YAKEEN NEET 2.0

2026

Kinematics - - -

Motion in a straight line

PHYSICS | Lecture – 02

By – Saleem Ahmed Sir

Todays Goal

Basic to advanced on Distance and displacement (Part 02)

Hum New

- Unit & dim ⟶ Backlog
- error & meas ⟶ "
- vector ⟶ Kuch-2 ✓ ≡ (one shot ≡ 1 hour)

KPP

Kinematics ✓

Kaddu Practice paper

AVERAGE VELOCITY AND AVERAGE SPEED:

1. A vehicle travels half the distance with speed v and the remaining distance with speed $2v$. Its average speed is:

[2023]

(1) $\frac{4v}{3} = 1.33v$

(2) $\frac{3v}{4} = .75v$

(3) $\frac{v}{3} = .33v$

(4) $\frac{2v}{3} = .66v$

v 2v

go fundamentally

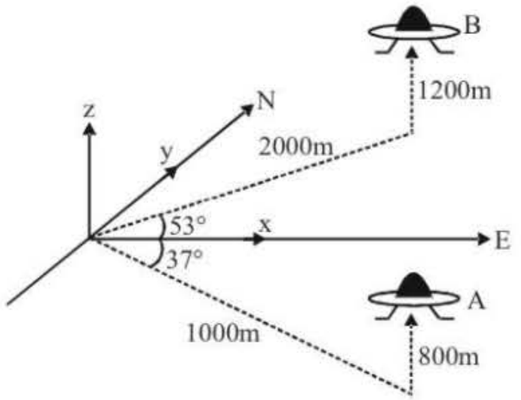
Avg speed = $\frac{\text{Distance}}{\text{time}} = \frac{x+x}{t_1+t_2}$

$= \frac{x+x}{\frac{x}{v}+\frac{x}{2v}} = \frac{4v}{3}$

Distance = Speed × time

time = $\frac{\text{Distance}}{\text{Speed}}$

37. Personnel at an air post control tower track a UFO. At 11:02 am it was located at position A and at 11:12 am is was located at position B. Displacement vector of UFO is :
एयर पोस्ट कन्ट्रोल टॉवर एक UFO को देखता है। समय 11: 02 am पर यह स्थिति A पर तथा समय 11:12 am पर यह स्थिति B स्थित था। UFO का विस्थापन सदिश है।



(A) $400\hat{i}+2200\hat{j}+400\hat{k}$

(B) $1200\hat{i}+1000\hat{j}+800\hat{k}$

(C) $2000\hat{i}+2200\hat{j}+2000\hat{k}$

(D) $400\hat{i}+1000\hat{j}+400\hat{k}$

Ans. (A)

