YAKEEN NEET 2.0

2026

Motion in a Straight Line

Physics | Lecture - 13

By- Manish Raj (MR Sir)

Topics to be covered

1. #
2.
3.
4.

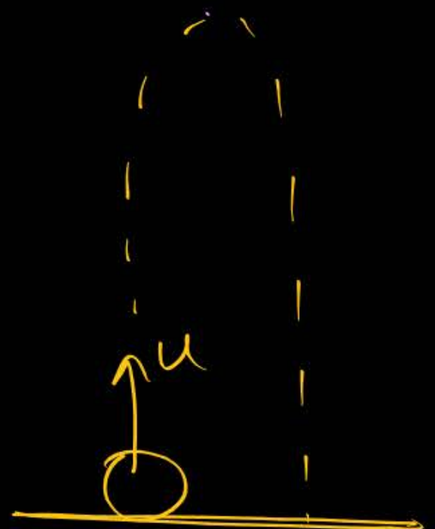
Play with Motion under gravity (*)

Motion under gravity :—

NEET-24

drop
$u = 0$ ✓
$a = g$ (downward)

Case-1

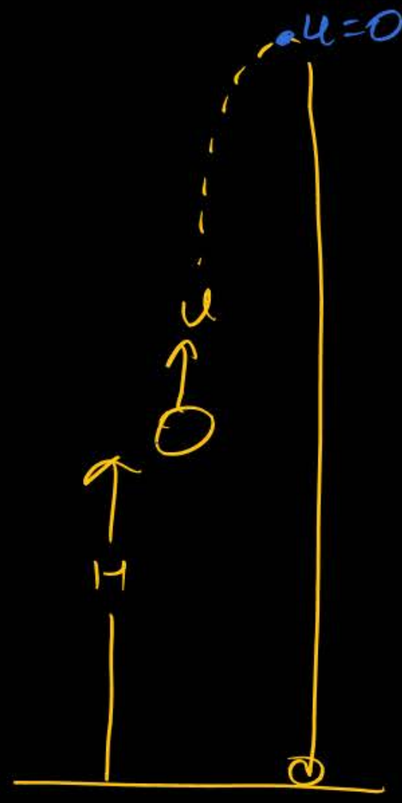


Case-2

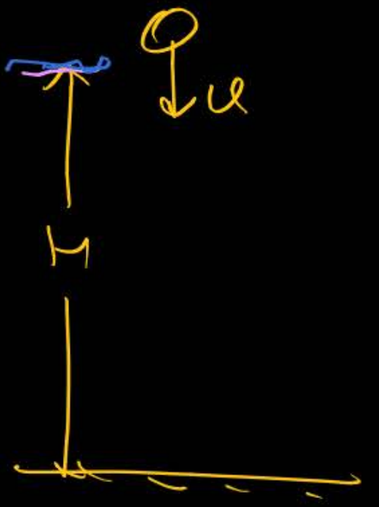
Ground to ground

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

$$H_{max} = u^2/2g$$

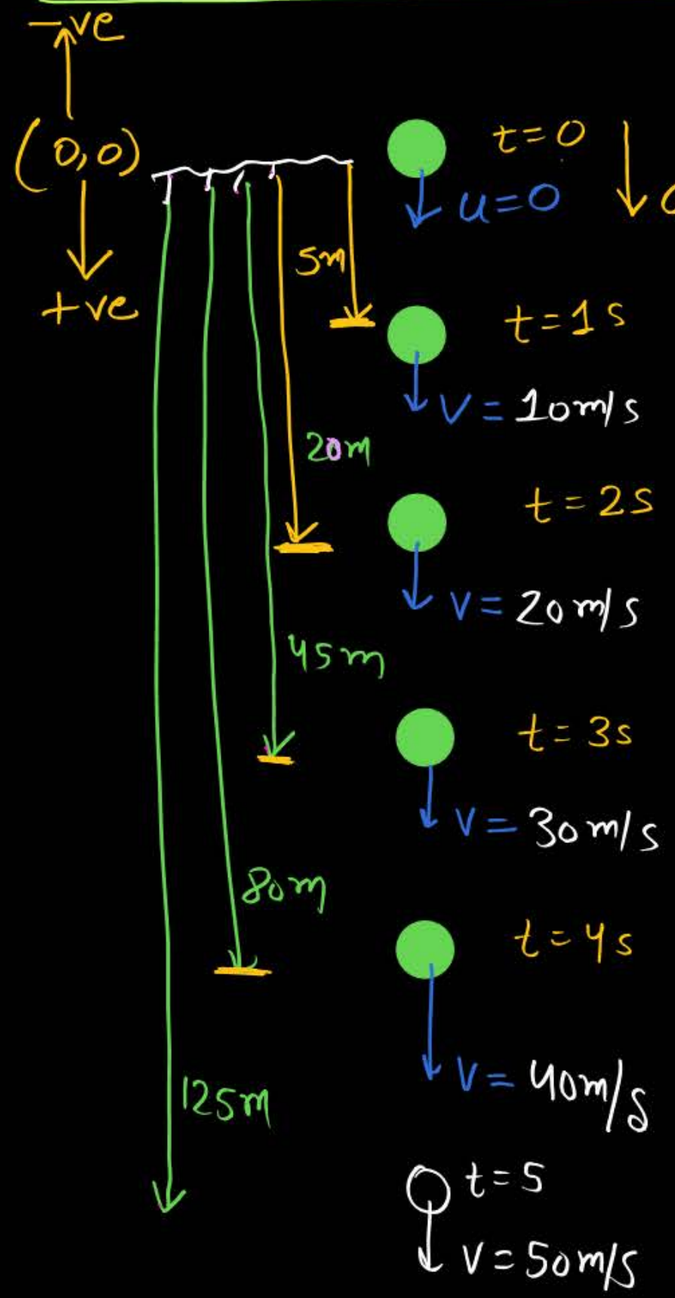


Case-3



Case-4

Object is droped (u=0)

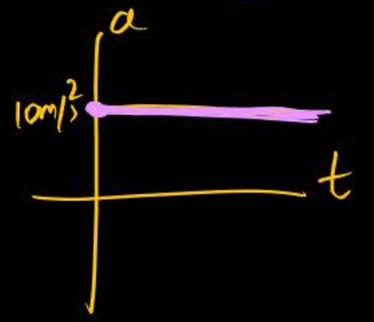


disp^m in n^th sec:

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

$S_{nth} = \frac{g}{2}(2n-1)$

$\boxed{S_{nth} = 5(2n-1)}$ *

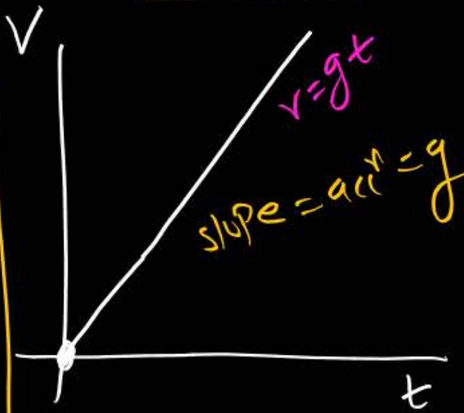


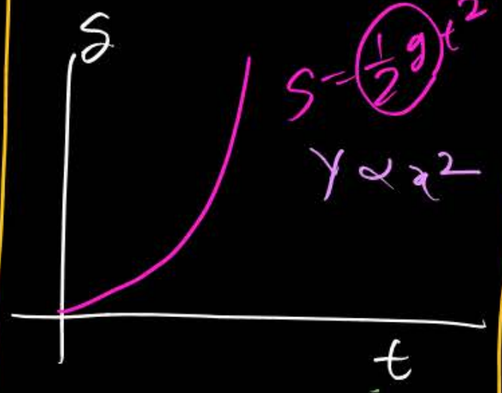
velocity at time 't'

$v = u^{0} + at$

$v = gt$

$\boxed{v = 10t}$ — ①





Disp^m aft^n time 't'

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

$S = 0 + \frac{1}{2}10(t^2)$

$S = 5(t)^2$ ✓

$S_{1s} = 5m$ $\quad S_2 = 5\times4 = 20m$

$S_{3sec} = 5(3)^2 = 45m$

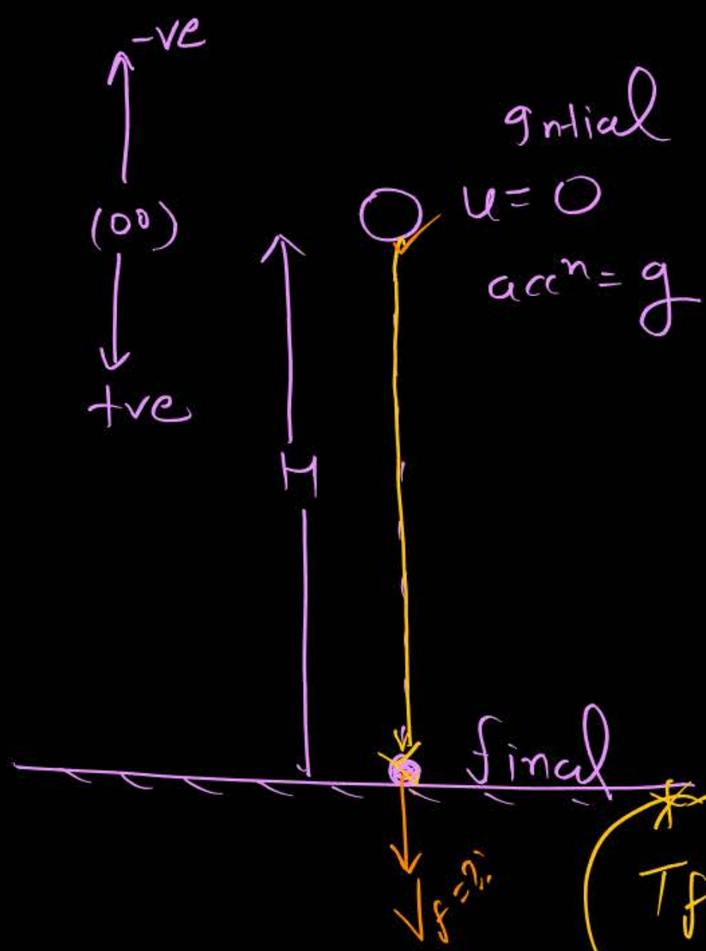
$S_{4sec} = 5(4)^2 = 80m$

$S_{1s} : S_{2s} : S_{3s} : S_{4s} = 5 : 20 : 45 : 80$

$= x : 4x : 9x : 16x$

$S_{1^{st}} : S_{2^{nd}} : S_{3^{rd}} : S_{4^{th}} = 5 : 15 : 25 : 35$ ⇒

Object is droped from Height 'H'



