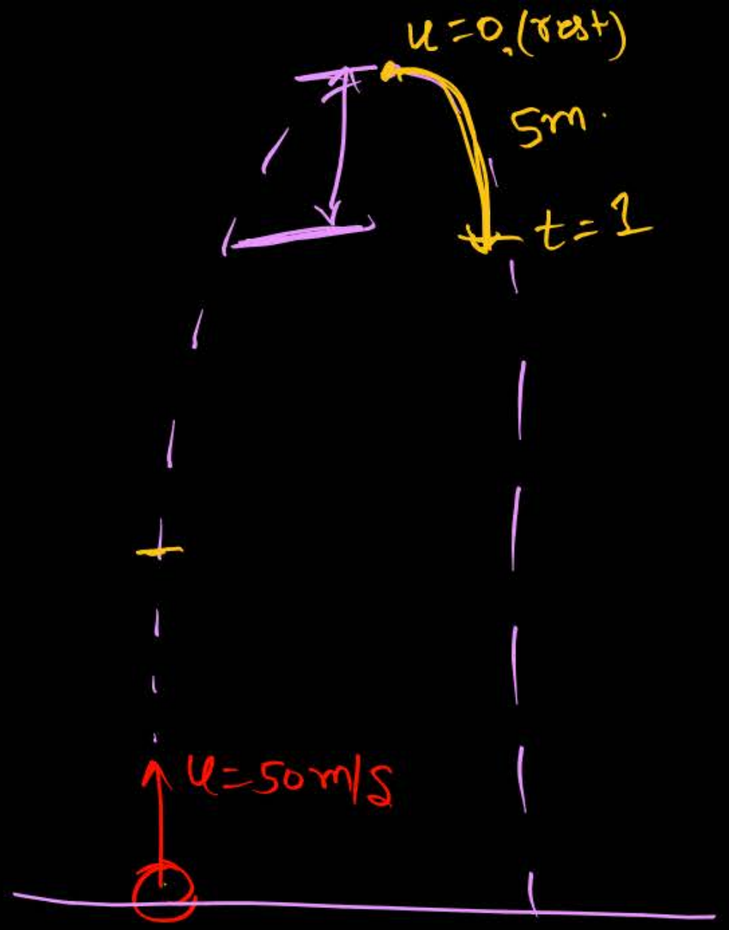
$$S = 50 \times 1 + \frac{1}{2} \times (-10) \times 1$$

$$= 50 - 5$$

$$= 45\ m$$

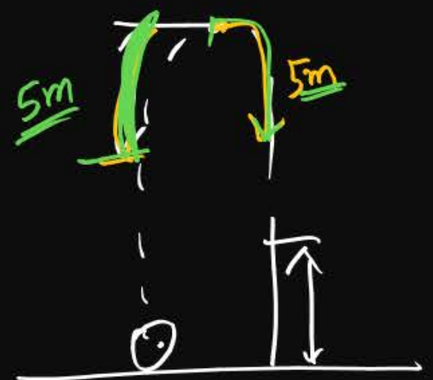
@mrsir_mrstar

Sir apne bola tha k 1 sec mai 5 m chalega but iske liye akhir dekhe too 1sec par too 45 m chal raha hai pls explain



Question Likhe

Object is projected with 40 m/s and 60 m/s respectively then find ratio of distance in last – sec of upward Journey.



Ans $S_1 : S_2 = 1 : 1$

* dist^n in 1st sec of downward Journey = dist^n in last sec of upward Journey. *

Question likha hai

If a ball is thrown vertically upwards with speed u, the distance covered during the last t seconds of its ascent is [2003]

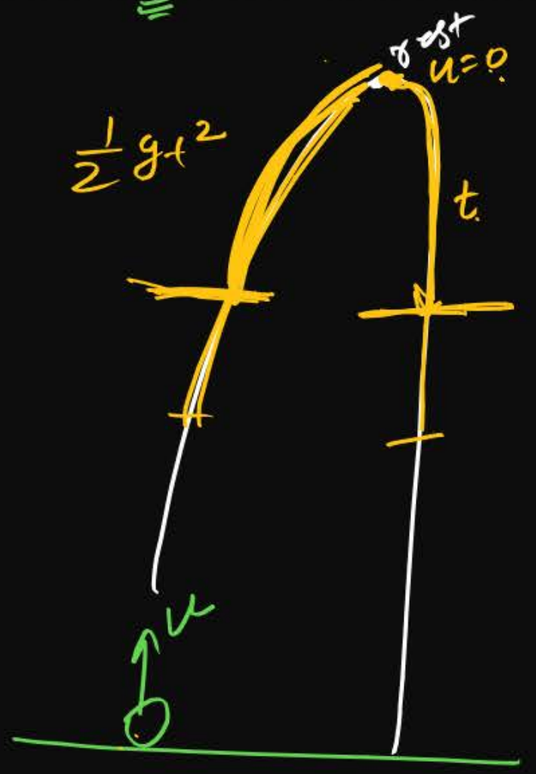
upward journey

1. ut
2. $\frac{1}{2}gt^2$ ✓
3. $ut - \frac{1}{2}gt^2$ ✗
4. $(u+gt)t$ ✗

Symmetry NR* concept

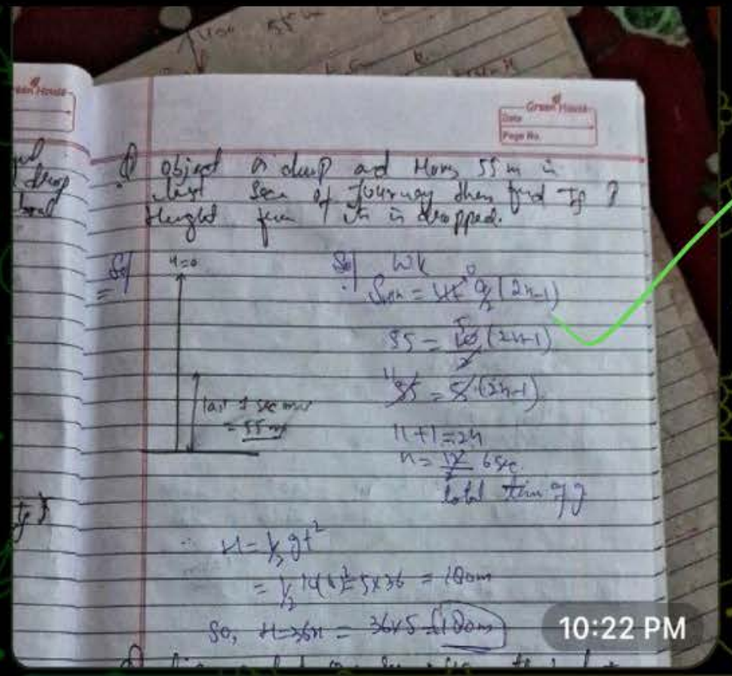
t is Not total time

t = last t sec of upe



disp' = $\frac{1}{2}gt^2$ ✓

Object moves 55 m in last sec. then fin T.

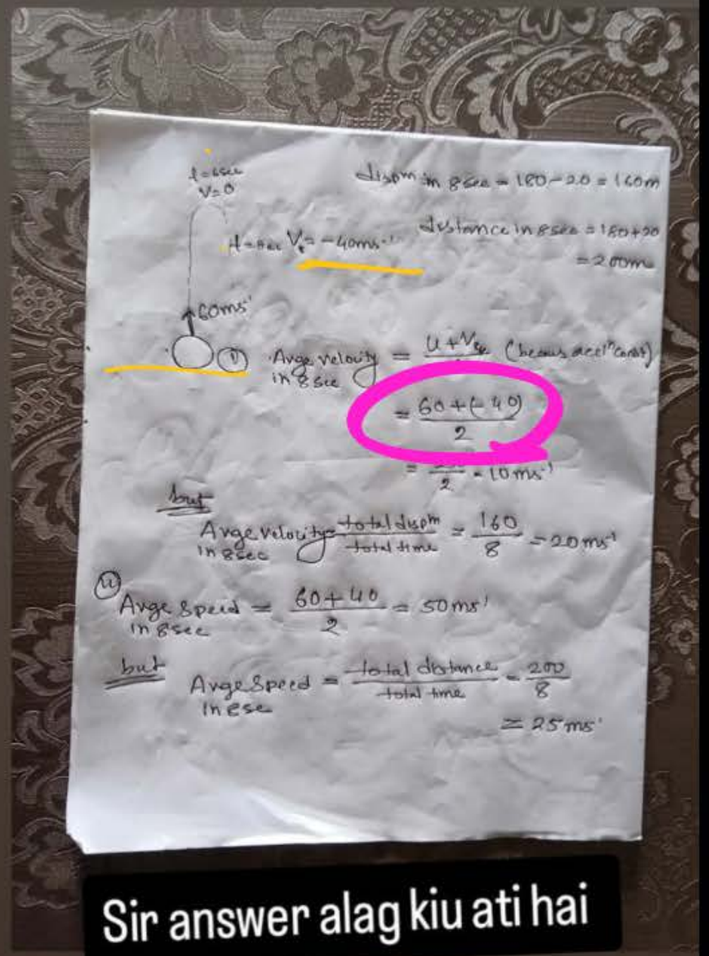


Sir yaha par huma kaisa para chala gaa ki Snth eq. Use Karni Hai
Hum to $S=ut+1/2at^2$ use karsak ta hai na
Mgr waha pai time wrong nikalta hai na??
😢🥺😢