Welcome to the . . . . . Hell Physics

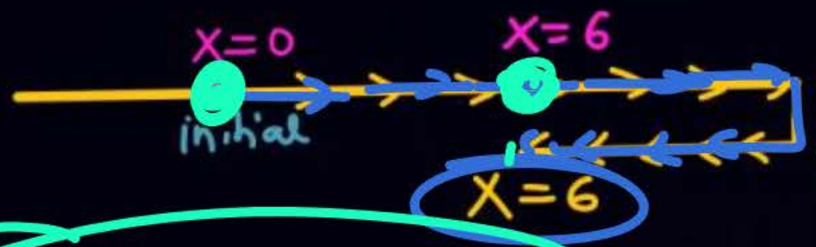
$(6-0)\hat{i}$

①

Distance = 10

Displacement = $10\hat{i}$

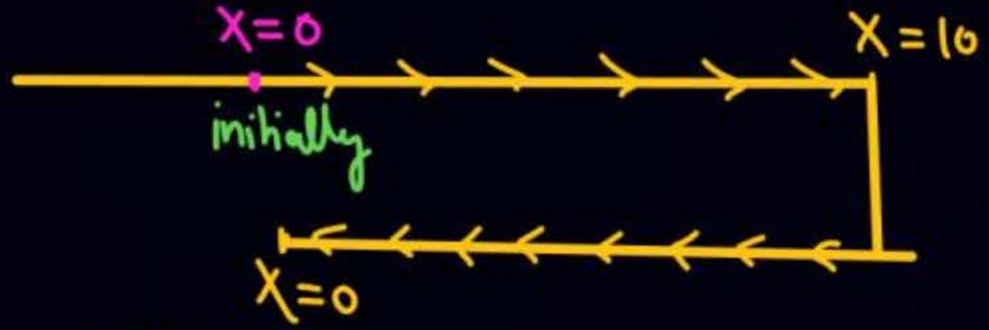
Distance = |Displacement|

* ② 

Distance = 10+4 = 14

Displacement = $6\hat{i}$

Distance > |Displacement|

③ 

Distance = 10+10 = 20

Displacent = 0

* Distance ≥ |Displacement|

* $\frac{\text{Distance}}{|\text{Displacement}|} \geq 1$

* Kya distance Hamesha .... displacement se Bada hoga. ✗

* Kya distance Kabhi displacement se chota ho sakta ha ✗

Revision

SKL

* अगर particle ने अपनी Dir^{n} नहीं बदली तो