displ^m = H

Time of flight :-

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

$$H = 0 + \frac{1}{2} g t_f^2$$

$$H = \frac{g}{2} t_f^2$$

$$T_f = \sqrt{\frac{2H}{g}} = \sqrt{\frac{K}{K T^{-2}}} = \sqrt{T^2} = T$$

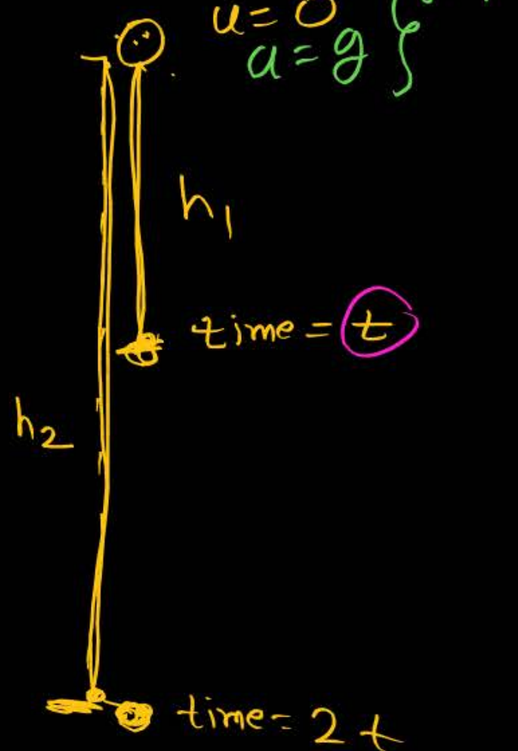
dim^n less

(#) Velocity at ground

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

$$v_f = \sqrt{2gH}$$

MR*



Relⁿ B/w h_1 & h_2

$$h_1 = \frac{1}{2} g t^2 \quad - (1)$$

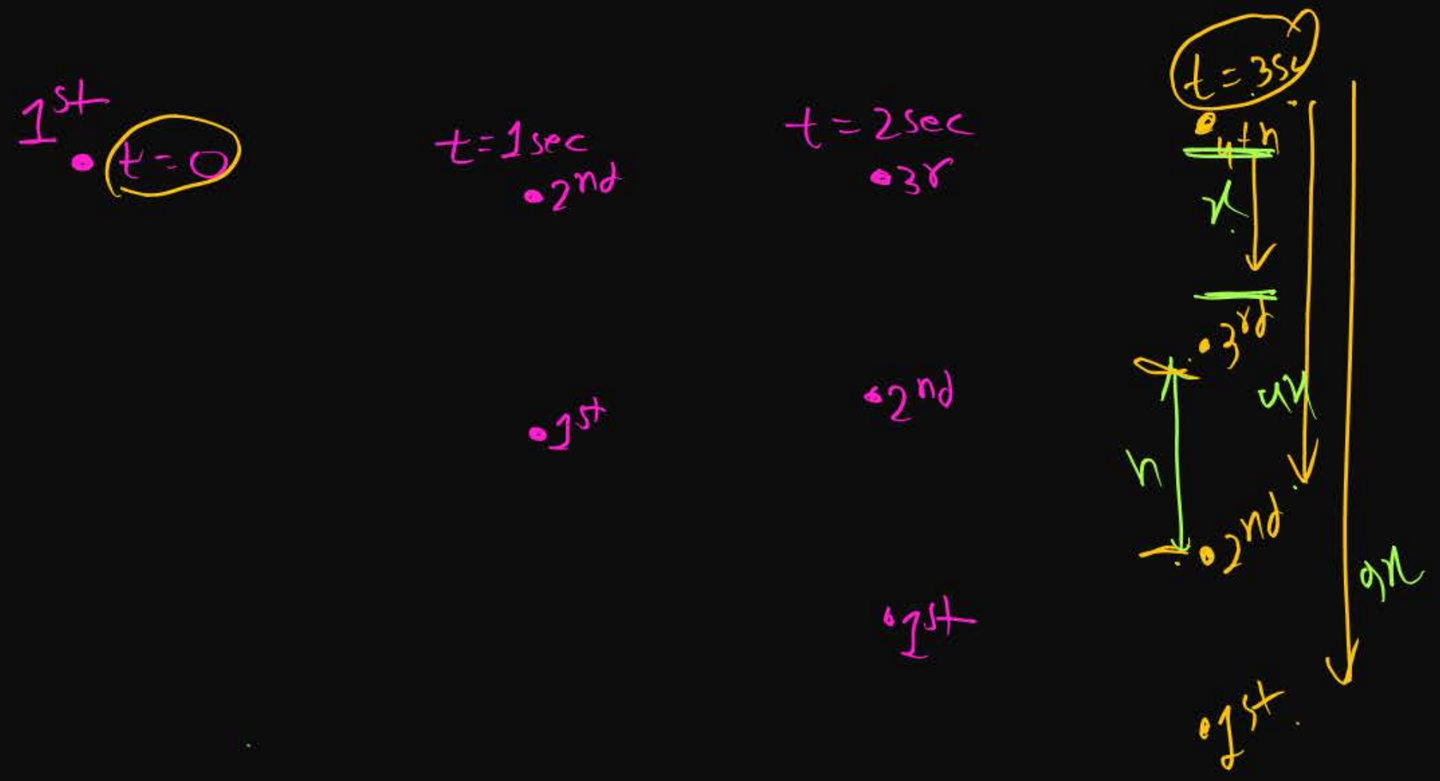
$$h_2 = \frac{1}{2} g (2t)^2 \quad - (2)$$

$$\frac{h_1}{h_2} = \frac{1}{4}$$

$$h_1 : h_2 = 1 : 4$$

Question

A ball is dropped at $t = 0$ sec after 1 sec 2^{nd} ball is dropped after 2 sec 3^{rd} ball is dropped, after 3 sec, 4^{th} ball is dropped. Then, find distance between 2^{nd} and 3^{rd} ball when 4^{th} ball is about to fall.



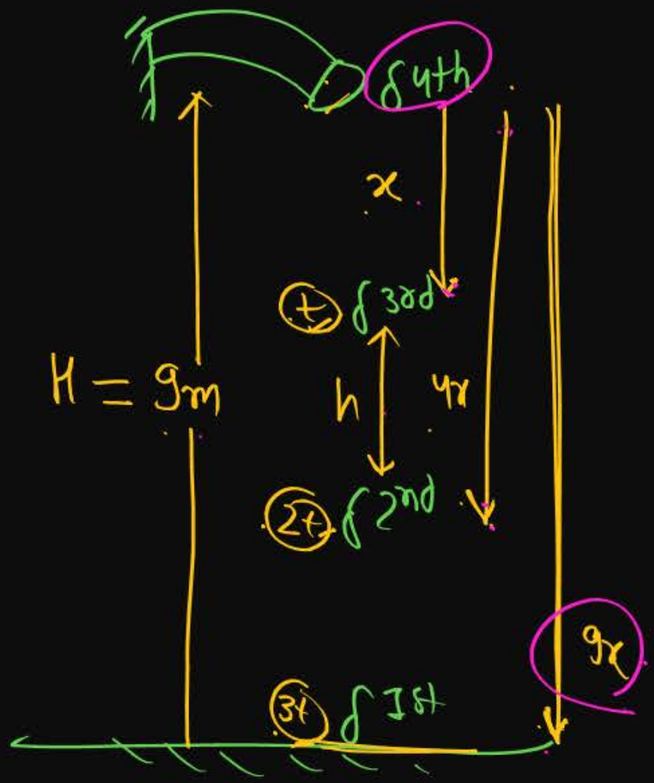
$h = 4x - x$

$= 3x$

$= 3 \times 5 = 15m$

Question

Water drop is falling in a regular intervals when 1st drop is reaches to ground then 4th drop is about to release, then find distance between 2nd drop and 3rd drop. Height of water tap is 9m.



time = t = 6 sec

$gx = g$

$x = 1\,m$

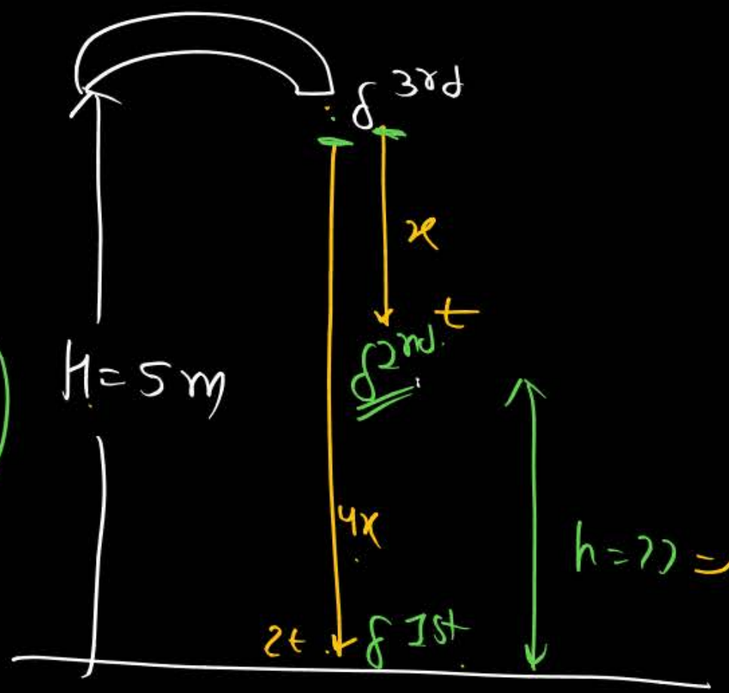
$h = 4x - x$

$h = 3x$

$= 3 \times 1 = 3\,m$

Water drop is falling in regular interval then find hight of 2nd drop from ground if 3rd is about to fall when 1st is at ground. (where H = 5m)

