YAKEEN NEET 2.0

2026

Motion in a Plane

PHYSICS | Lecture - 02

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Today's Goal

- Kinematics ques practice
- Tap water problem

Q A train is moving with velocity 50 m/s along east as shown in diagram. Driver see a wall at a distance 500 m from train & he apply break s.t acc. of train is const. when driver apply break at $t=0$ a bird start flying from wall towards the train and she touches the train and return back to wall and touches the ball & again return back to train. This chuhan chuhai happen till train comes to at rest just at wall. find distance travel by bird. (speed of bird is 75 m/s const)

Q

Speed of bird = 75 = Const

Break ≡ a → Const

(1) how many times घुअन-घुआई ∞

(2) Total Distance traval by bird .. ≡ 1500 m

So → $75\,t_0$

$= 75 \times 20$

$= 1500\ m$

$0^2 = (50)^2 - 2 \times a \times 500$

$a = \frac{2500}{1000} = 2.5$

$0 = 50 - 2.5\,t_0$

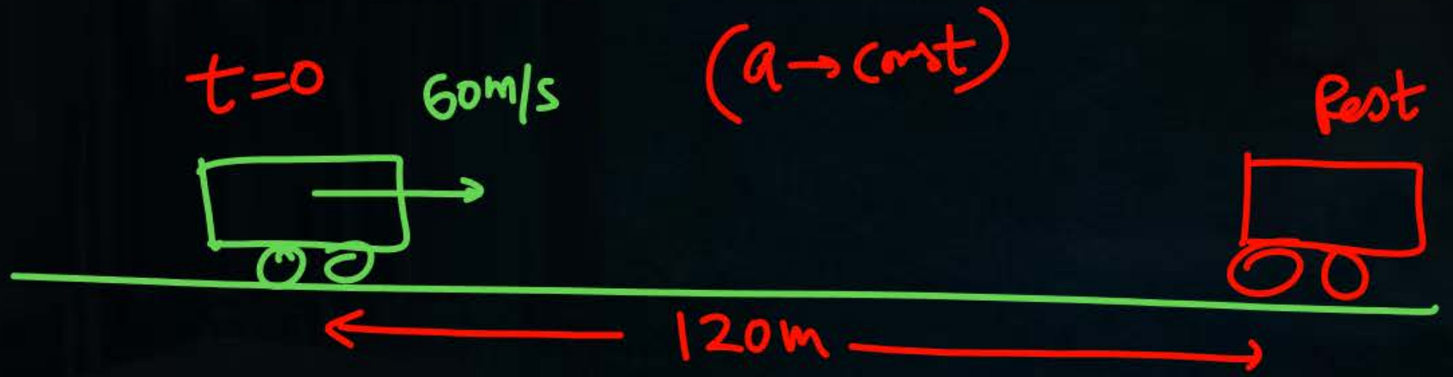
$t_0 = \frac{50}{2.5} = 20$

Avrg Velocity = $\frac{\text{Displ.}}{\text{time}}$

$\frac{50 + 0}{2} = \frac{500}{t}$

$t = 20$ sec

note



$$\langle \vec{v} \rangle = \frac{\vec{u}+\vec{v}}{2} = \frac{\vec{d}}{\text{time}}$$

$$\langle \text{velocity} \rangle = \frac{60+0}{2} = \frac{120}{t}$$

$$t = 4 \text{ sec}$$

Q ① $\vec{u_i} = 40\hat{i} + 80\hat{j}$

② $T = 16$

③ $h_{max} = 320$ $\left(0^2 = 80^2 - 2\times 10 \times h_{max}\right)$

④ Range $= 40 \times 16 = 640$

⑤ $t = 3$ $\vec{v} = 40\hat{i} + 50\hat{j}$

⑥ $t = 3$ $x = 40 \times 3 = 120$

$y = 80 \times 3 - \frac{1}{2} \times 10 \times 3^2 = 195$

⑦ Eq^n of trajectory.