10:24 PM

Message

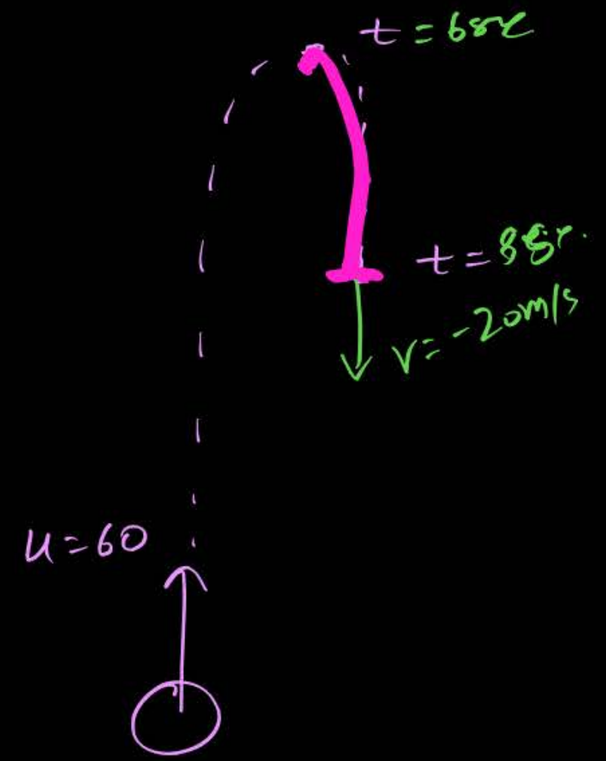
Mentions · rabul_670 37m



Sir answer alag kiu ati hai

Sir. Kia aha par mr scam hogaya R_MRSTAR

Send message...



t=8sec ⇒ Avg velocity

$$\text{Avg vel} = \frac{\vec{v_i} + \vec{v_f}}{2}$$

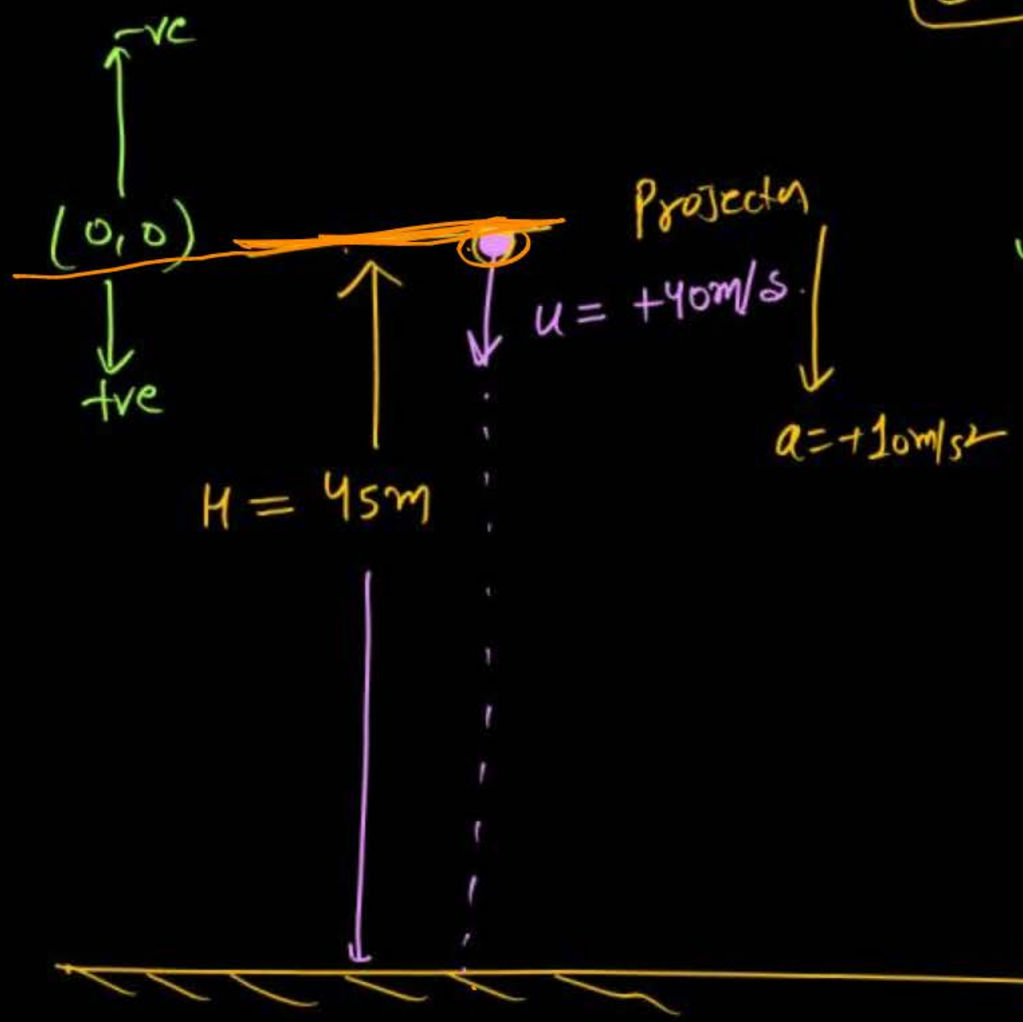
$$= \frac{60 - 20}{2}$$

$$= \frac{40}{2} = 20\,m/s$$

$$\text{Avg velocity} = \frac{\vec{u}_i + \vec{v}_f}{2}$$

for const^n acc^n

$s = 45m,\ u = 40m/s\ \ a = +10\ m/s^2$



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

$45 = 40t + \frac{1}{2}(10)t^2$

$5t^2 + 40t - 45 = 0$

$t^2 + 8t - 9 = 0$

$t^2 + 9t - t - 9 = 0$

$t(t+9) - 1(t+9) = 0$

$(t+9)(t-1) = 0$

$t = -9$ ✗

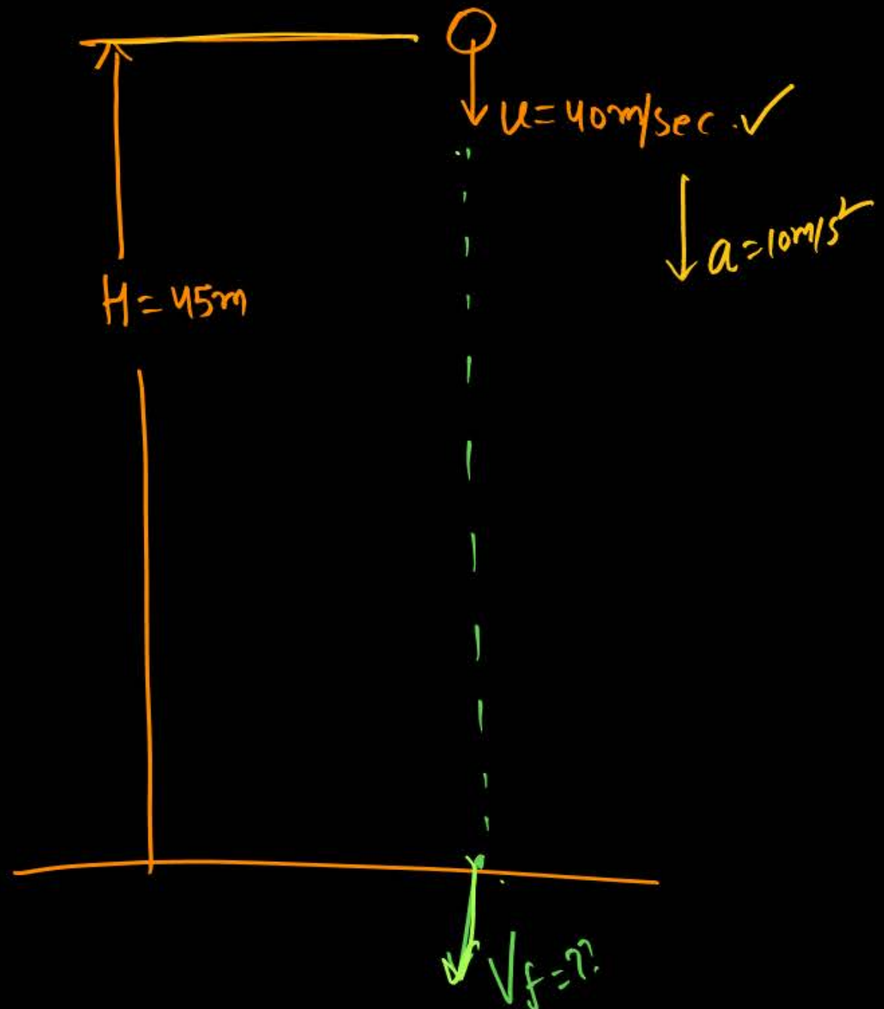
Likha hai solve $\rightarrow$ $t = 1$ sec

$t = 1$ sec

MR*

$t = 1$ sec drop.