NEET



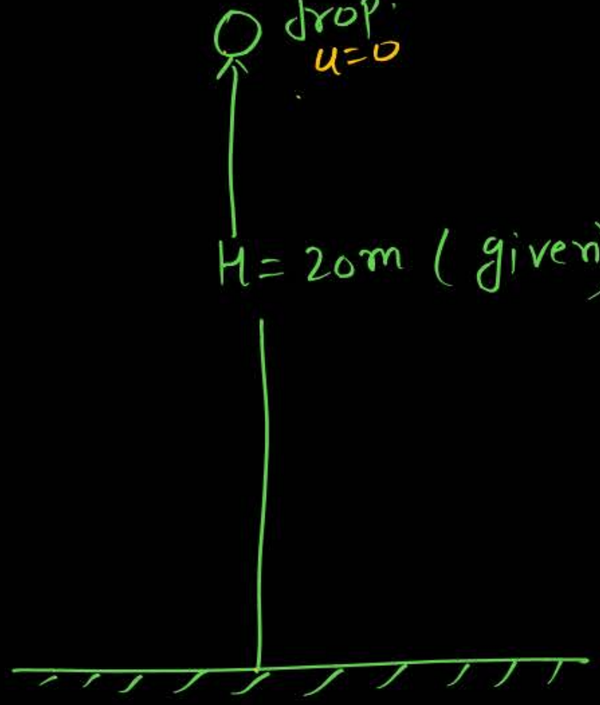
$4x = 5$

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

$h = 3x = 3 \times 1.25$

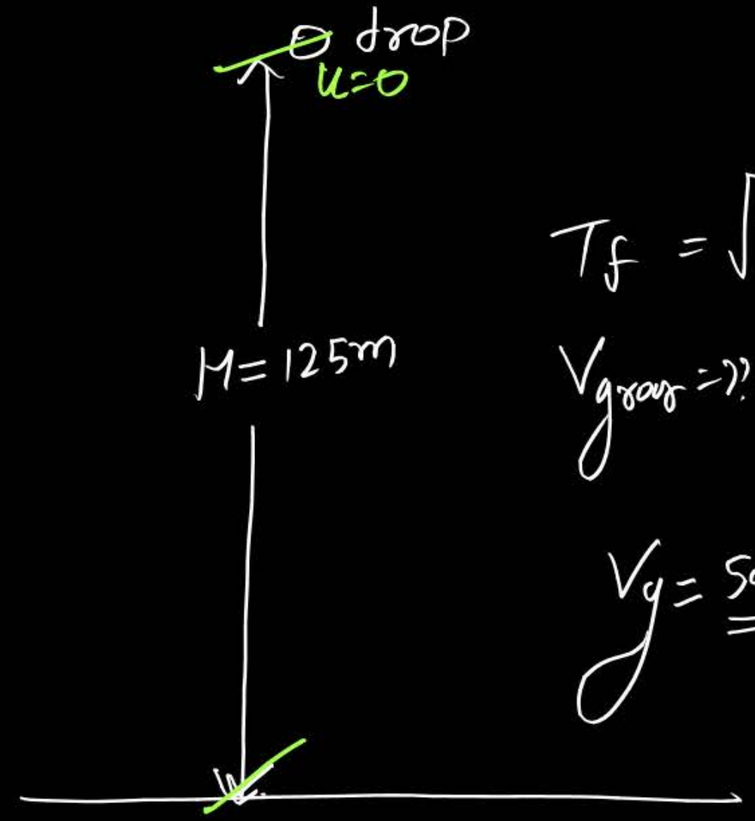
$= 3.75\ m$

Ans



$$T_f = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2\times 20}{10}} = \sqrt{4} = 2\ \text{sec}$$

$$V_g = 20\ \text{m/s} = gt$$



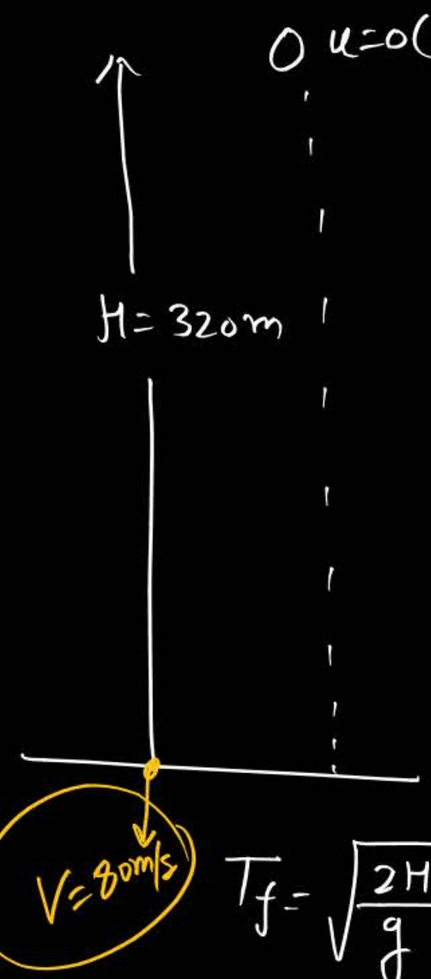
$$T_f = \sqrt{\frac{2H}{g}} = \sqrt{\frac{2\times 125}{10}}$$

$V_{g\,\text{avg}} = ??$

$$= \sqrt{\frac{250}{10}}$$

$$= 5\ \text{sec}$$

$$V_g = 50\ \text{m/s}$$

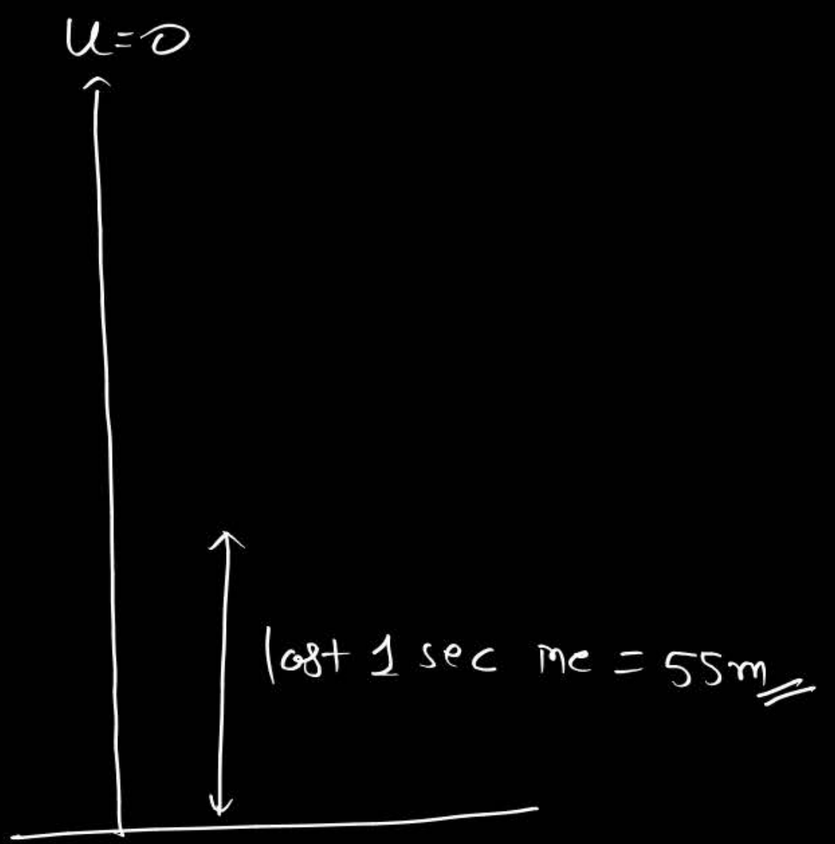


$$T_f = \sqrt{\frac{2H}{g}}$$

$$= \sqrt{\frac{2 \times 320}{10}}$$

$$= \sqrt{64} = 8 \text{ sec.}$$

(4) Object is droped & moves 55m in last- sec of Journey then find T_f & Height from it is droped.



Sol^n

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

$55 = \frac{10}{2}(2n-1)$

$\frac{11}{5} = (2n-1)$

$11+1 = 2n$

$n = \frac{12}{2} = 6\text{sec}$ Total time of γ

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

$= \frac{1}{2}10(6)^2 = 5\times 36$

$= 180\text{m}$

MP*

$H = 36x$

$= 36\times 5$

$= 180\text{m}$

disp^m in last one sec is 45m then find T_f =??

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

$$45 = 0 + \frac{10}{2}(2n-1)$$

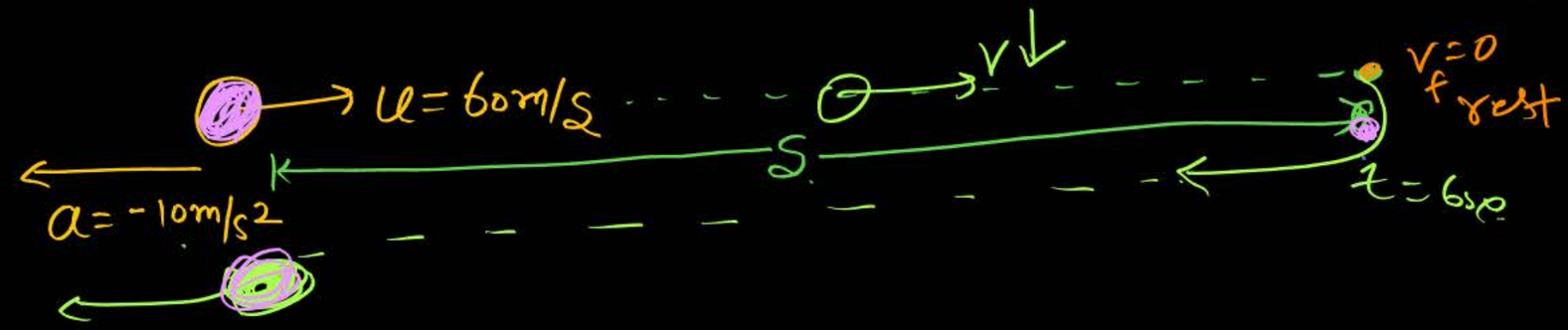
$$9 = 2n-1$$

$$10 = 2n$$

$n = 5sec$

$H = 125m$

Object starts motion with velocity 60m/s & $a = -10 m/s^2$



"$v = u + at$"