⑧ Angle between $\vec{v}$ & initial velocity at $t = 3$ sec

⑨ when velocity become perpendicular to its initial velocity

SKC

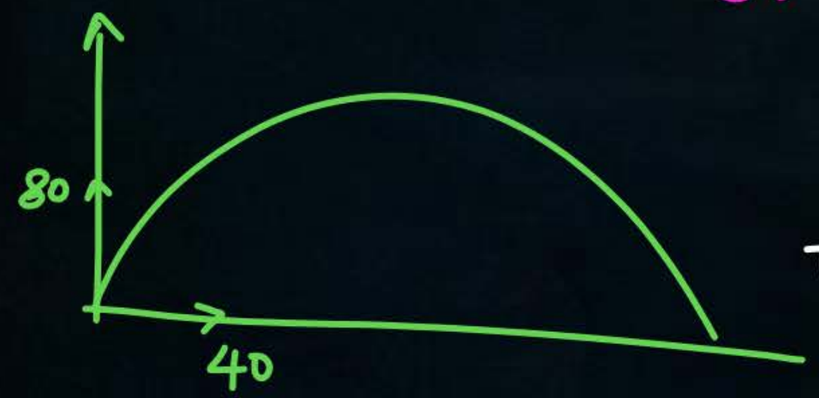
Kisi bhi time par x & y likh lo or 't' ko eliminate karo

⑦ Eq^n of trajectory

$x = 40t \quad t = x/40$

$y = 80t - \frac{1}{2} \times 10 \times t^2$

$y = 80\left(\frac{x}{40}\right) - \frac{5x^2}{1600}$



⑧ $\vec{u}_i = 40\hat{i} + 80\hat{j}$

$t = 3 \quad \vec{v} = 40\hat{i} + 50\hat{j}$

Angle between $\vec{u}_i$ & $\vec{v}$

$\vec{u}_i \cdot \vec{v} = u_i \cdot v \cos\theta$

$\cos\theta = \frac{1600 + 4000}{\sqrt{(40)^2+(80)^2} \times \sqrt{(40)^2+(50)^2}}$

⑨ when $\vec{v} \perp \vec{u}_i$

$\vec{v} \cdot \vec{u}_i = 0$

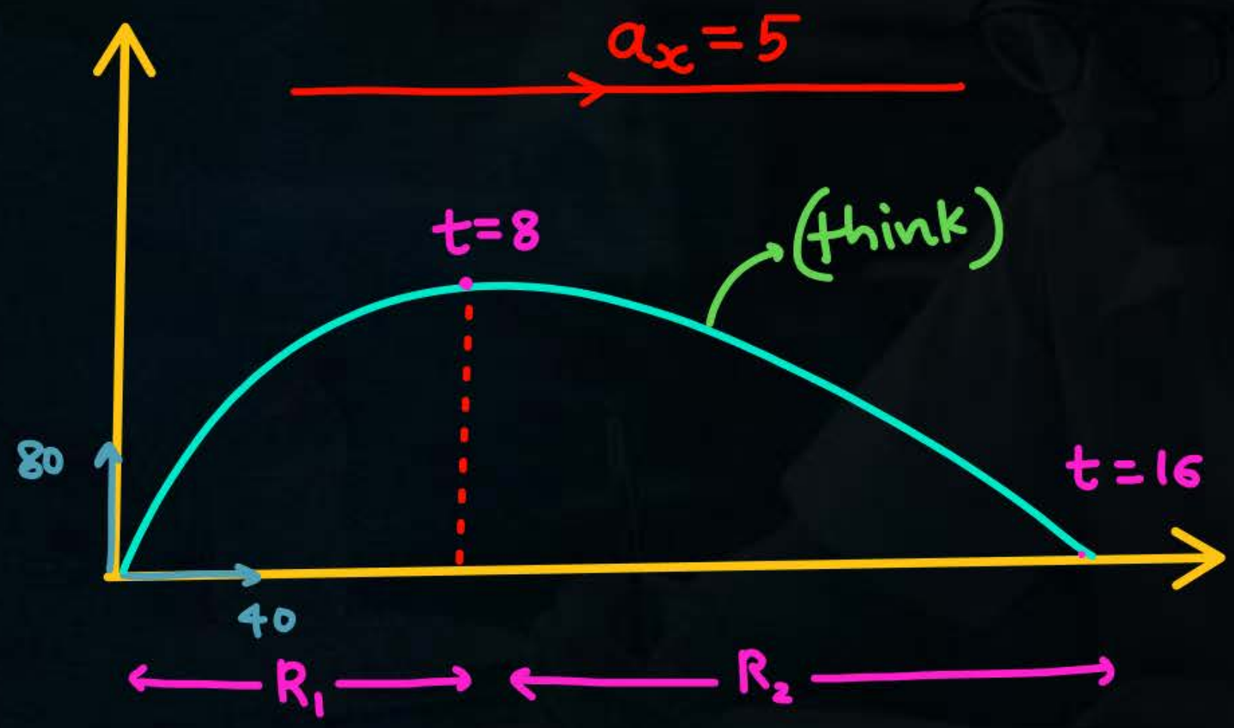
$[40\hat{i} + (80-10t)\hat{j}][40\hat{i} + 80\hat{j}] = 0$