Likho---



2nd method ✓

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

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

$V_f^2 = 1600 + 900$

$V_f = \sqrt{2500} = 50 m/s$

1st eqn of motion ✓

$V_f = u + at$

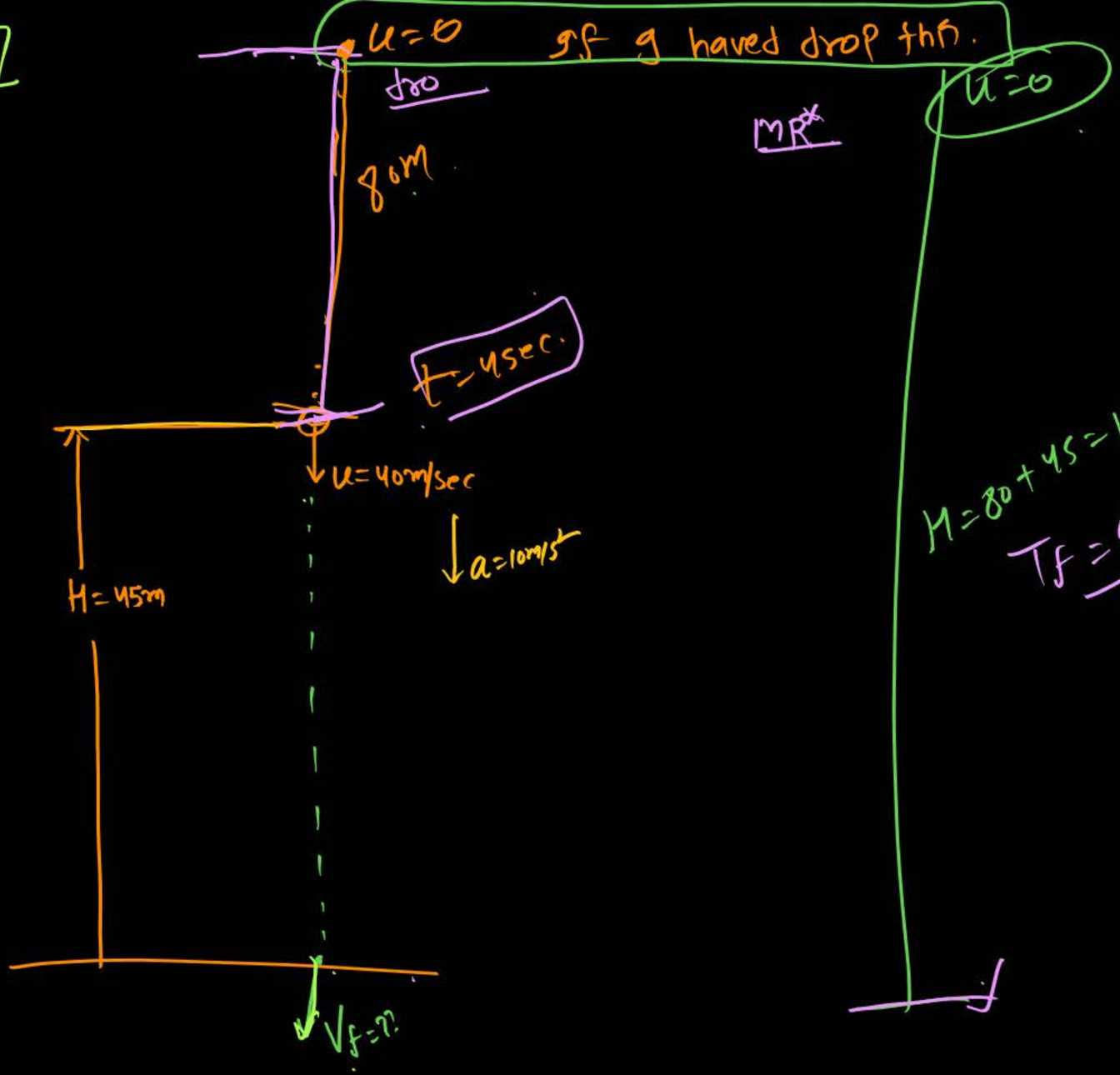
$50 = 40 + 10t$

$10 = 10t$

$t = 1 sec$ ✓✓

mR* → motion under gravity ke question me g given nahi hai to bhi g = 10m/s² lena hai

Likho---

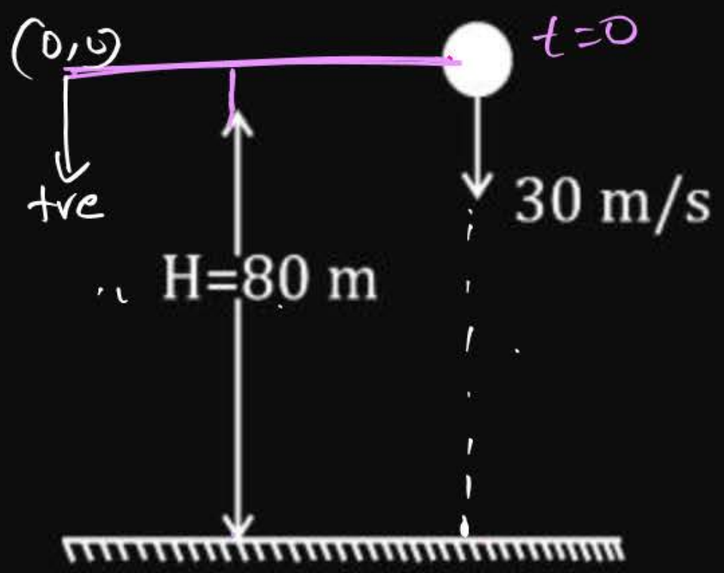


$t = 5 - 4 = 1\,sec$

for H=45m)

Question

Find time of flight.



1st method

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

$80 = 30t + \frac{1}{2}(10)t^2$

$5t^2 + 30t - 80 = 0$

$t^2 + 6t - 16 = 0$

$t^2 + 8t - 2t - 16 = 0$

$t(t+8) - 2(t+8) = 0$

$t = -8$ ✗

$t = 2$ sec ✓

2nd method.

$v^2 = u^2 + 2as$

$v^2 = (30)^2 + 2 \times 10 \times 80$

$v = \sqrt{900 + 1600}$

$v = 50$ m/s

1st eqn. of motion

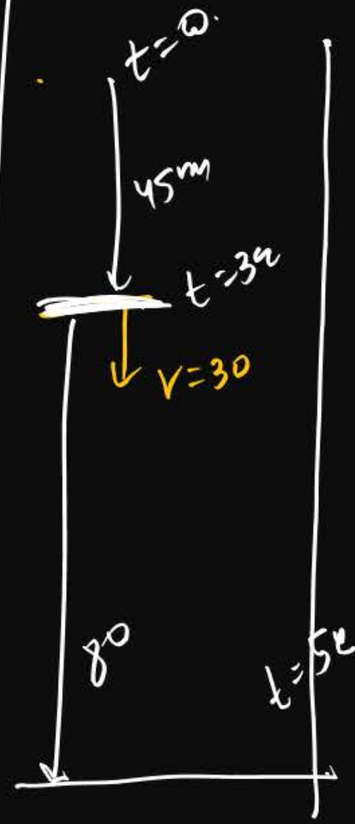
$\frac{v-u}{a} = t$

$\frac{50-30}{10} = t$

$t = 2$ sec. ✓

3rd method

mRA



$T_f = 5 - 3$

$= 2$ sec

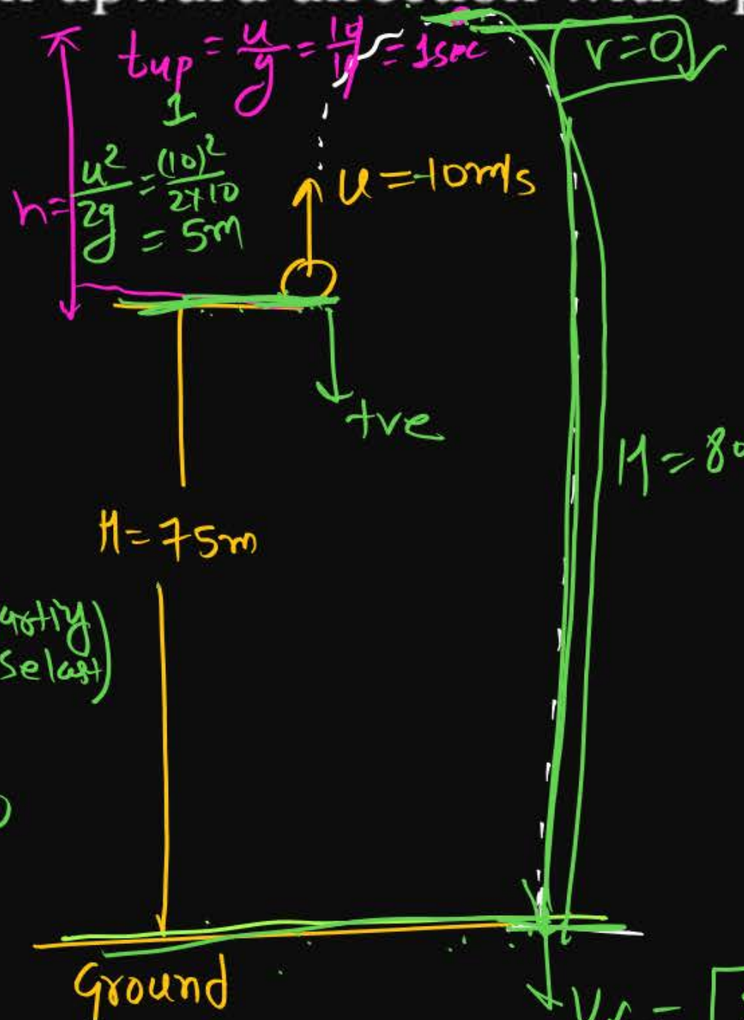
Question

Ball is projected from height of 75 m in upward direction with speed 10 m/s then find

(i) Total time of height. = 5 sec

(ii) Velocity at ground. $v = +40\ m/s$

(iii) Maximum height from ground. = 80m



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

$80 = \frac{1}{2}\times10\times t^2$

$16 = t^2$

$t = 4sec$ (top to ground) $= t_2$

$T_f = t_1 + t_2 = 5sec$

3rd eqn of motion (Slightly selected)