$0 = 60 - 10t$

$60 = 10t$

$t = 6 sec$

at rest

$T_{total} = 6 + 6 = 12 sec$

\# s (stopping dist) $= \frac{u^2}{2a}$

$= \frac{(60)^2}{2 \times 10}$

$= \frac{3600}{2 \times 10}$

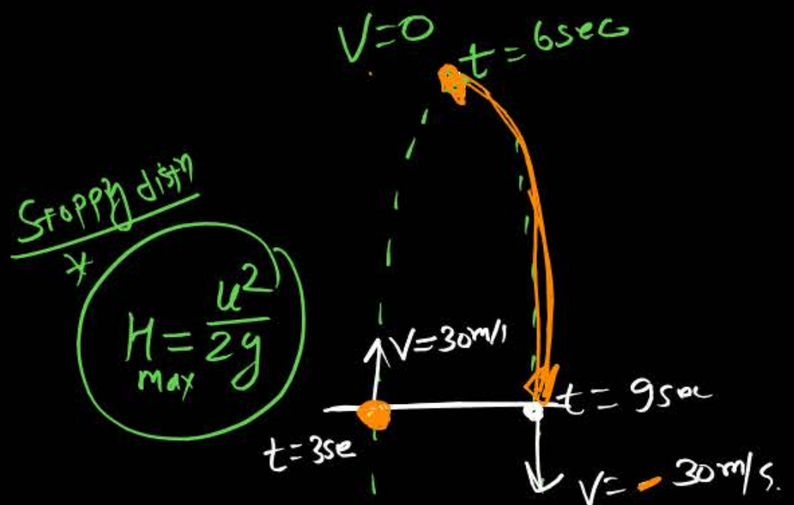
$= 180 m$

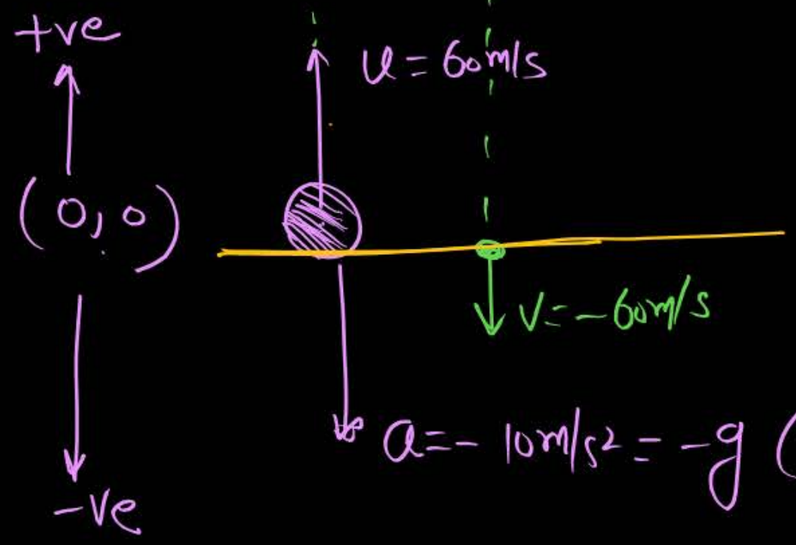
$V_{t=5sec} = +10 m/s$ ✓

$V_{t=6sec} = 0$ rest

$V_{t=7sec} = -10 m/s$ ✓

Motion under Gravity from Ground to ground :—





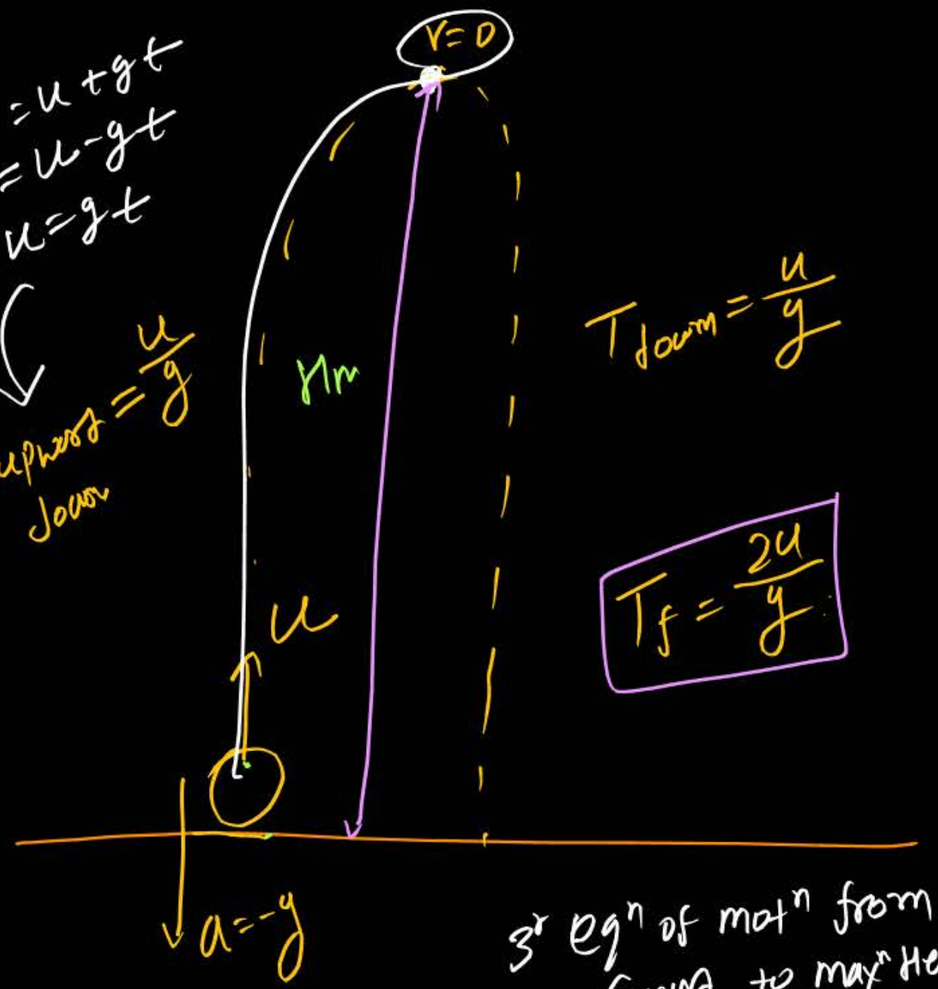
$a = -10\,m/s^2 = -g$ (downward)