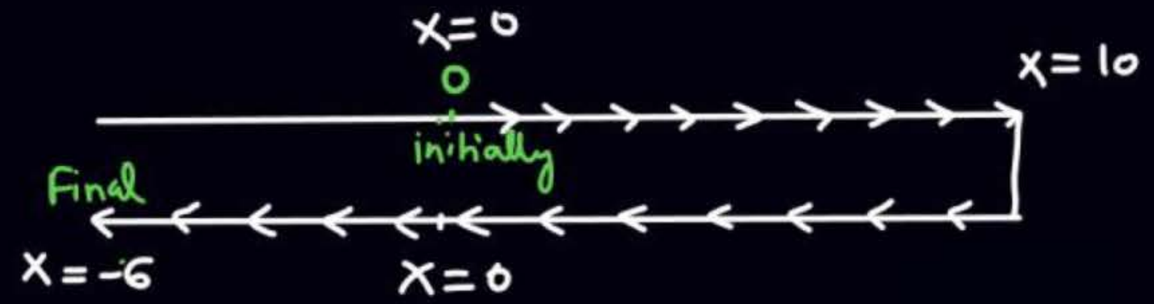
$$\text{Distance} = |\text{Displacement}|$$

वरना Distance > |Displ.|

* Agar particle Ne apni dir^{n} Nahi badli to

$$\text{Distance} = |\text{Displacement}|$$

④



Distance = $10 + 10 + 6 = 26$

Displacement = $-6\hat{i}$

* Displacement ⟶ increase, decrease, const; +, −, 0
* position ⟶ (x-co-ordinate) ⟶ increase, decrease, Const, +, −, 0

} kuch bhi ho sakta

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

① $A \longrightarrow B$

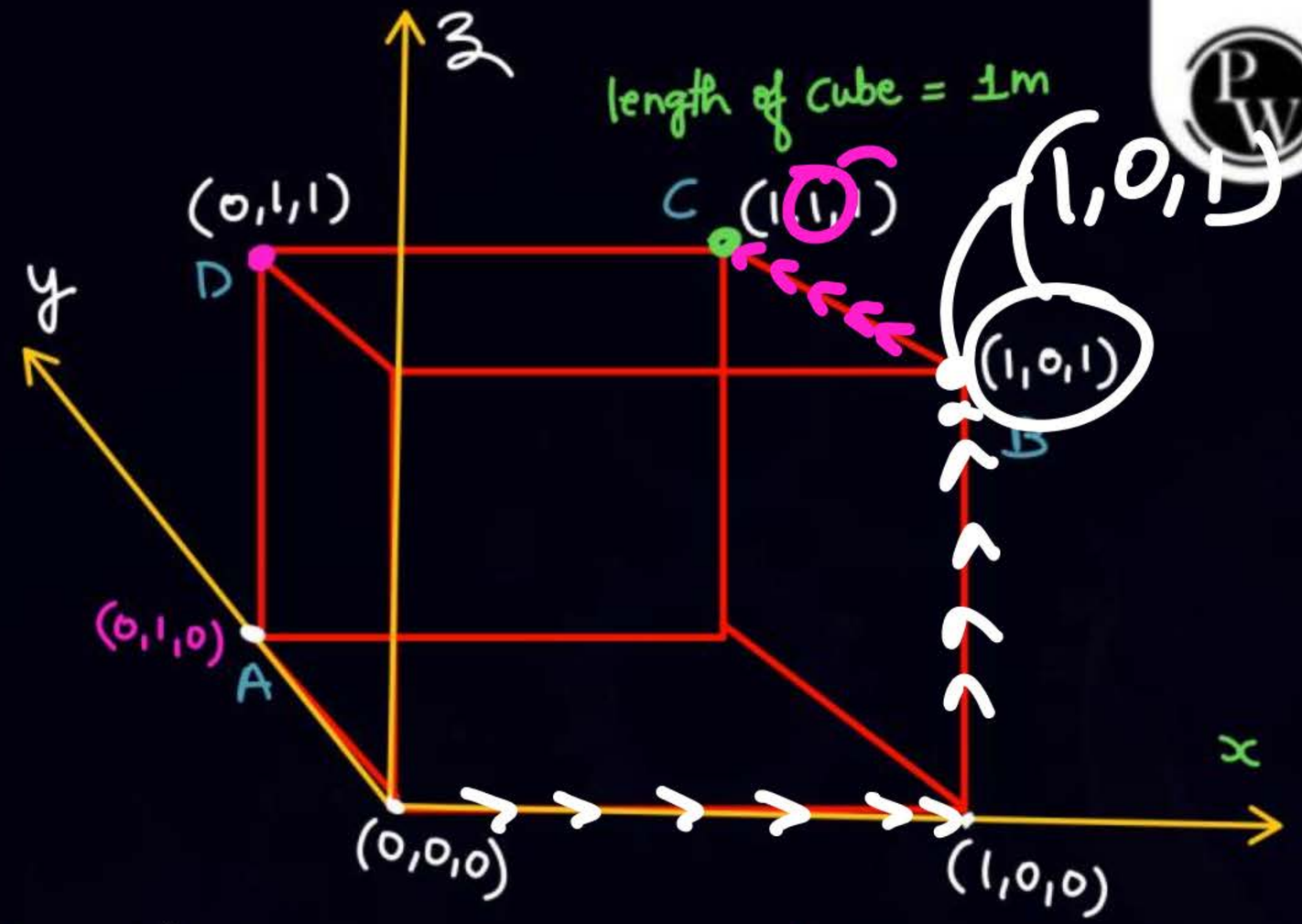
Displacement $= \hat{i} - \hat{j} + \hat{k}$