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

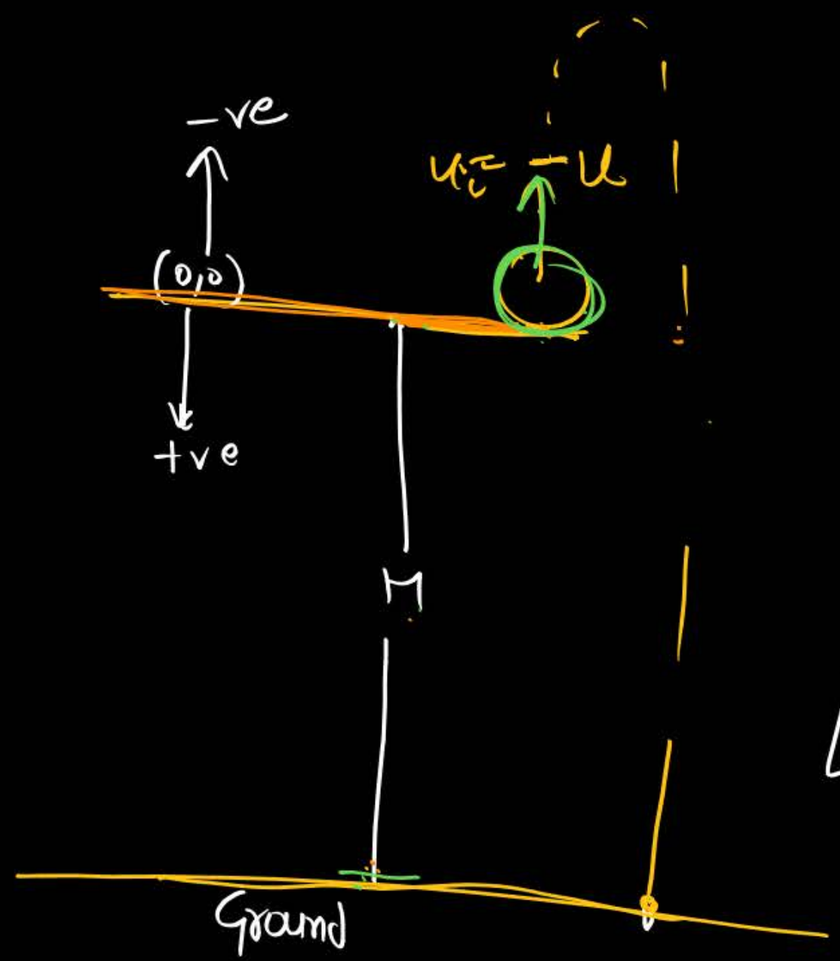
$v^2 - (-10)^2 = 2\times75\times10$

$v^2 = 100 + 1500$

$\Rightarrow v = \sqrt{1600} = 40\ m/s$

magnitude

Motion under gravity from Height to ground



$S = +H$

$a = +g$

$u = -u$

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

$$H = -ut + \frac{1}{2}gt^2$$

$$\left[\frac{g}{2}t^2 - ut - H = 0\right] \times \frac{2}{g}$$

$$t^2 - \frac{2u}{g}t - \frac{2H}{g} = 0$$

$$at^2 + bt + c = 0$$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2 \times a}$$

solve it ~~or~~ gyrs

$$t = \frac{u}{g} + \sqrt{\frac{u^2}{g^2} + \frac{2H}{g}}$$

MP
- gf $H = 0$; ground to grav ✓

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

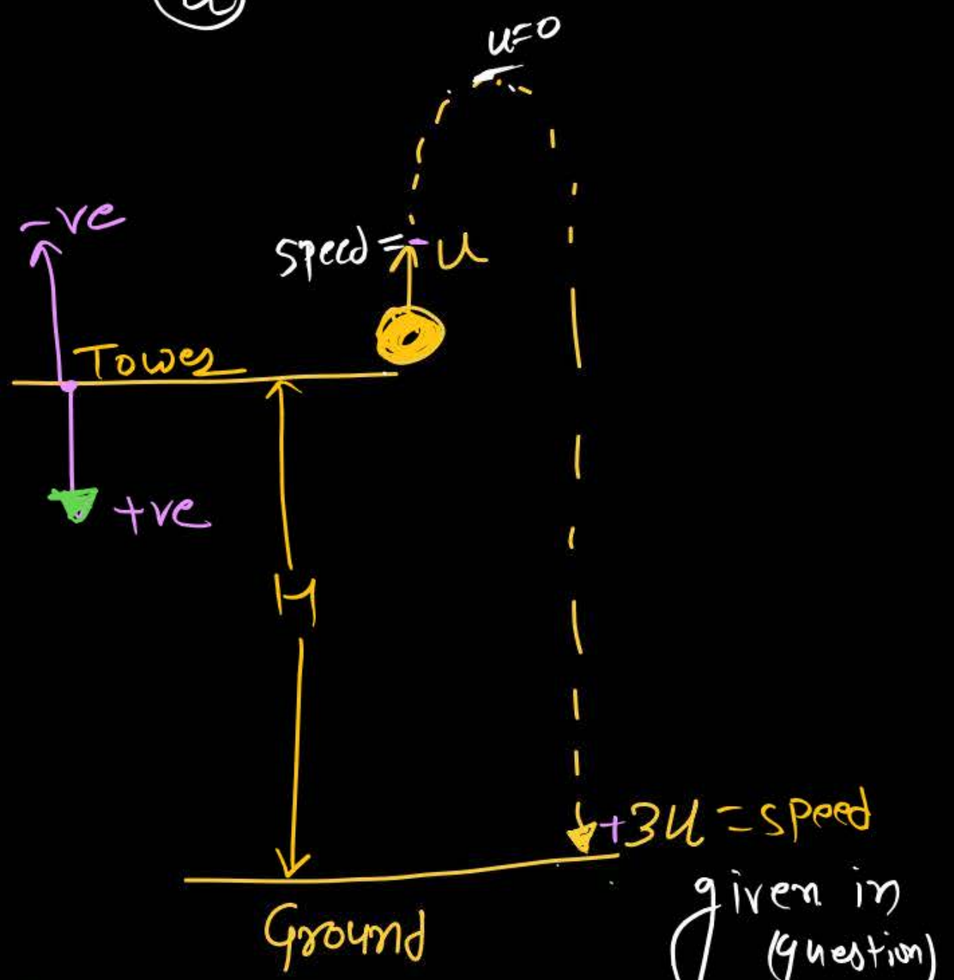
- gf $u = 0$ (drop)

$$T = \sqrt{\frac{2H}{g}}$$ ✓✓

- dimension correct ✓✓

Likho

(a)



* always take sign +ve in downward dirn if dirn not mensin in questin

* find Time of flight and Height of Tower

Soln

H = Not given

1st eqn of motn

$\vec{v} = \vec{u} + at$

$3u = u + gt$

$3u - u = gt$

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

$3u = -u + gt$

$3u + u = gt$

$4u = gt$

$T_f = \frac{4u}{g}$ A2

3rd eqn of mn

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

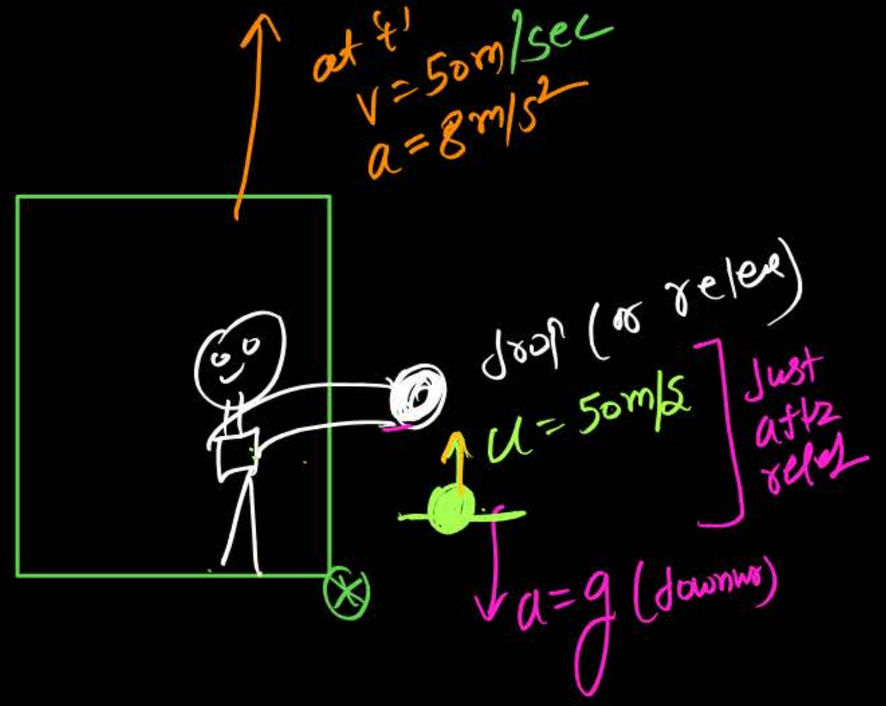
$(3u)^2 - (-u)^2 = 2gH$

$9u^2 - u^2 = 2gH$

$H = \frac{8u^2}{2g} = \frac{4u^2}{g}$ A2

MR* Box: ⟶ Jab bhi object ko moving frame (lift / Balloon) se release karte hai to woo wske velocity ko share kar leta hai but acc^{n} share nahi karta hai.

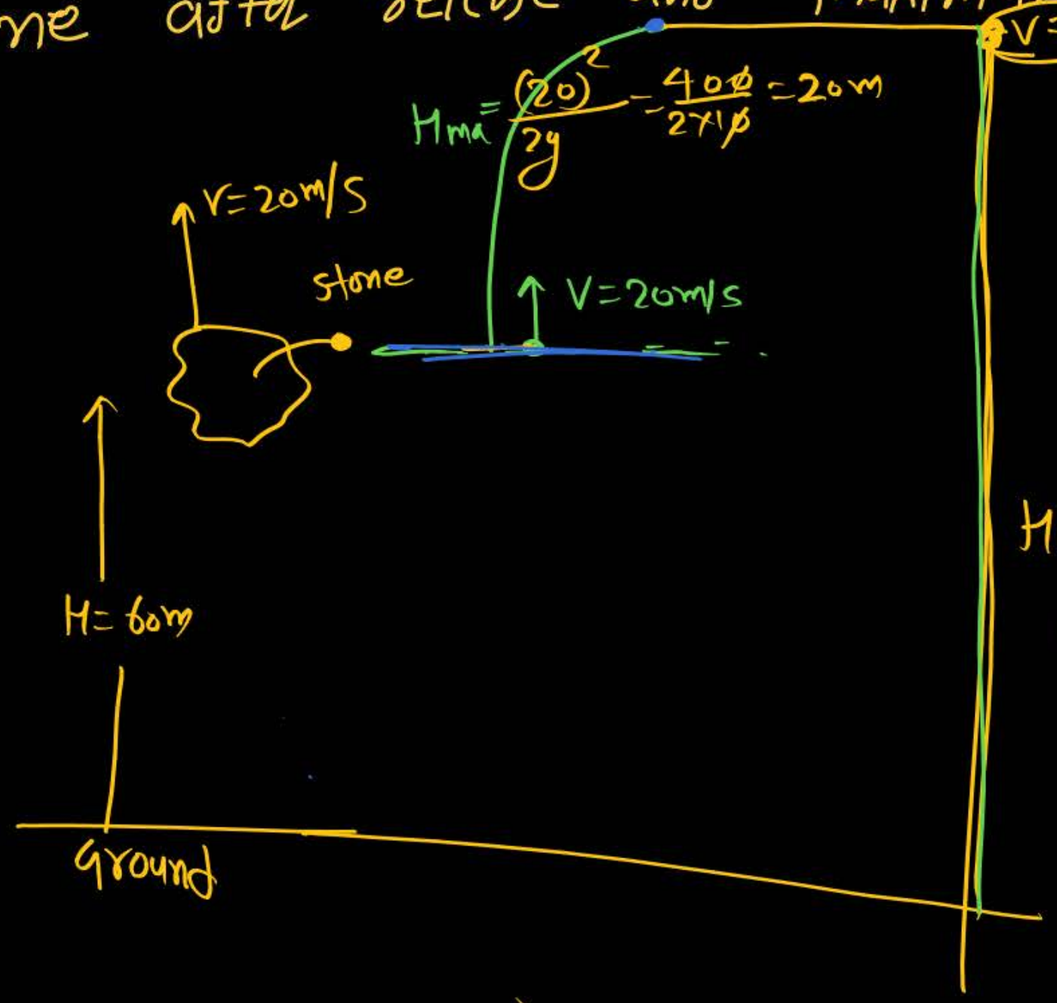
,gf object moving freely in air (a=g)