$v = u + gt$

$0 = u - gt$

$u = gt$

$T_{upward} = \frac{u}{g}$



$T_{down} = \frac{u}{g}$

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

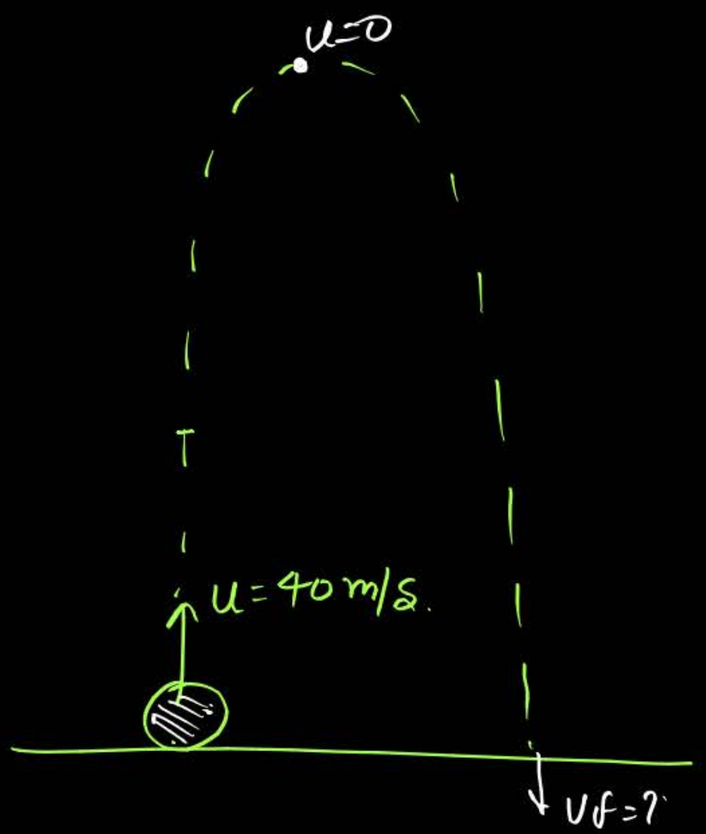
3rd eqn of motn from Ground to max Ht

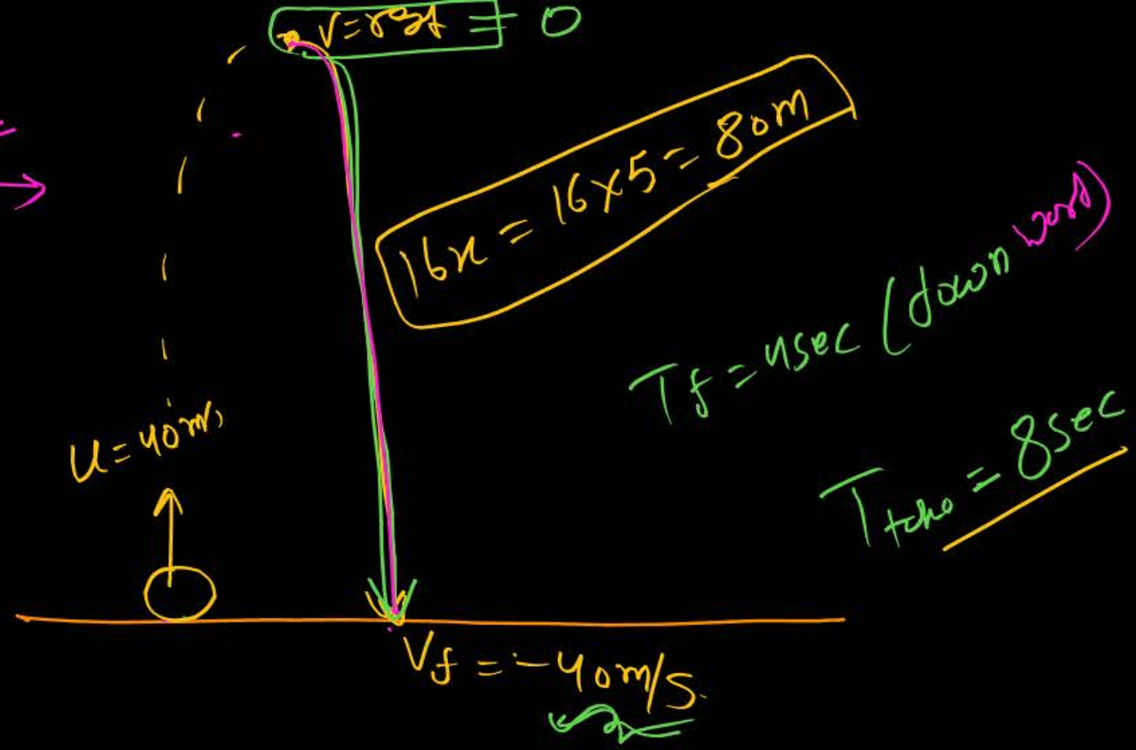
$v^2 - u^2 = 2as$

$0^2 - u^2 = 2as$

$+u^2 = 2(+g)H$

$\frac{u^2}{2g} = H_{max}$ *

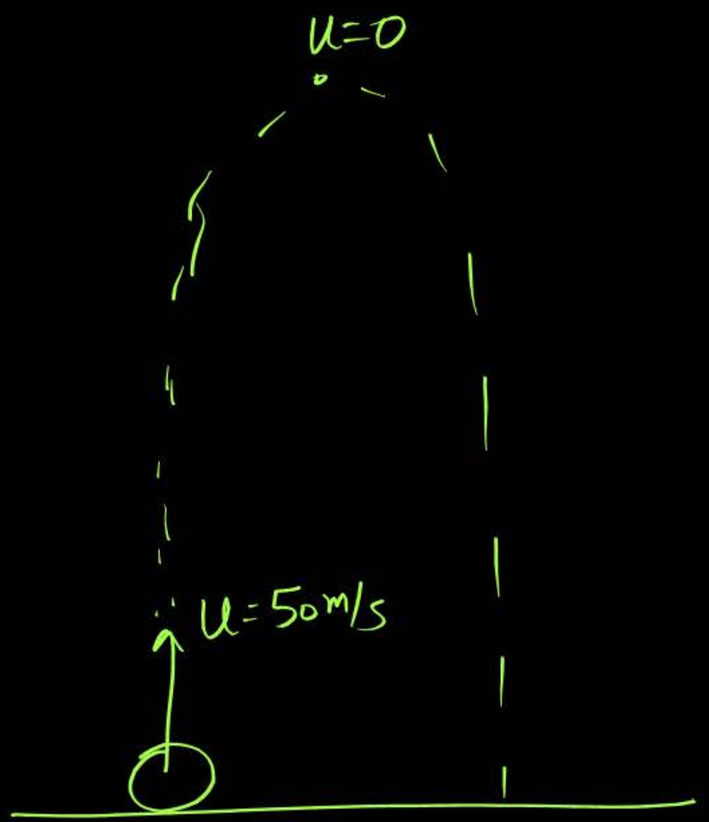




$(T_f)_{total} = 4+4 = 8sec$

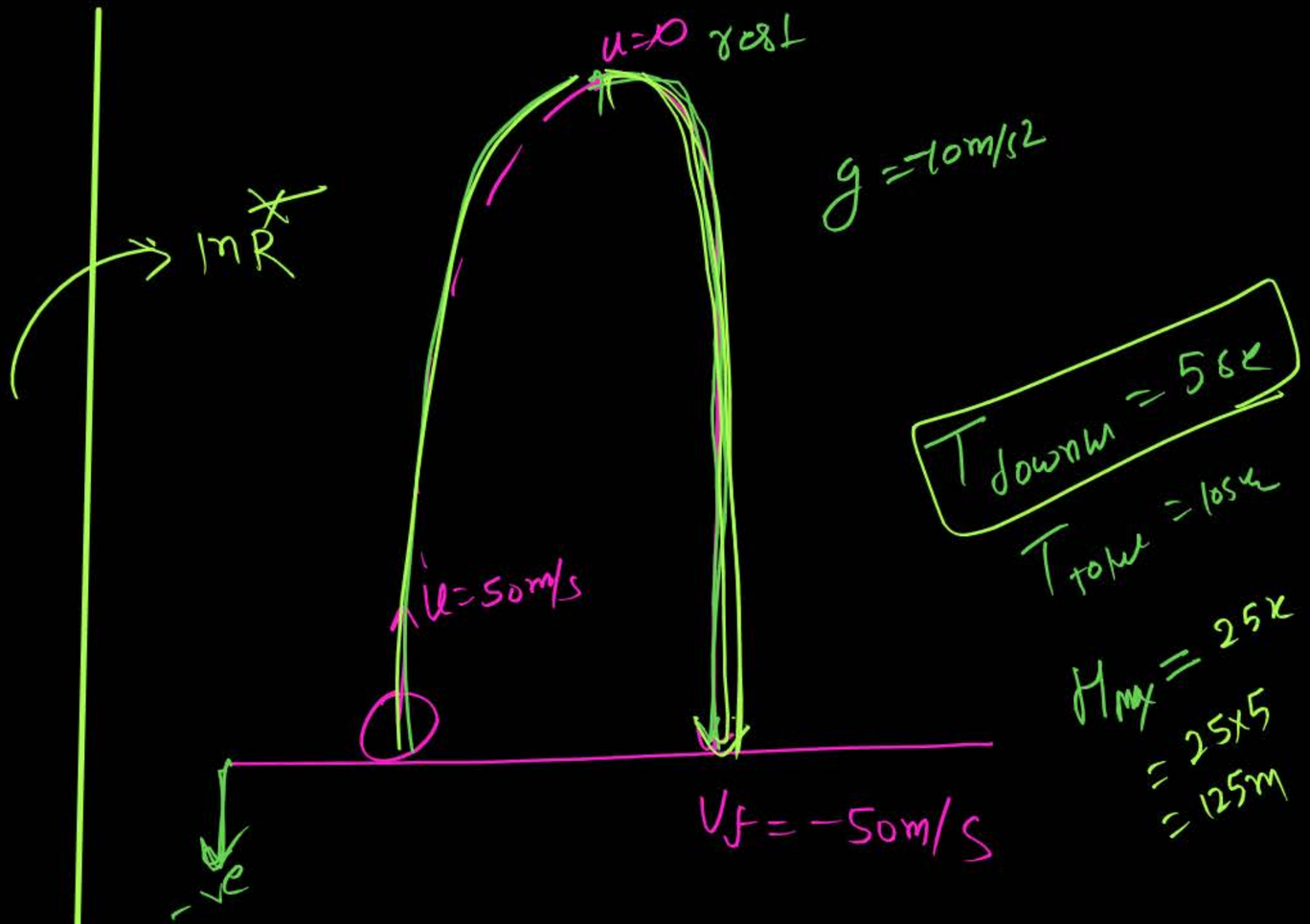
$H_{max} = \frac{(40)^2}{2g} = \frac{40 \times 40}{2 \times 10} = 80m$ ✓

(a)



(#) $T_f = 5+5 = 10\,sec$

$$H_{max} = \frac{(50)^2}{2g} = 125\,m$$



$T_{downward} = 5s$

$T_{total} = 10s$

$H_{max} = 25x$

$= 25 \times 5$

$= 125m$

(*)

(1) Time of upward Journey = 6 sec

(2) Time of flight = 12 sec

(3) Max^m Height = 180m

(4) velocity $t = 4$ sec $= 20$ m/s

(5) velocity at $t = 9$ sec $= -30$ m/s

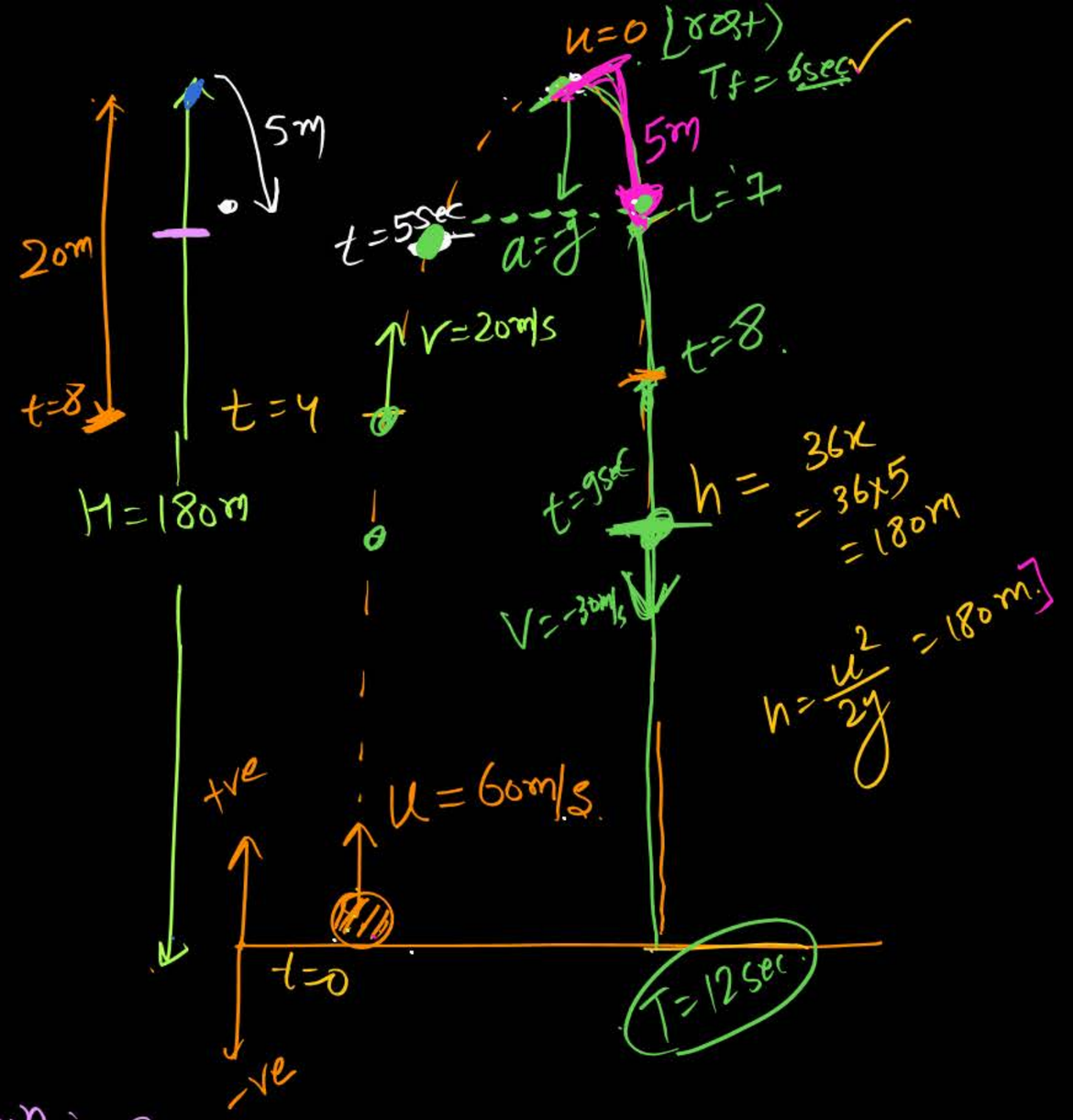
(6) disp^m in 5 sec = } same
disp^n in 5 sec. = } 175 m.