leave it focus on concept. $(t = 10 \text{ sec})$

(16) if ------ $a_x = 5$

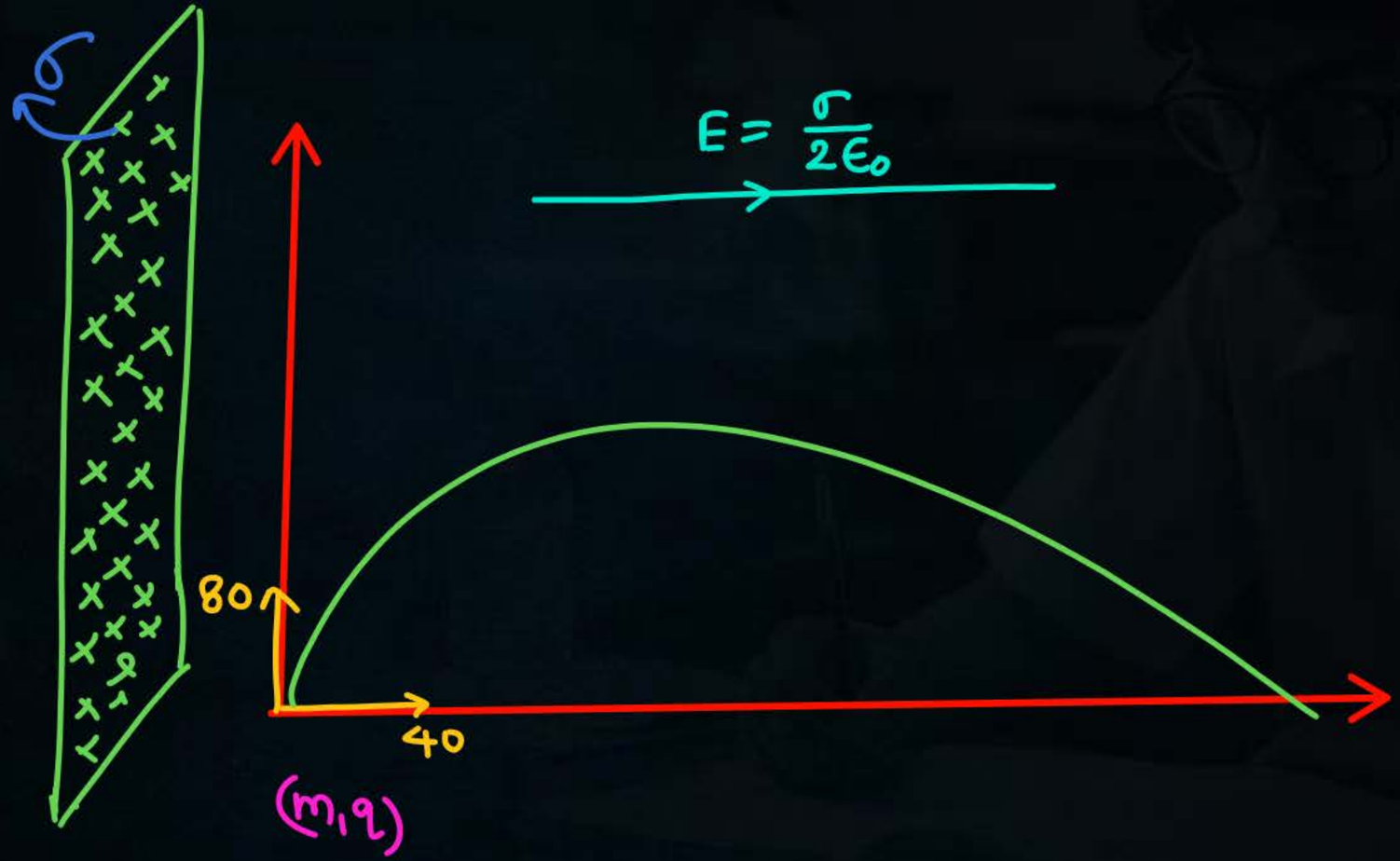
$$R = 40 \times 16 + \frac{1}{2} \times 5 \times (16)^2$$