Likho

Balloon is moving up with velocity 20m/s at height of 60m a stone is release from Balloon then find Time of flight of stone after release and maximum height :-

Sol3



$H = 20 + 60 = 80m$

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

$= \sqrt{\frac{2\times80}{10}} = \sqrt{16}$

$= 4sec$

$T_{flight} = 2sec + 4sec = 6sec$

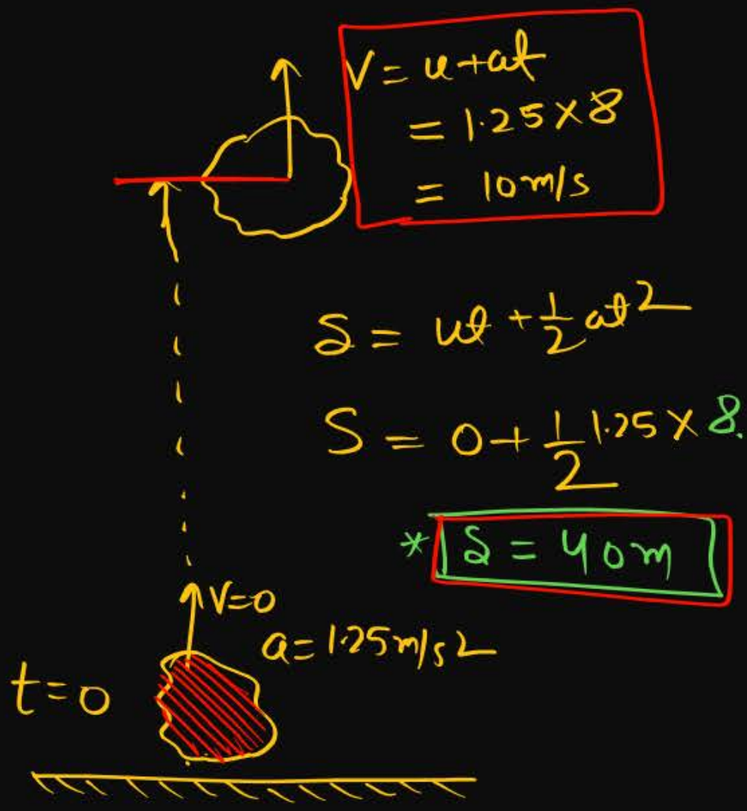
Ans

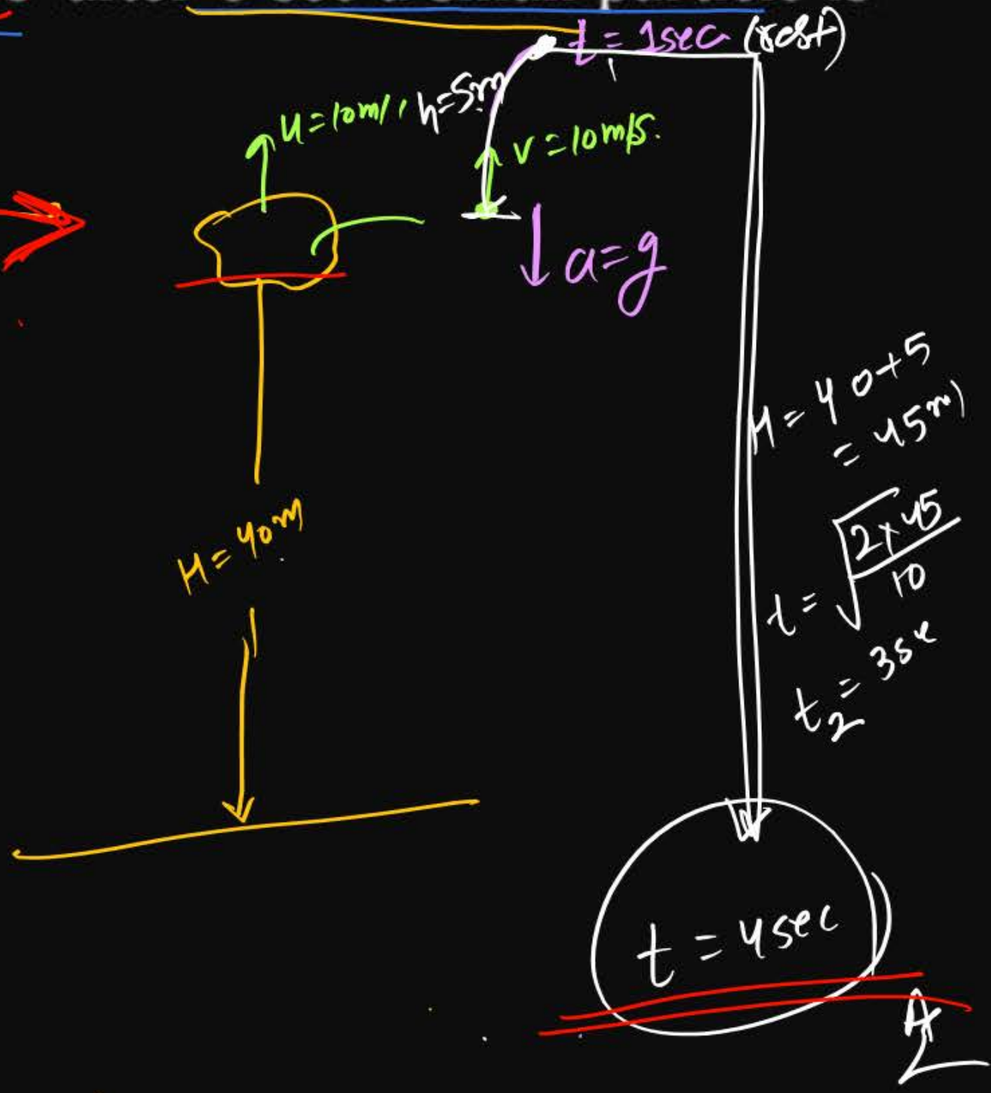
$H_{from\ ground} = 80m$

Question

A balloon starts moving up from ground with 1.25 m/s² after 8 sec a small particle is dropped then find time of flight of particle.