(7) disp^m in 6-sec = 180m.

(8) disp^n in 7 sec = 180 − 5 = 175m

(9) disp^m in 8 sec = 180 − 20 = 160m ✓

(10) disp^n in 8-sec = 180 + 20 = 200m ✓



Q) Object is Projected with 40 m/s.

(1) Time of upward Journey = 4 sec

(2) $T_f = 8$ sec

(3) $H_{max} = 80$ m

(4) speed at $t = 7$ sec $= 30$ m/s ✓

(5) disp^m in 7-sec $= 80 - 45 = 35$ m

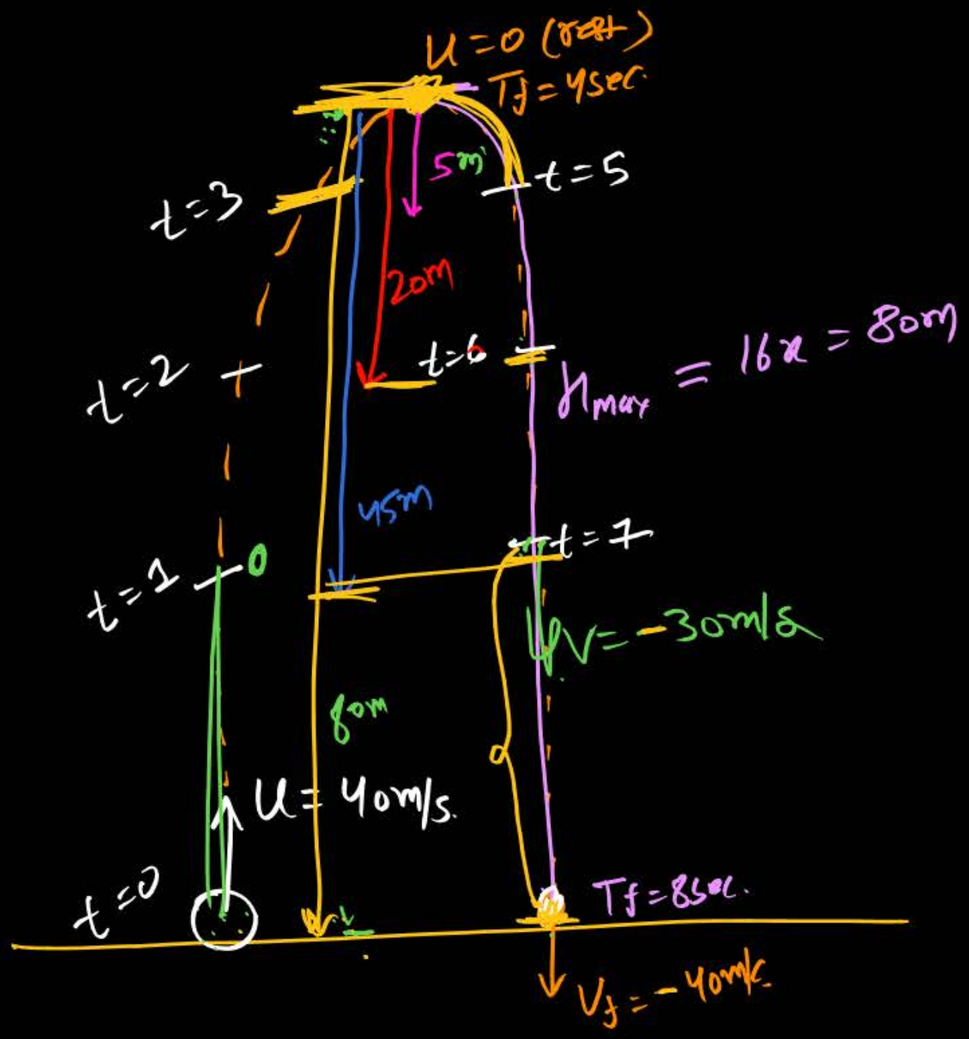
(6) dist^n in 7-sec $= 80 + 45 = 125$ m

(7) Avg speed in 6-sec $= \frac{80+20}{6} = \left(\frac{100}{6}\right)$ m/s

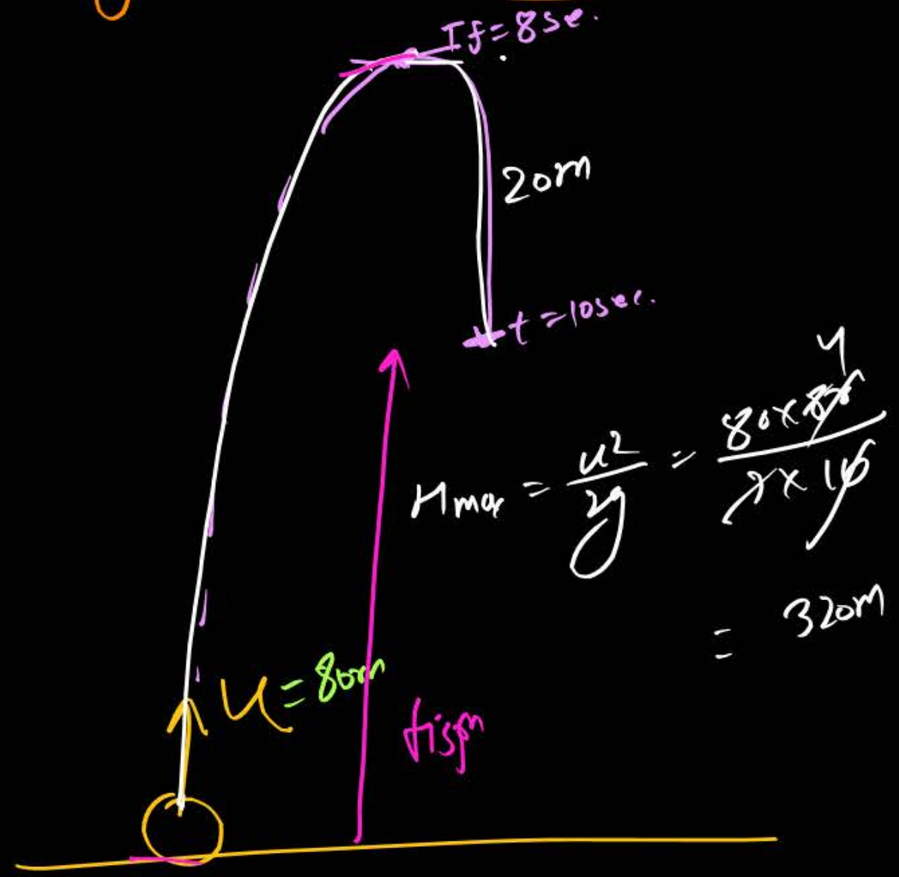
(8) Avg velocity in 5 sec $= \frac{80-5}{5} = 75/5$

(9) dist^n moved in last-sec of Journey $= 4^{th}$ sec in downward $= 35$ m

(10) disp^m in last sec of upward Journey $= 5$ m



(12) object is projected with 80m/s find **Avg speed** in $t = 10sec$:



$$H_{max} = \frac{u^2}{2g} = \frac{80 \times 80}{2 \times 10} = 320m$$

$$\text{Avg speed} = \frac{\text{total disp}^n}{\text{total time}}$$

$$= \frac{320+20}{10}$$

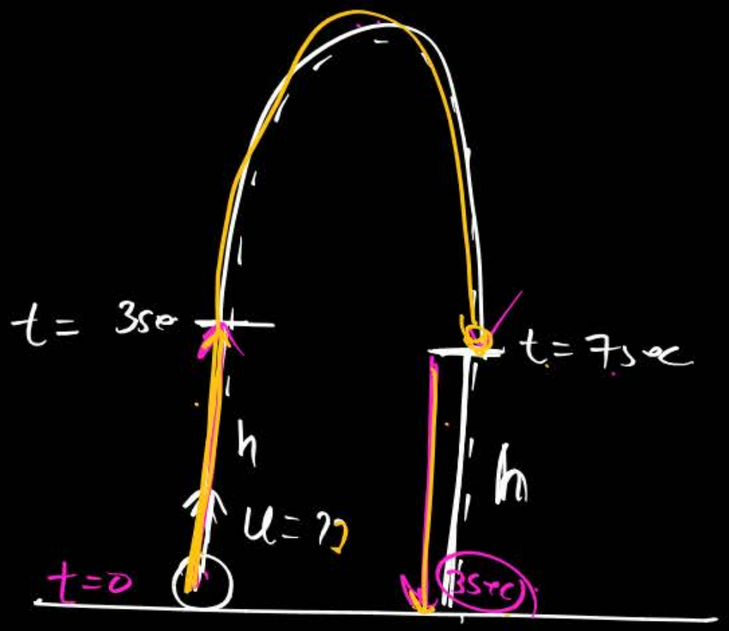
$$= \frac{340}{10}$$

$$= 34\ m/s$$

$$\text{Avg velocity} = \frac{300}{10} = 30\ m.$$

AIEEE'

Object is Projected & it is at same height at 3sec & t=7sec then find speed of Projection ??