② $A \longrightarrow D$

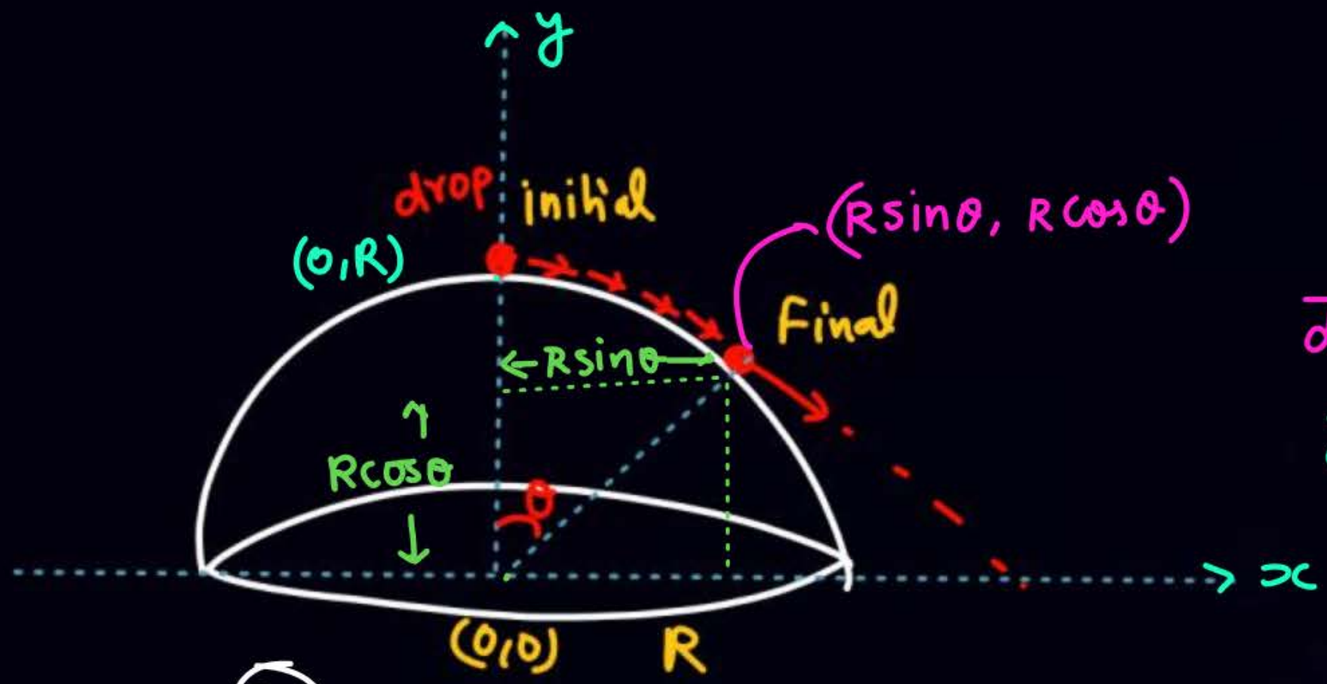
$\vec{d}_{AD} = \hat{k}$

③ $\vec{d}_{A \to C} = \hat{i} + 0\hat{j} + \hat{k}$

④ $\vec{d}_{\text{origin} \to C} = \hat{i} + \hat{j} + \hat{k}$



H.W
Q



Rm

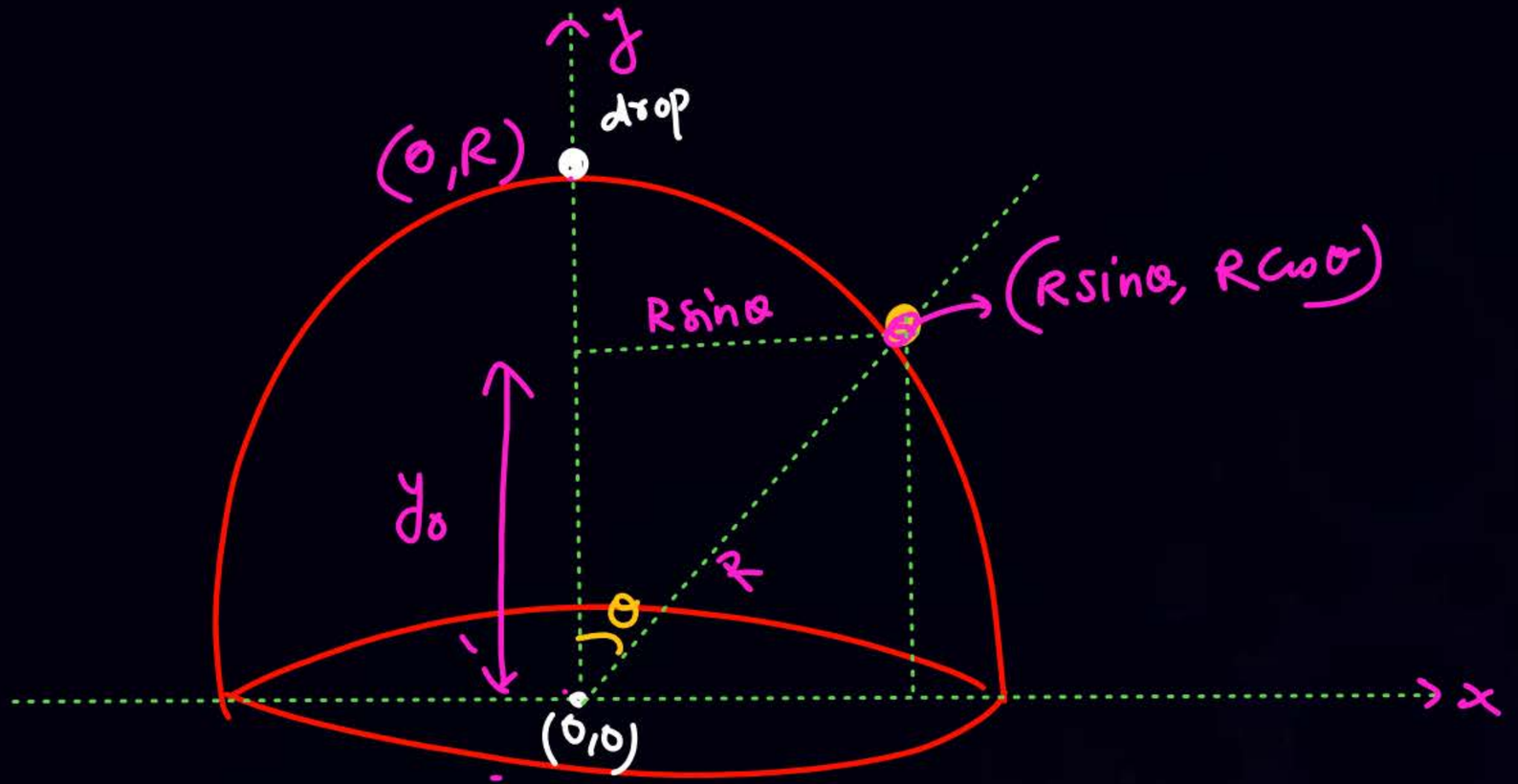
$\cos\theta = \frac{2}{3}$

$\vec{d} =$ ✓

$\vec{d} = R\sin\theta\,\hat{i} + (R\cos\theta - R)\hat{j}$

$\vec{d} = R\,\frac{\sqrt{5}}{3}\hat{i} + \left(R\,\frac{2}{3} - R\right)\hat{j}$