Likho

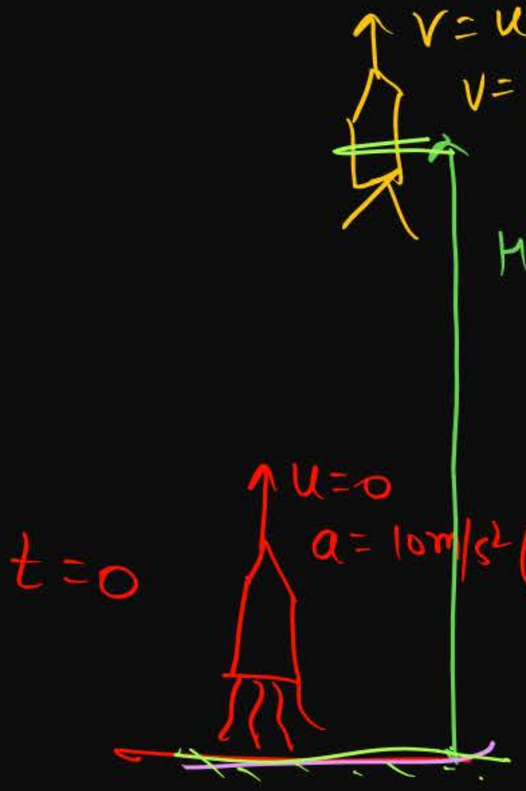


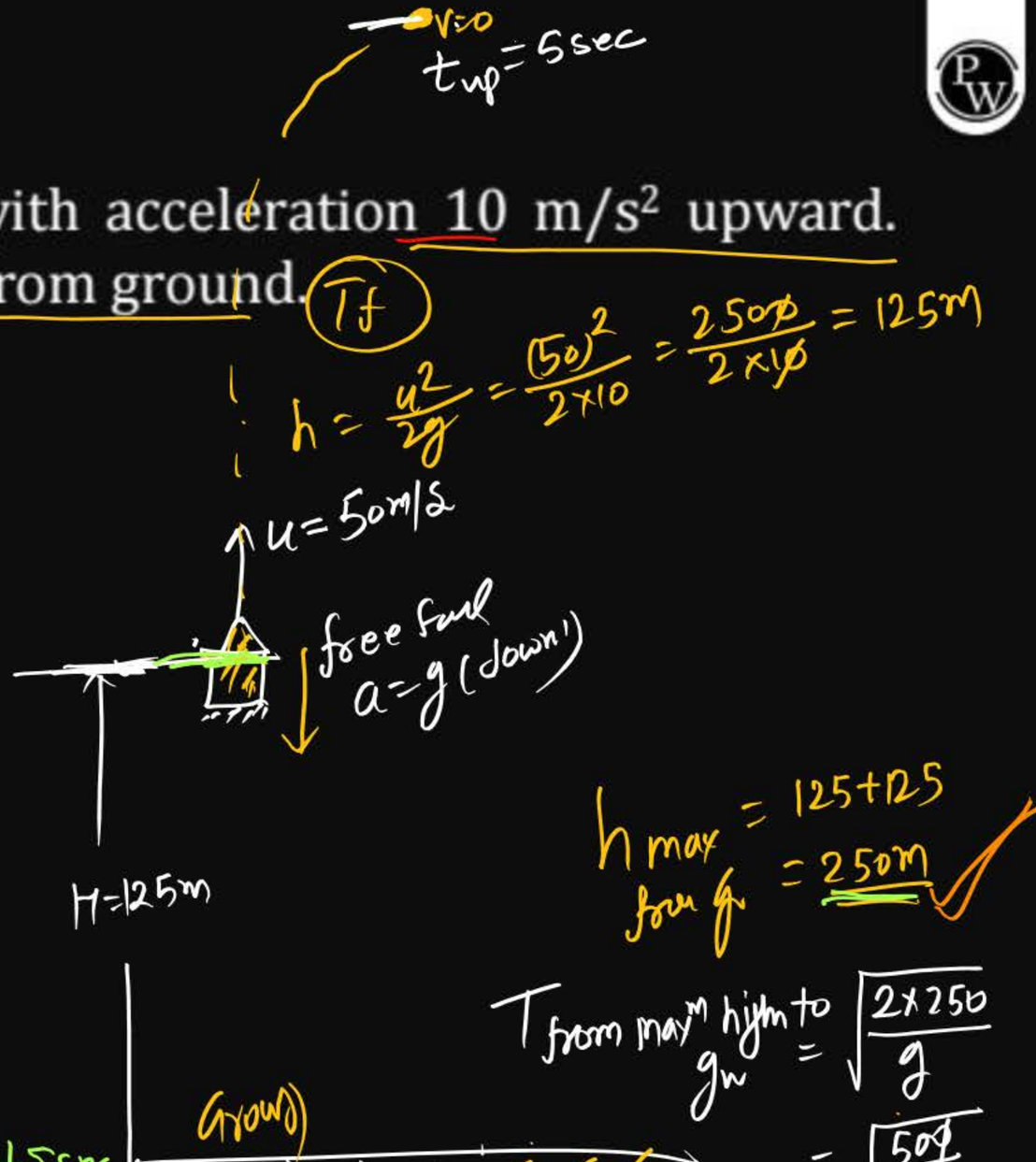


Question

Rocket starts his motion in upward direction with acceleration 10 m/s² upward. After 5 sec engine off then find maximum height from ground.

JEE



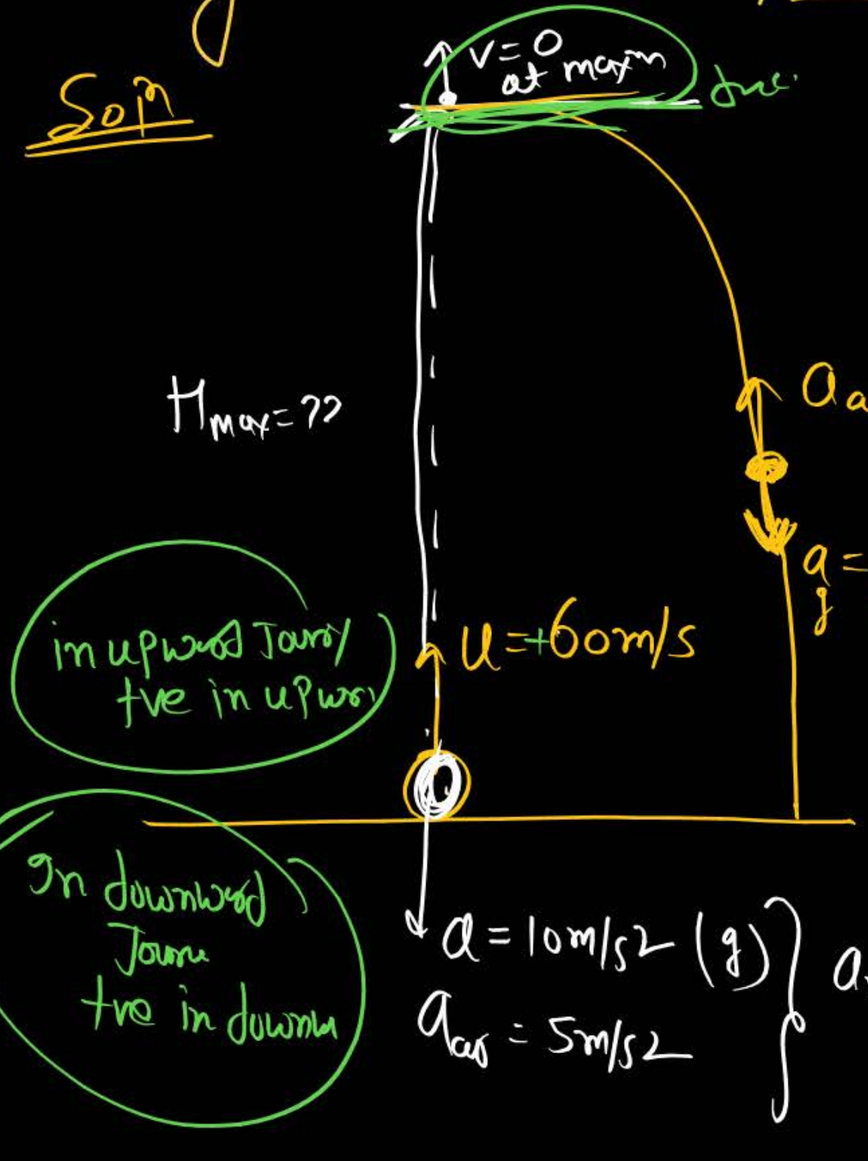


Total time of Journey = 5 sec + 5 sec + 7.1 = 17.1 sec.
Ground to ground

(8) object is projected up with 60m/s and constant air friction acting on it which produce retardation 5m/s2 then find T_{up}, T_{down}, H_{max}

(motion ke opposite lagta hai air friction)

Sol^n



for max height

$$h=\frac{u^2}{2a_{net}}$$

$a_{net}=g-a_{air}$

$=10-5$

$=5m/s^2$ (in downward)

$$=\frac{(60)^2}{2\times15}$$

$$=\frac{60\times60^2}{30}$$

$=120m$

time of upward Journ.

$v=u+at$

$0=60-15t$

$t=\frac{60}{15}=4sec$

time of downward

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

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

$48=t^2$ $t=\sqrt{48}$

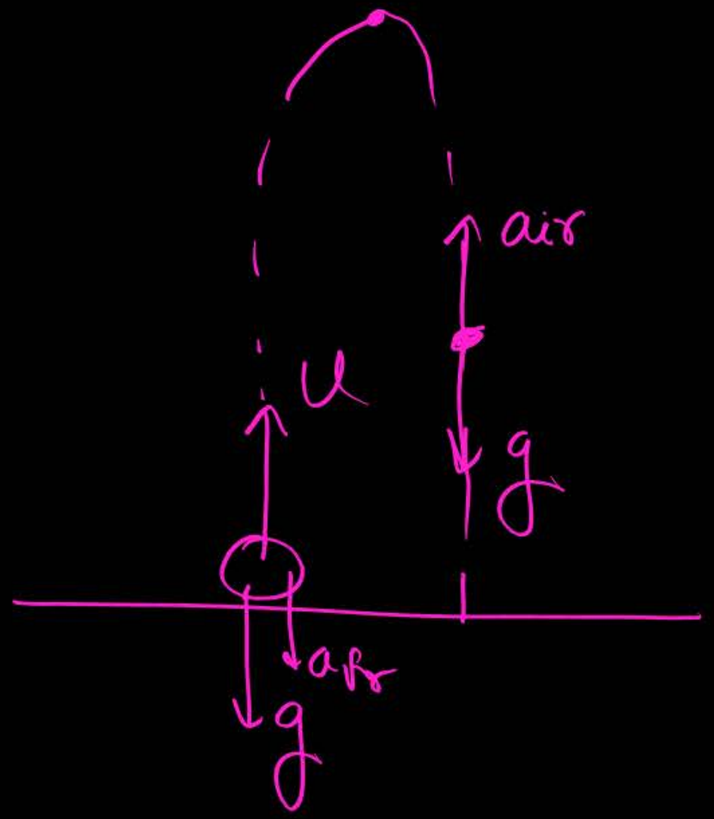
$\approx 7sec$

$V_{at\ gr}=u+at=0+5\times7$

$=35m/s$

$=34.6m/s$

motion under gravity with air resistance



$t_{up} < t_{down}$.

$u_{projection} > u_{cession}$

final velocity at ground.

next chapter

(a) In above question, find work done by air friction. if m=2kg.

Work done by air fri. $= \Delta K.E$

$= \frac{1}{2} m \left[v_f^2 - v_i^2\right] = \frac{1}{2}(2)\left[(35)^2 + (60)^2\right]$

Ans

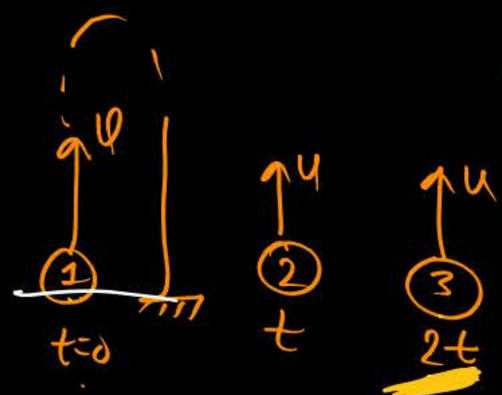
Juggler wants to keep n- Ball in air, if he throw each Ball with speed u then find time intraval Between each ball.

- u (velocity of Projection) = Same for all Ball.
- t = time gap B/w Projectio of each Ball is Same.

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

n = no of Ball To Keep in air.