$$R = 1280$$



$R_2 > R_1$

SSSB

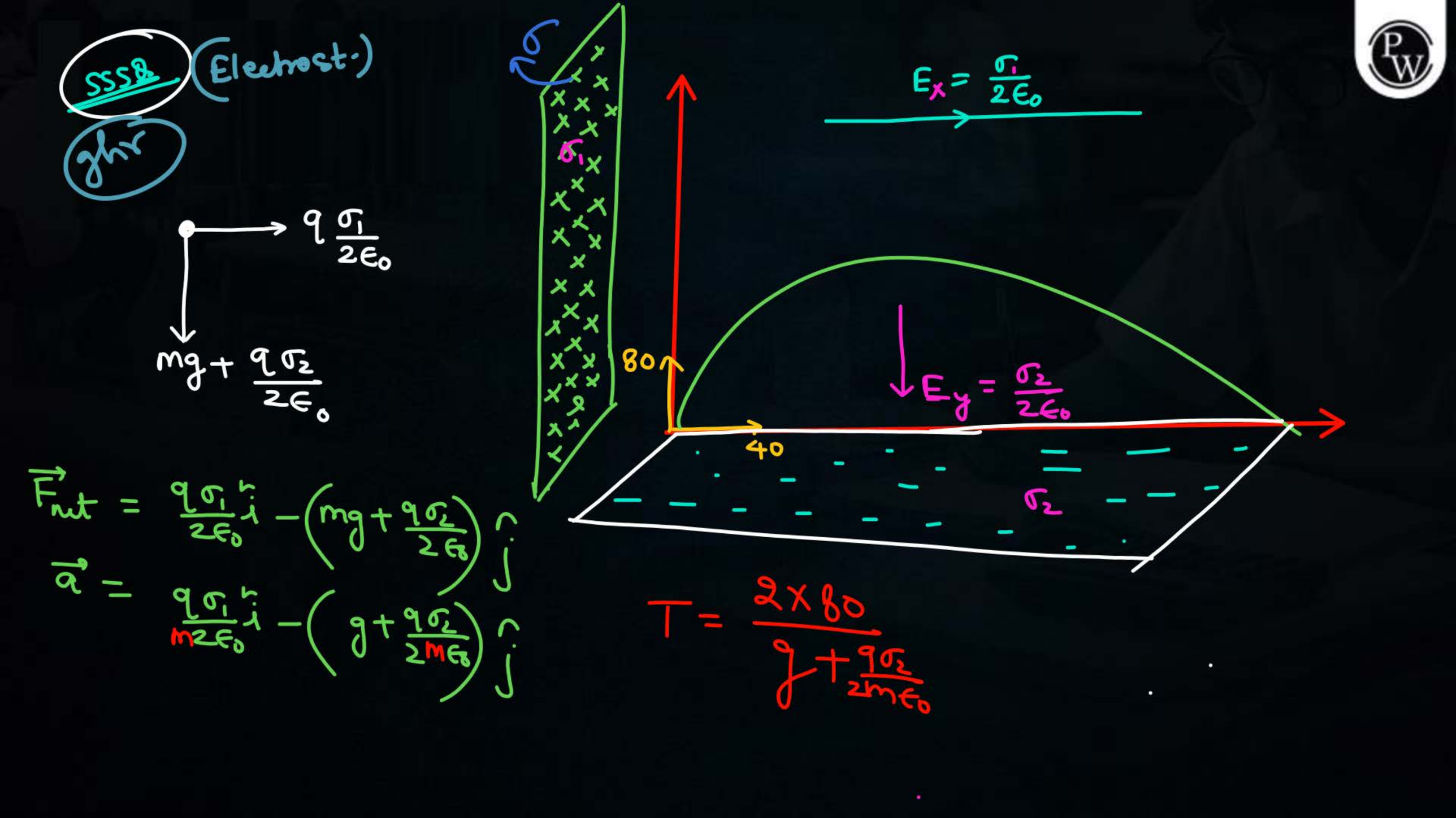


$$F_x = qE = q\frac{\sigma}{2\epsilon_0}$$

$$a_x = \frac{q\sigma}{2\epsilon_0 m}$$

$$\text{Range} = 40 \times 16 + \frac{1}{2} \times \left(\frac{q\sigma}{2\epsilon_0 m}\right)(16)^2$$

SSSB (Electrost.)