$T_f = 7+3 = 10\,sec$
total

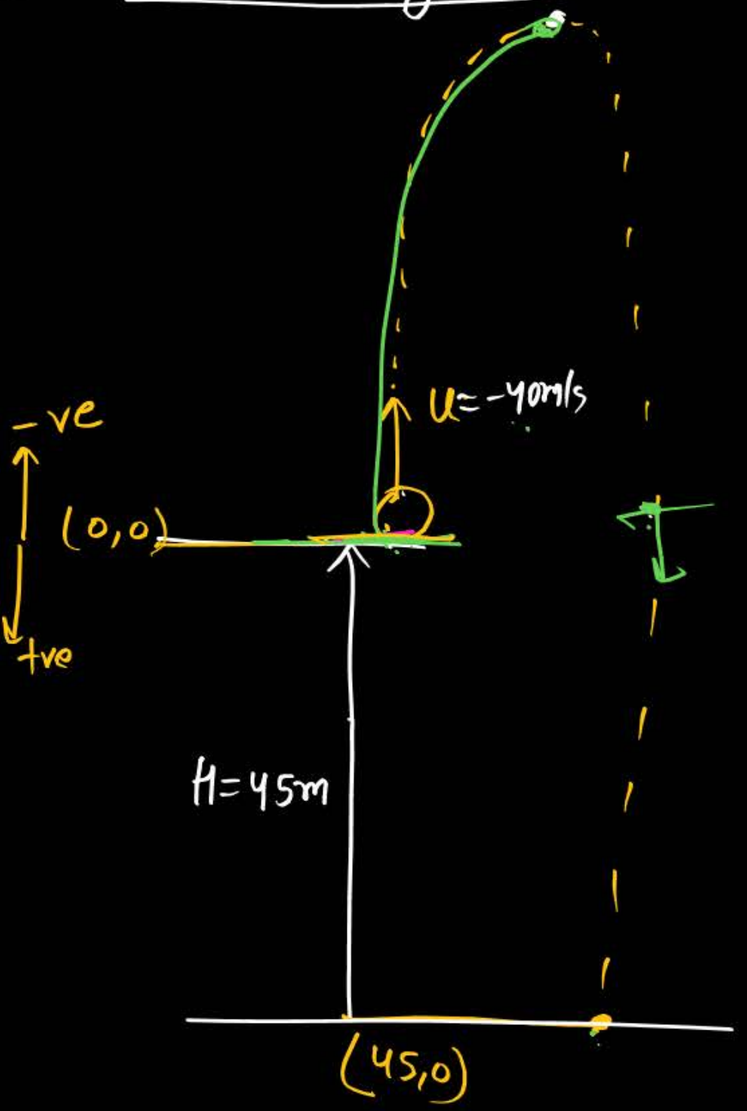
$T_f = \frac{2u}{g}$

$10 = \frac{2u}{g}$

$10 \times 5 = u$

$u = 50\,m/s$

Case-3 Motion under gravity



find $T_f = ?$

$u = -40\,m/s$

$S = 45m$

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

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

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

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

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

No major

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

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

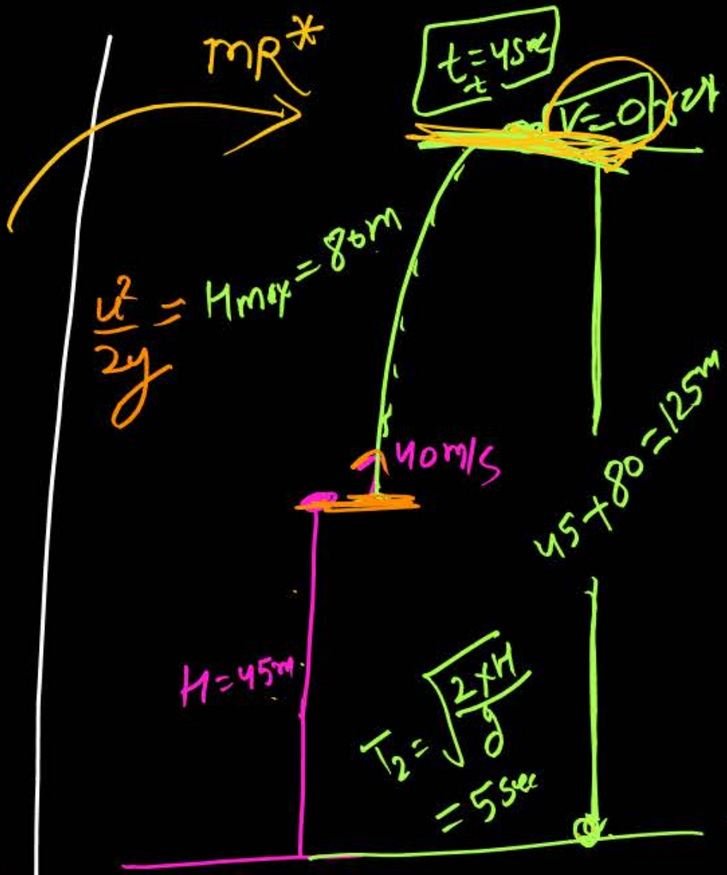
$$(t-9)(t+1) = 0$$

$t - 9 = 0$

$t = 9$ ✓

$t = -1$ ✗

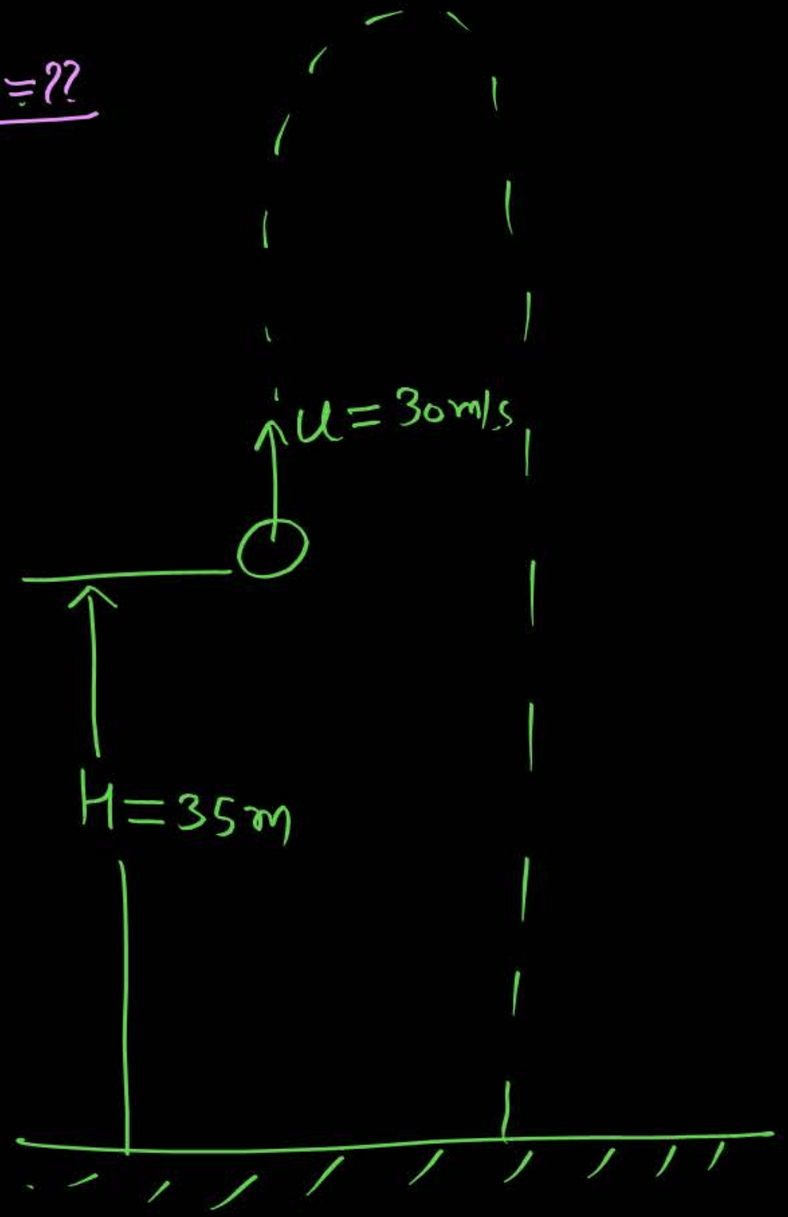
$T_f = 8$ ✗



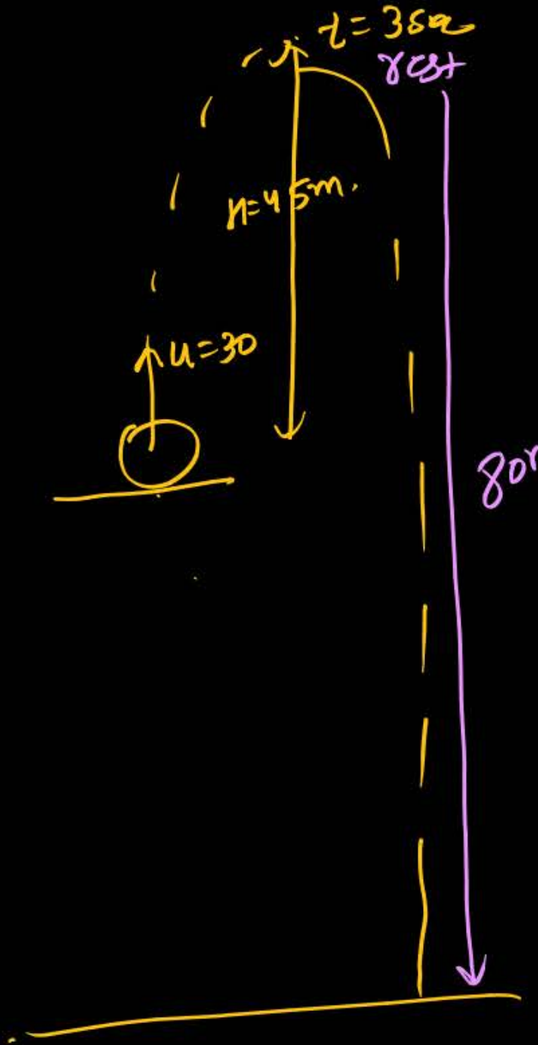
$T = 4 + 5$

$= 9sec$ ✓

Q. find $T_f = ??$

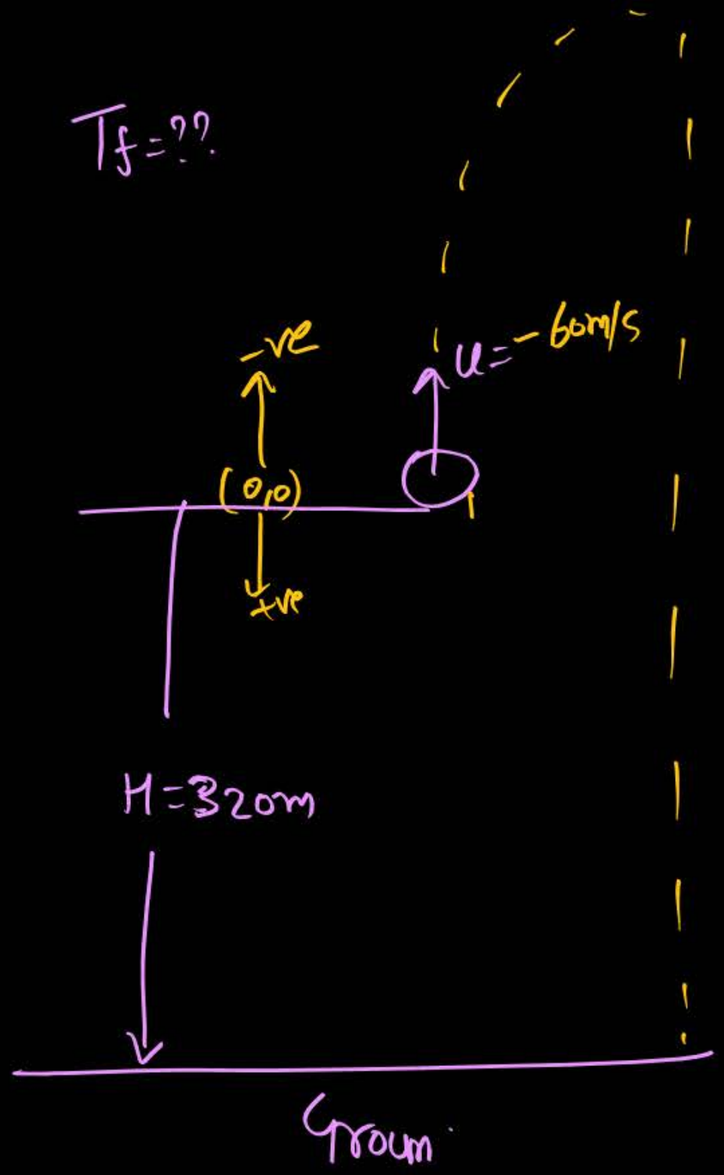


Sol^n



$T_{Total} = 4 + 3$
$= 7 sec$

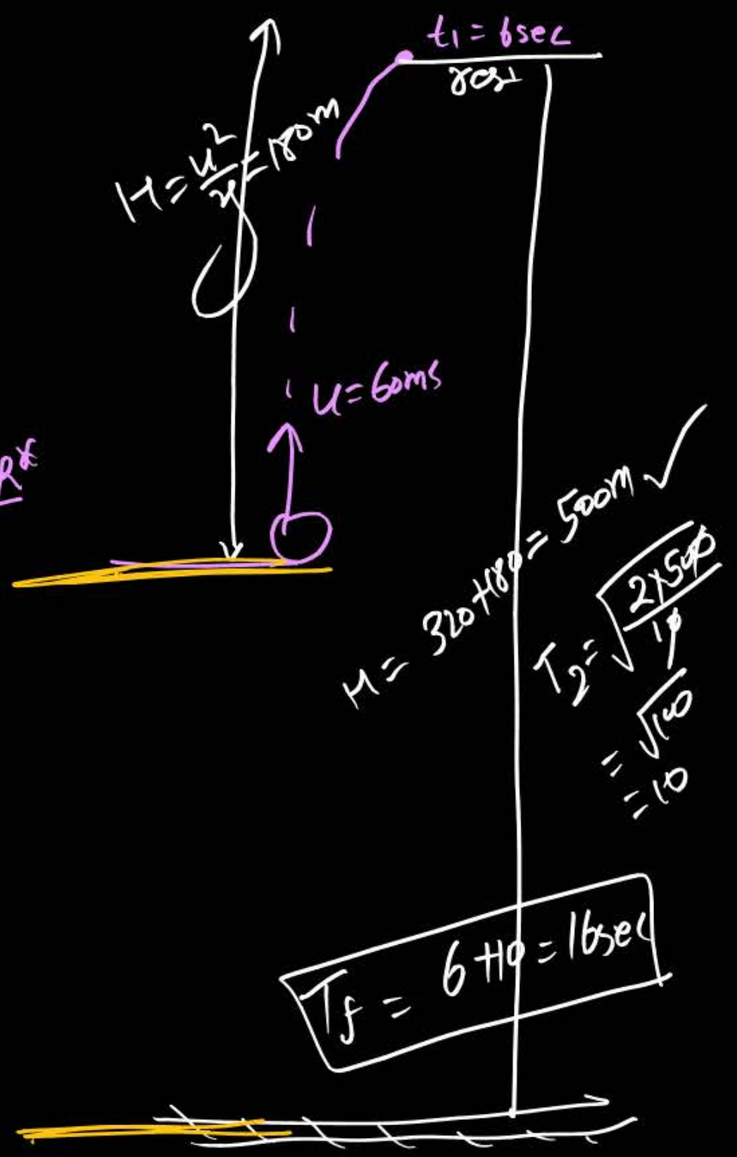
$T_f = ??$



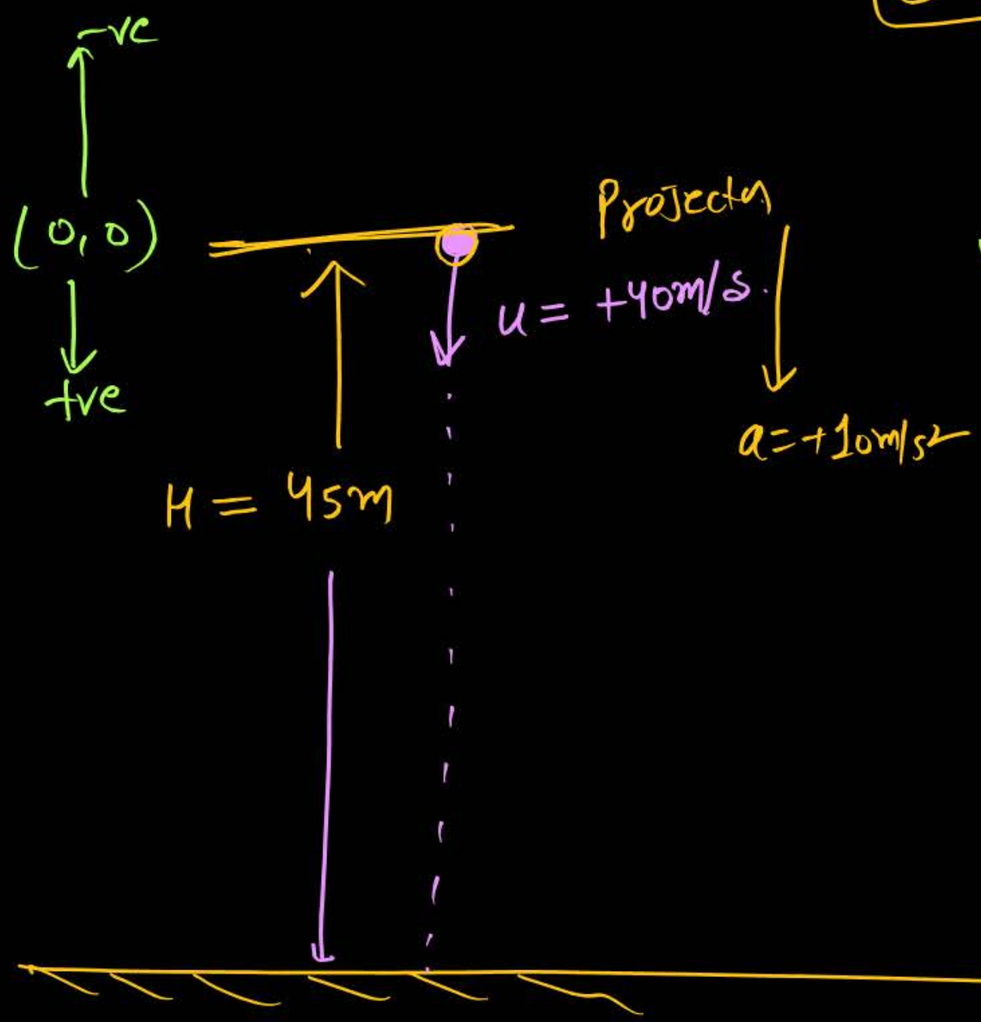
$$S = ut + \frac{1}{2}at^2$$

$$320 = -60t + 5t^2$$

MR*



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



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

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

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

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

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

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

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

$t = -9$ ✗

$t = 1$ sec

$t = 1$ sec

MR*

$t = 1$ sec

drop.

mR* kahi se bhi
project kiya TO
dekho rukega kaha.
uske bad Simple drop
ka case lagao.

Question

Motion under gravity is an example of