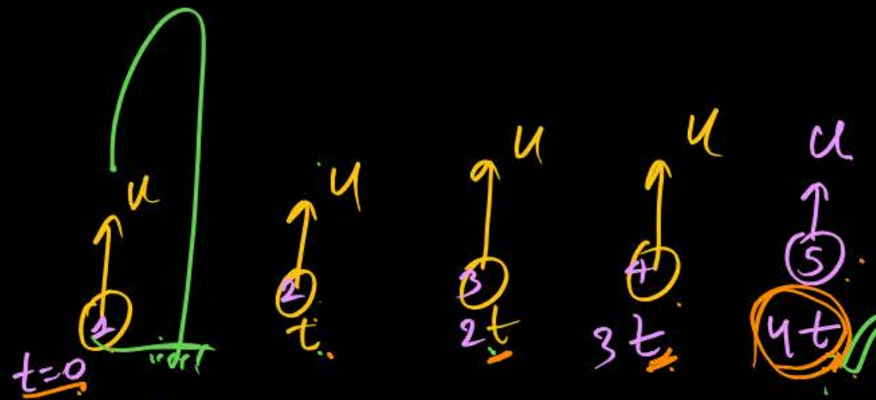
2-Ball in



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

→ time gap.

Example → 4 Ball एक साथ हवा



$$\left(\frac{2u}{g}\right) = 4t$$

time of flg of 1st ball

no of Ball

Juggler wants to keep 5-Ball in air with time intraval of 2sec then find velocity of projection of each Ball.

$t = 2sec$

$n = 5$

$t = 2sec$

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

$$\frac{2 \times u}{10} = 5 \times 2$$

$$u = 50\ m/s$$

Q Juglar maintain 10 balls in motion making each rise upto 80m height. find time interval maintain by Jugglar.

Soln given

$n = 10$

$H_{max} = 80m$ each ball $\left(H_{max} = \frac{u^2}{2g}\right)$

$t = ??$

$u = \sqrt{2gH}$

$= \sqrt{2 \times 10 \times 80}$

$= \sqrt{1600}$

$= 40 m/s$

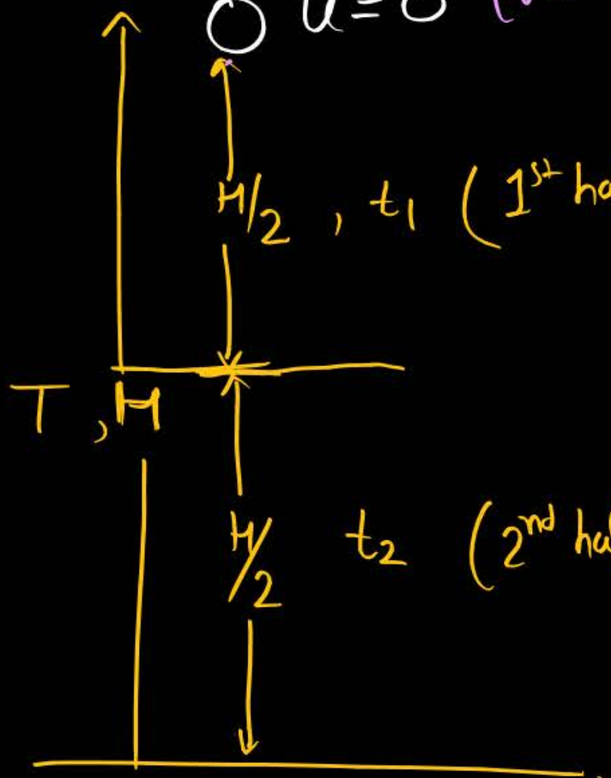
$\frac{2u}{g} = nt$

$\frac{2 \times 40}{10} = 10t$

$t = 0.8 sec$ Ans.

Important

Object is droped ; find ratio of $t_1 : t_2 = ??$



(a) $t_1 : t_2 = 1 : 1$

(b) $t_1 : t_2 = 1 : 2$ MR scam

(c) $t_1 : t_2 = 1 : 4$

$t_1 : t_2 = 1 : \sqrt{2}-1$ already done

$H = \frac{1}{2} g T^2$ — (i)

$\frac{H}{2} = \frac{1}{2} g t_1^2$ — (ii)

$t_2 = T - t_1$

$t_2 = T - \frac{T}{\sqrt{2}}$

$2 = \frac{T^2}{t_1^2}$

$t_1^2 = \frac{T^2}{2}$

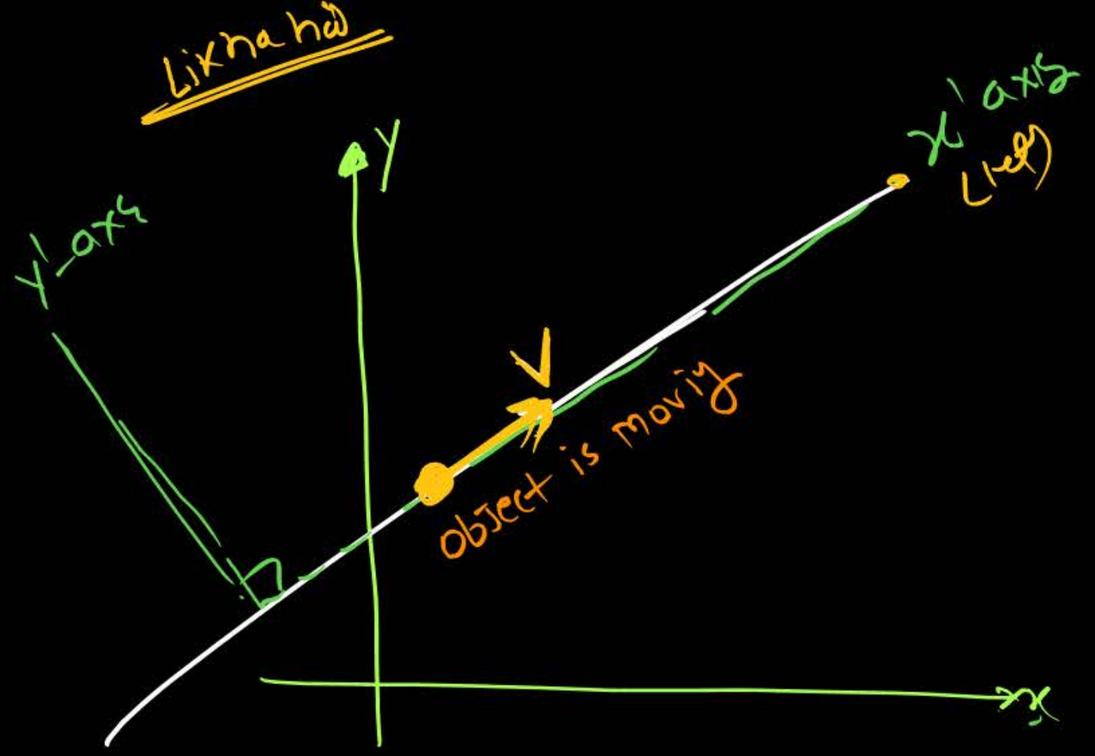
$t_1 = \frac{T}{\sqrt{2}}$

Question

Object is dropped then it moves 2^{nd} half distance in last 1 sec of motion then find time of flight.

(JEE/NEET)

Likha hai



(a) 1-D motion.

(b) 2-D wrong (MR scam)

Q If Positin of object $\vec{r} = 2t\hat{i} + 3t\hat{j}$ then motin of motio of obj on which Path

MR Scam

(a) 1-D

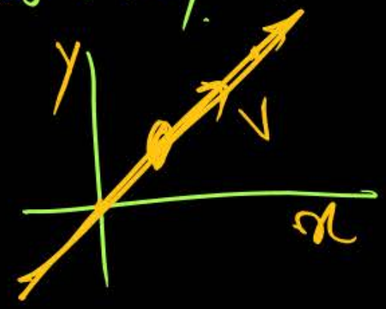
(b) 2-D (63%) Wrong

$x = 2t$ → $t = x/2$ → Now Put value of t in y.

$y = 3t$

$y = 3t = 3\left(\frac{x}{2}\right)$

$\boxed{y = \frac{3x}{2}}$



Reaction time :→ The time gap between taking desigion and respond.

@ CAR is moving with Velocity 50m/s and he decided to apply Break which produce retardation $10m/s^2$ before coming to rest he Traval 150m then find reaction time.

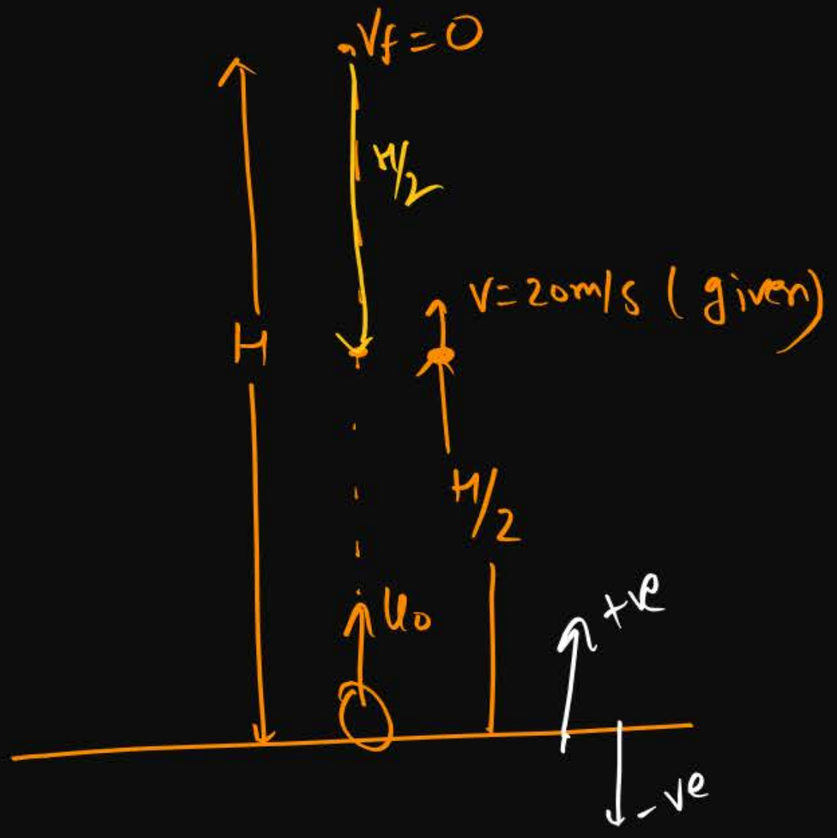
hint

1st calculate Stopping dism

4/40

Question

A ball is thrown upward with u_0 if its velocity at half of maximum height is 20 m/s then find it velocity u_0.