$q\frac{\sigma_1}{2\epsilon_0}$

$mg + \frac{q\sigma_2}{2\epsilon_0}$

$\vec{F}_{net} = \frac{q\sigma_1}{2\epsilon_0}\hat{i} - \left(mg + \frac{q\sigma_2}{2\epsilon_0}\right)\hat{j}$

$\vec{a} = \frac{q\sigma_1}{m2\epsilon_0}\hat{i} - \left(g + \frac{q\sigma_2}{2m\epsilon_0}\right)\hat{j}$

$T = \frac{2\times 80}{g + \frac{q\sigma_2}{2m\epsilon_0}}$

Q A particle is projected with velocity v at angle 53° with horizontal at $t=0$, such that at $t=3$ sec velocity of the particle makes 45° with horizontal & after 2 more second particle move horizontally. find R, T, v.

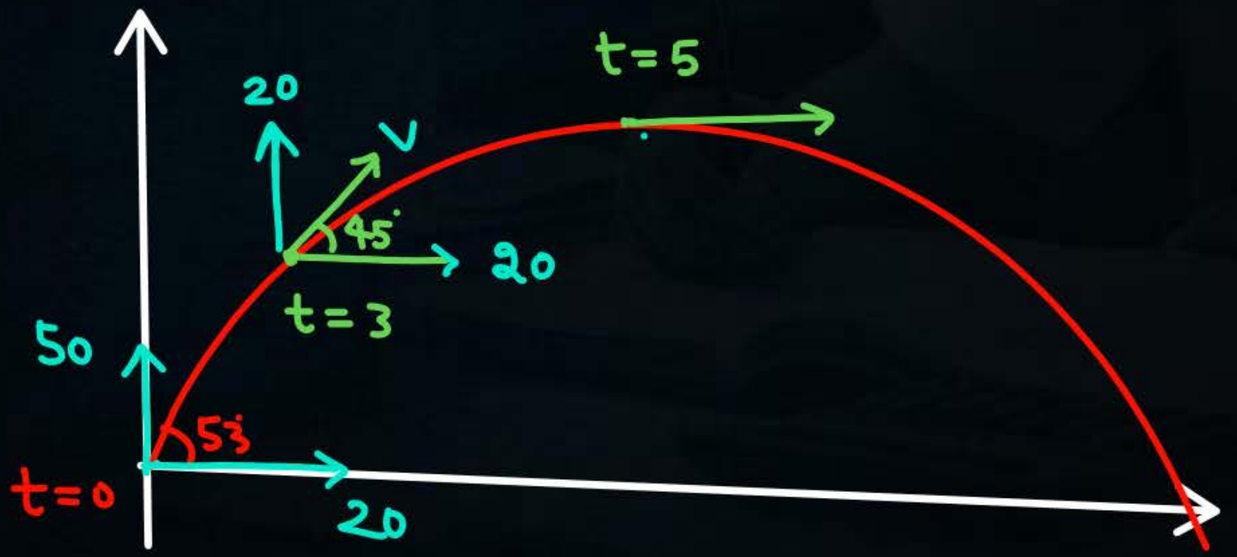
Sol^n

$T = 10$

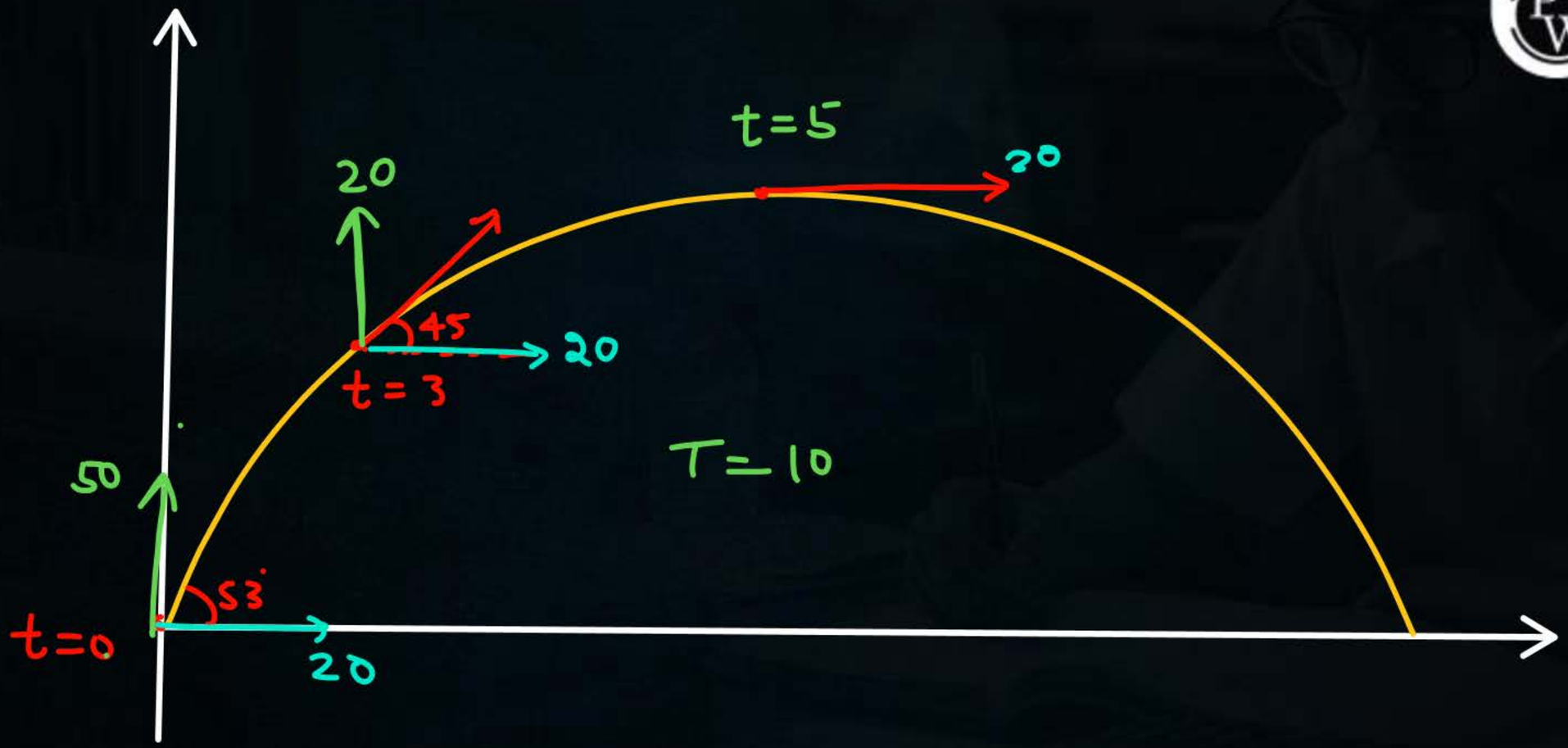
$R = 20 \times 10 = 200$

$\vec{v_i} = 20\hat{i} + 50\hat{j}$.