$= \frac{R\sqrt{5}}{3}\hat{i} - \frac{R}{3}\hat{j}$



$$\cos\theta = \frac{y_0}{R}$$

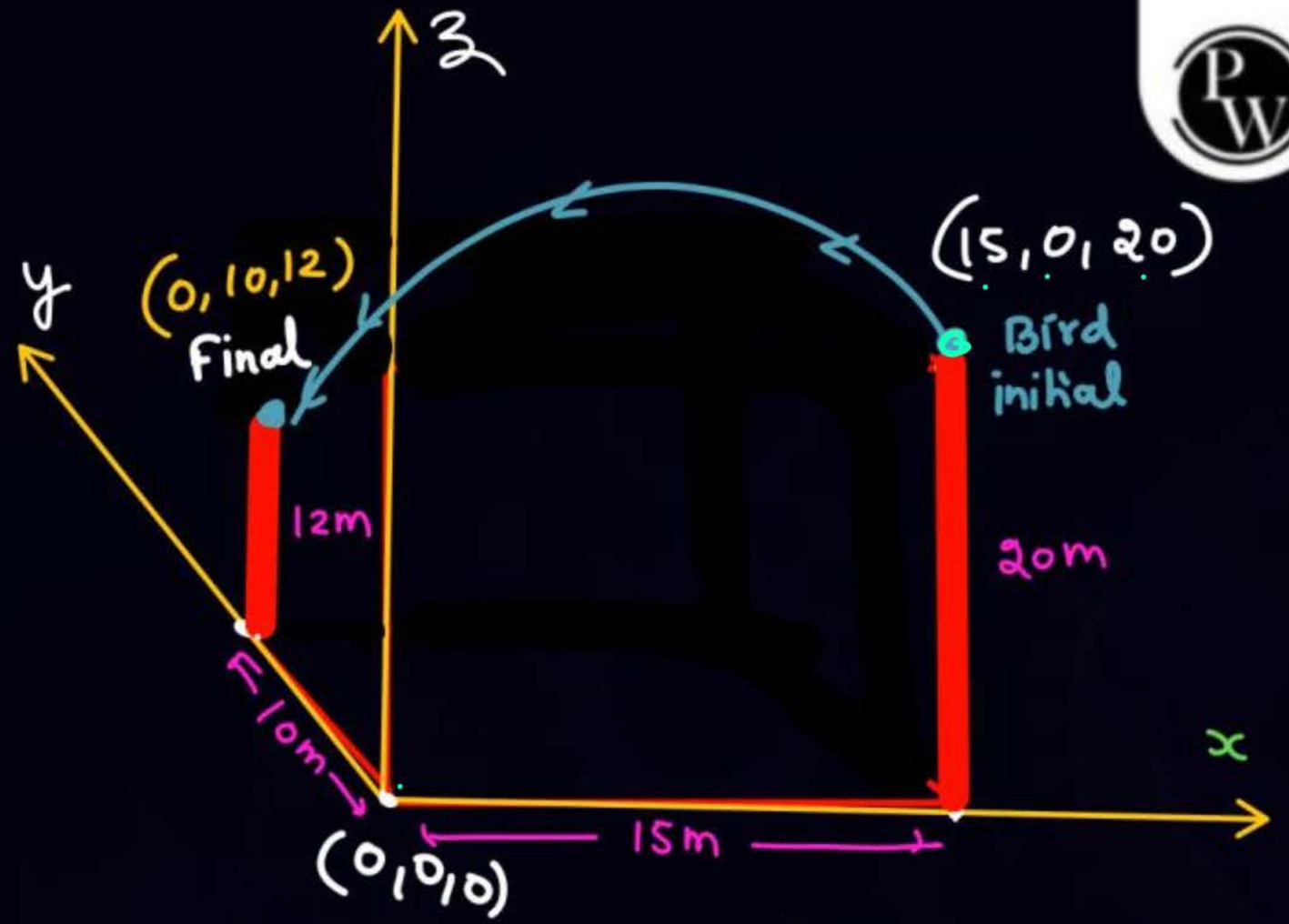
$$y_0 = R\cos\theta$$

SSSR

$\vec{d} = -15\hat{i} + 10\hat{j} - 8\hat{k}$

$-15, 10, -8$