Comp^t motn

$$0 - u_0^2 = 2(-g)H$$

$$H = \frac{u_0^2}{2g} \quad - (1)$$

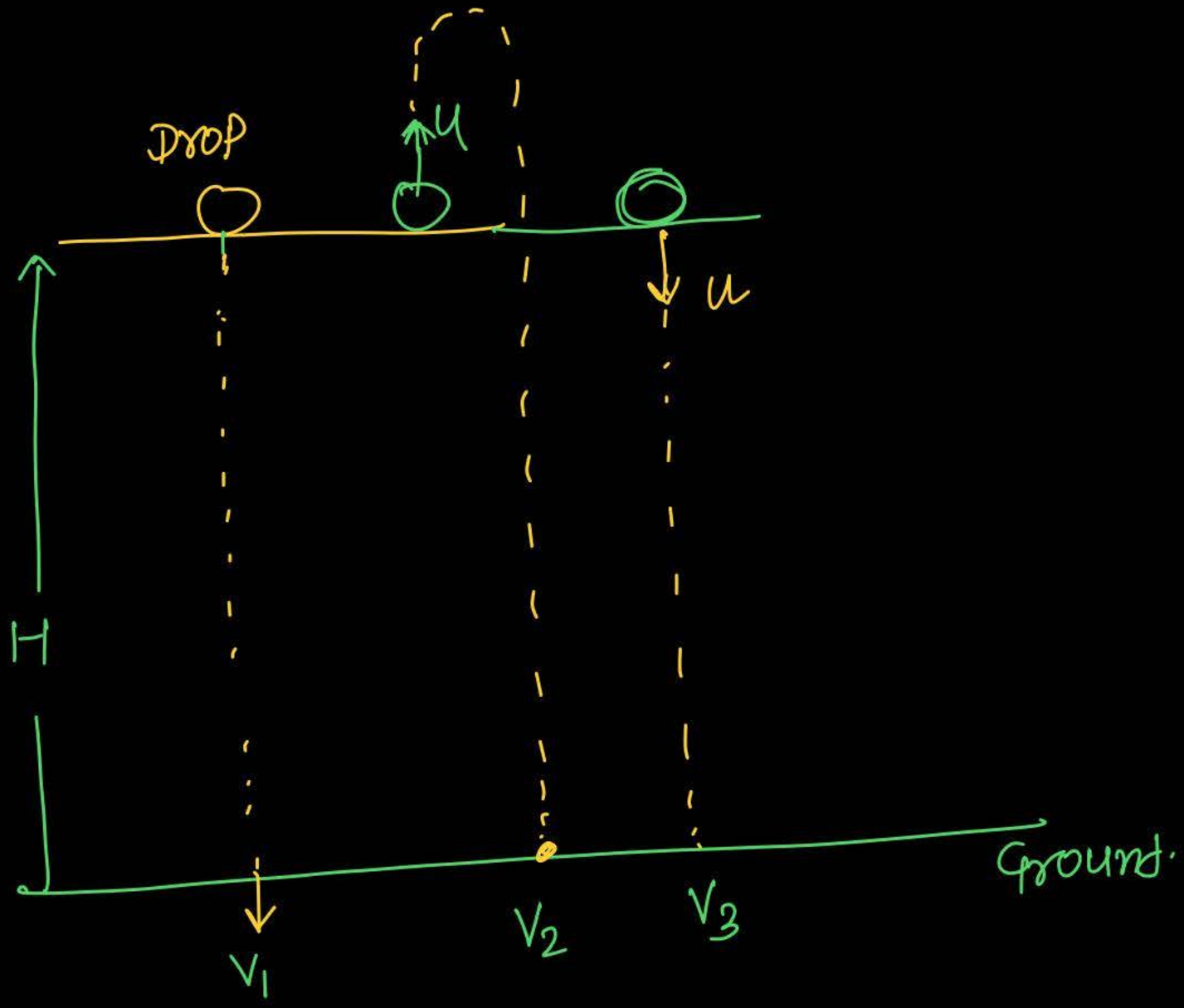
half to max^m Height :—

$$(0)^2 - (20)^2 = 2(-g)H$$

$$+400 = +2g\left(\frac{u_0^2}{2g}\right)$$

$$u_0^2 = 400 \qquad u_0 = \sqrt{400} = 20 \text{ m/sec}$$

$\therefore$

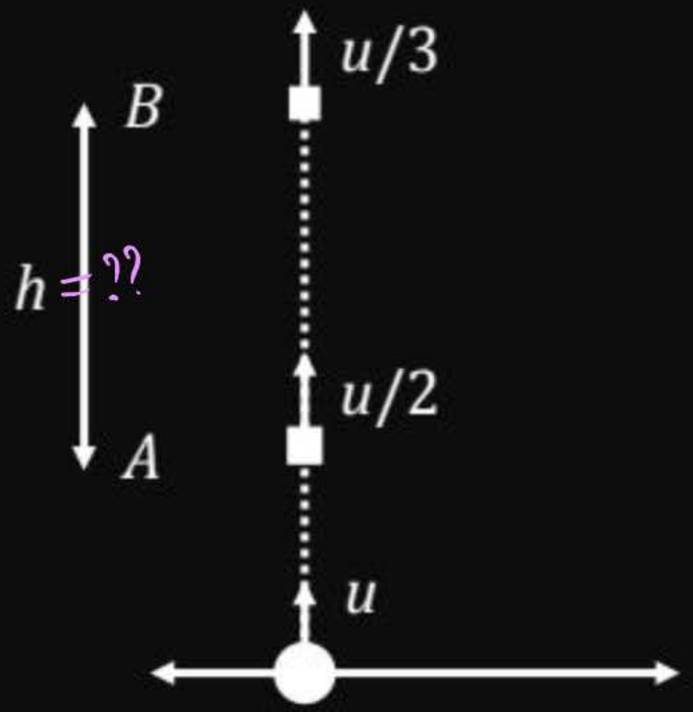


Rel^n B/w V_1 & V_2 & V_3

H/W

Question

Ball is projected with speed u as shown in figure then find distance between A and B



hint:
use 3rd eqn of motion ??

PYQ

no need to write in note2

Question

The ratio of the distance traveled by a freely falling body in the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} second:

[MR* (2022)]

1. 1 : 1 : 1 : 1
2. 1 : 2 : 3 : 4
3. 1 : 4 : 9 : 16
4. 1 : 3 : 9 : 16

Question

A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is: ($g = 10\ m/s^2$) **[2020]**

1. 340 m
2. 320 m
3. 300 m
4. 360 m

Question

A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is: **(2013)**

1. $h_1 = h_2 = h_3$
2. $h_1 = 2\,h_2 = 3\,h_3$
3. $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$
4. $h_2 = 3\,h_1$ and $h_3 = 3\,h_2$

Question

A boy standing at the top of a tower of 20 m height drops a stone. Assuming $g = 10\ m/s^2$, the velocity with which it hits the ground is: **(2011 Pre)**

1. 10.0 m/s
2. 20.0 m/s
3. 40.0 m/s
4. 5.0 m/s

Question

A ball is dropped from a high rise platform at $t = 0$ starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18$ s. What is the value of v? **(2010 Pre)**

1. 75 m/s
2. 55 m/s
3. 40 m/s
4. 60 m/s

Question

Two bodies, A (of mass 1 kg) and B (of mass 3 kg) are dropped from heights of 16 m and 25 m, respectively. The ratio of the time taken by them to reach the ground is:

(2006)

1. 5/4
2. 8/5
3. 5/8
4. 4/5

Question

If a ball is thrown vertically upwards with speed u, the distance covered during the last t seconds of its ascent is [2003]

1. ut
2. $\frac{1}{2}gt^2$
3. $ut - \frac{1}{2}gt^2$
4. $(u + gt)t$

Question

A man throws ball with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time? (Given $g = 9.8\ m/s^2$) **[MR* (2003)]**

1. More than 19.6 m/s
2. At least 9.8 m/s
3. Any speed less than 19.6 m/s
4. Only with speed 19.6 m/s

Question

A particle is thrown vertically upward. Its velocity at half of the height is 10 m/s, then the maximum height attained by it: ($g = 10\ m/s^2$) **(2001)**

1. 8 m
2. 20 m
3. 10 m
4. 16 m

Question

A body starts falling from height 'h' and travels distance $h/2$ during last second of motion then time of flight is (in second): **(1999)**

1. $\sqrt{2}-1$
2. $2+\sqrt{2}$
3. $\sqrt{2}+\sqrt{2}$
4. $\sqrt{3}+2$

$$t_2 = T - \frac{T}{\sqrt{2}}$$

$$1 = T\left(1-\frac{1}{\sqrt{2}}\right)$$

$$1 = T\left(\frac{\sqrt{2}-1}{\sqrt{2}}\right)\times\left(\frac{\sqrt{2}+1}{\sqrt{2}-1}\right)$$

Question

A body dropped from a height h with initial velocity zero, strikes the ground with a velocity 3 m/s. Another body of same mass dropped from the same height h with an initial velocity of 4 m/s. The final velocity of second mass, with which it strikes the ground is:

[MR* (1996)]

1. 5 m/s
2. 12 m/s
3. 3 m/s
4. 4 m/s

Question

The water drop falls at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap at instant the first drop touches the ground. How far above the ground is the second drop at that instant? **(1995)**

1. 3.75 m
2. 4.00 m
3. 1.25 m
4. 2.50 m

Question

A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window? ($g = 10\ m/s^2$)

(2020-Covid)

1. 14.5 m/s
2. 4.5 m/s
3. 20 m/s
4. 15.5 m/s

@MRPHYSICSS

Join for Class question P.d.f.

THANK YOU