$v_i = \sqrt{(20)^2 + (50)^2}$

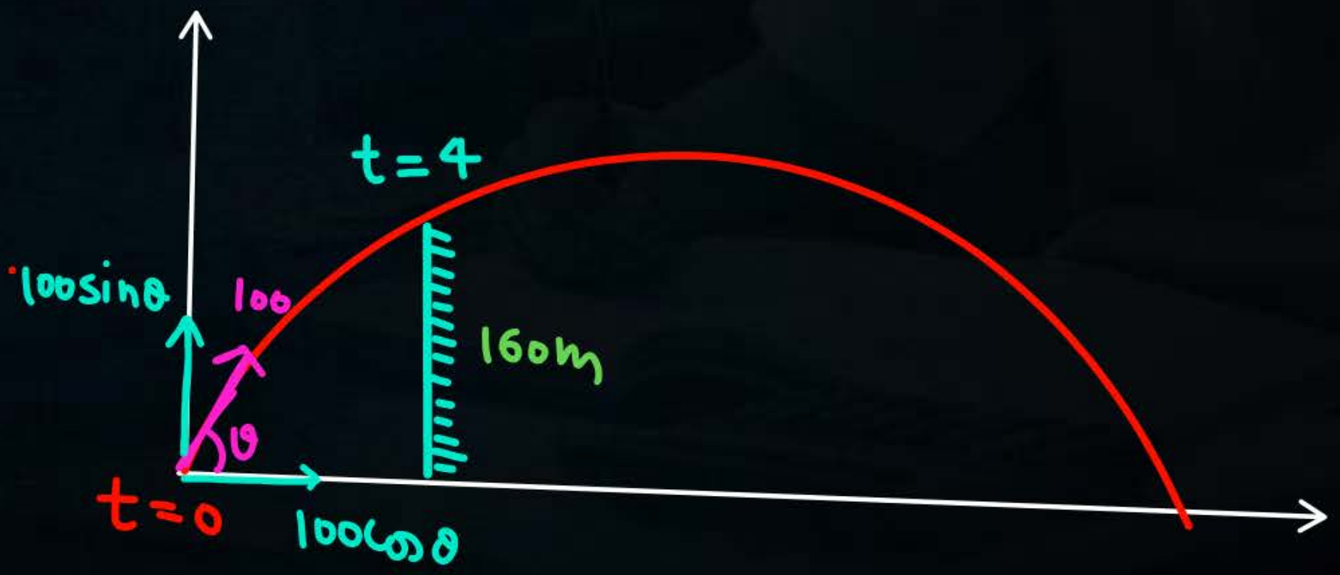


$\therefore$


t=5
20
20
45
20
t=3
T=10
50
53°
t=0
20

Q A particle is projected with velocity 100 m/s at angle θ at $t=0$. Such that at $t=4$ sec it just crosses a vertical wall of height 160 m. find θ & everything.

Soln ~~$h_{max} = 160$~~



$$160 = (100\sin\theta)\times 4 - \frac{1}{2}\times 10\times 4^2$$

$$160 = 400\sin\theta - 80$$

$$\sin\theta = \frac{240}{400} = \frac{3}{5}$$

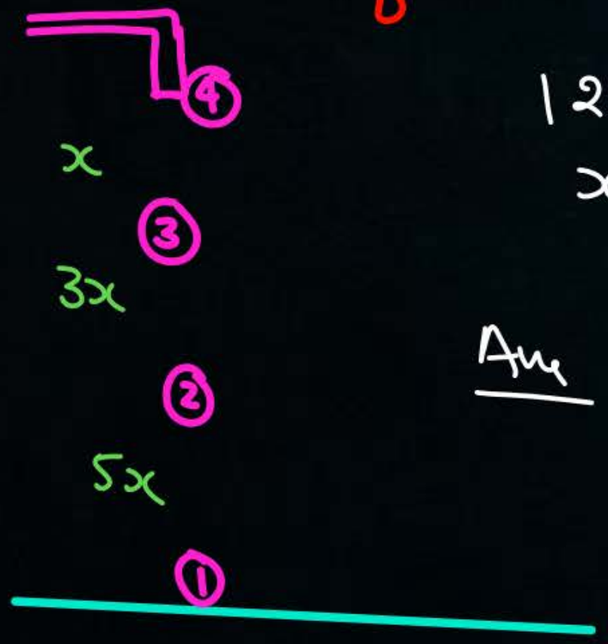
$\theta = 37^\circ$

$\therefore$

Tapwater problem (notes)

Q Water drop are falling from a top in regular interval of time s.t. height of tap (नल) from ground is 125m when 1st drop is about to hit ground at that time 4th drop just leaves (or about to leave). find location of second drop at this moment.