1. Non-uniform acceleration, uniform motion
2. Non-uniform motion, Non-uniform acceleration
3. Non-uniform motion, uniform acceleration
4. Uniform motion, uniform acceleration

Question

Object is dropped and moves 55m in last 1 sec of its Journey then find time of flight and H from it is dropped?

Question

Ball is drop and move 85 m in n^{th} sec then find that time interval.

Question

Ball is dropped from 80m then find ratio of distance moved in 1^{st} 2 sec and last 2 sec of Journey.

Question

Ball is dropped then find ratio of distance in 3^{rd} sec and 7^{th} sec?

Question

Object is dropped and distance in last 1 sec is equal to 1^{st} 3 sec then find height from ground from where ball is dropped.

Question

Object is projected with 80 m/s then find average speed and velocity in 8 sec.

Question

A ball is dropped and after 2 sec other ball is dropped from same point then find distance between them after 4 sec from starting.

Question

A ball is thrown upward with speed 40 m/s then find average velocity of upward Journey and speed at half of the maximum height.

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.

Question

A body is dropped and moved 80 m in last 2 sec of Journey then find height.

Question

Ball is projected up with 50 m/s then find distance moved in 8 sec.

Question

Ball is projected up with 70 m/s then find displacement in 10^{th} sec and 10 sec.

Question

Ball is projected up its position at $t = 7s$ and $t = 11s$ is same then find velocity of projection and maximum height.

Question

Object is projected up with u its height at 3 sec and 13 sec is same find u and that height.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THANK YOU