Sol



$$125 = x + 3x + 5x$$

$$x = \frac{125}{9}$$

Ans 2nd drop from ground $= 5x = 5 \times \frac{125}{9}$

SKC

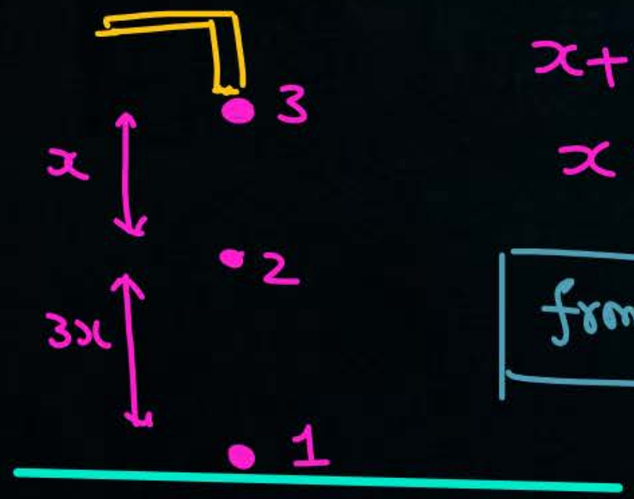
- Daigram बनाओ। → counting नीचे से start.
- X : 3X : 5X : 7X
- ये देखो कि Distance कहाँ से पूछी है

Tapwater problem . (notes)

Q Water drop are falling from a top in regular interval of time s.t. height of tap (नल) from ground is 5m. when 1st drop is about to hit ground at that time 3rd drop just leaves (or about to leave)

find location of second drop at this moment.

Sol'



$x + 3x = 5$

$x = \frac{5}{4} = 1.25$ (From tap)

from ground $5 - 1.25 = 3.75$

SKC

- Daigram बनाओ।
- $X : 3X : 5X : 7X$
- ये देखो कि Distance कहाँ से पूछी है

Tapwater problem (note)

Q Water drop are falling from a top in regular interval of time s.t. height of tap (नल) from ground is 6m when 1st drop is about to hit ground at that time 3rd drop just leaves (or about to leave). find location of second drop at this moment.

Sol

$$x + 3x = 6$$

$$x = \frac{6}{4}$$

Ans $3x = 3 \times \frac{6}{4} = 4.5$ (above ground).

SKC

- Daigram बनाओ। → counting नीचे से start.
- X : 3X : 5X : 7X
- ये देखो कि Distance कहाँ से पूछी है

Tapwater problem.

Q Water drop are falling from a top in regular interval of time s.t. height of tap (नल) from ground is 9m when 1st drop is about to hit ground at that time 4th drop just leaves. (or about to leave)

find location of second drop at this moment from tap.

Sol 

$9x = 9$

$x = 1$

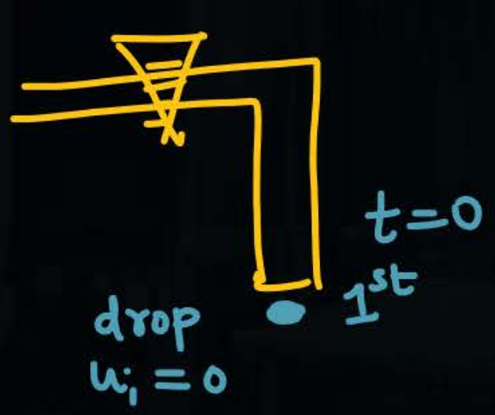
2^{nd} drop $= 5x = 5 \times 1 = 5$

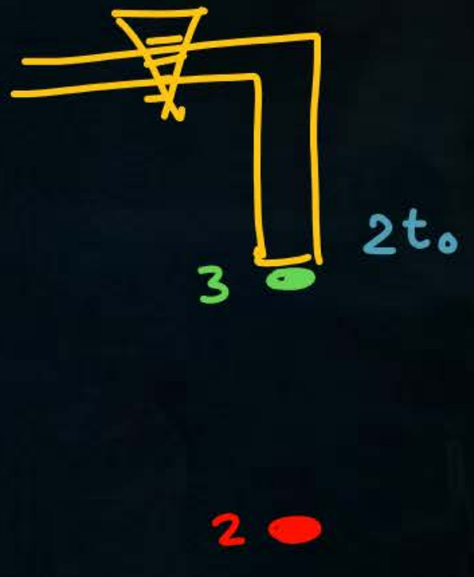
3^{rd} $= 8x = 8 \times 1$ (above ground)

$= 8m$ (above ground)

SKC → counting नीचे से start.

- Daigram बनाओ।
- $X : 3X : 5X : 7X$
- ये देखो कि Distance कहाँ से पूछी है





Rest से drop

t_0 = Regular interval of dim
↳ दो बूंदों के बीच का time.


t=0
X
t=t0
3X
t=2t0
5X
t=3t0
Rest

Home Work

- HCV (page 51)

Ex. → 1, 2, 5, 6, 7, 8, 9, 10, (13-20), 26, 30,

THANK YOU