शाबाश

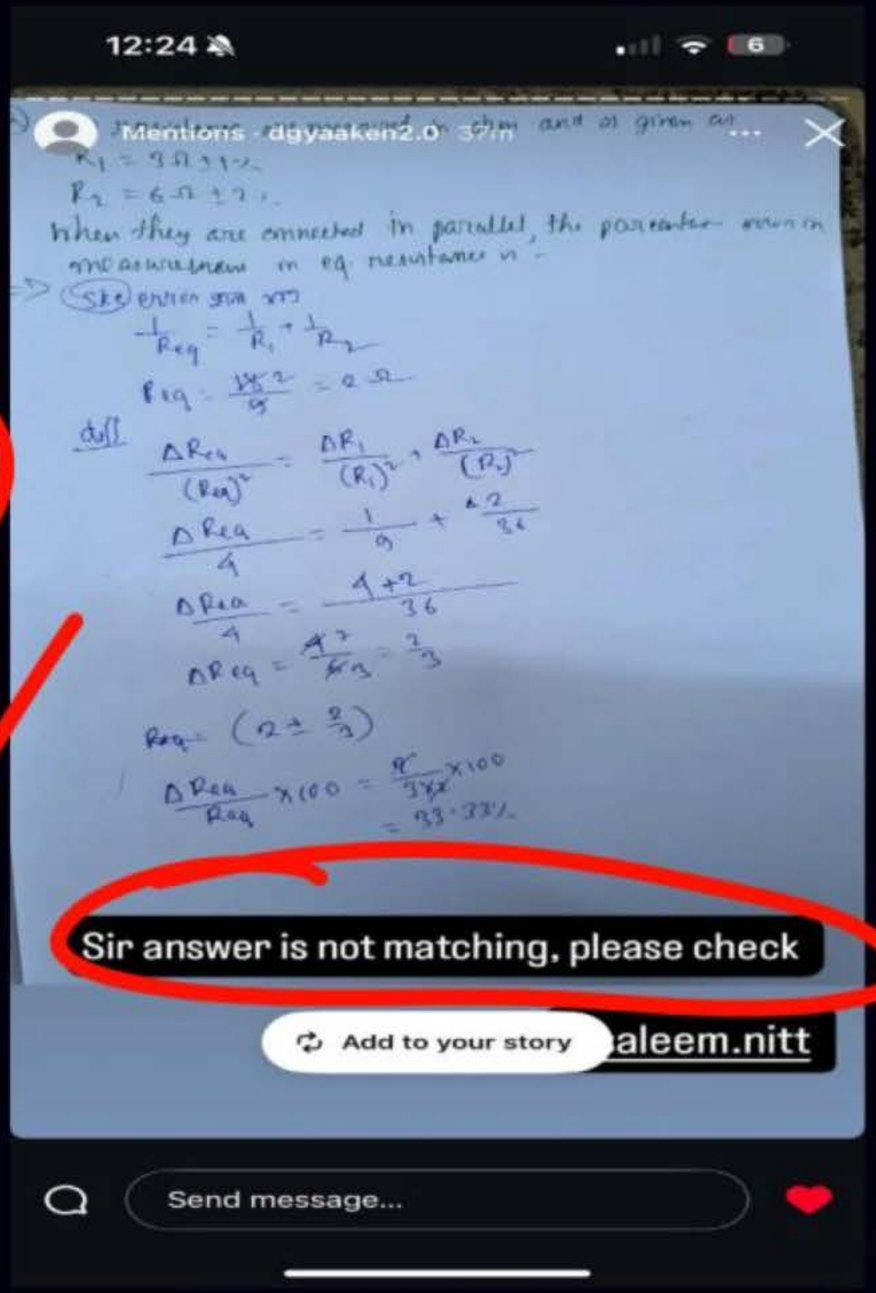


$R_1 = 3\Omega \pm 1\%$

$R_2 = 6\Omega \pm 2\%$

$\frac{\Delta r}{r} \times 100$: ✓

Solve again.



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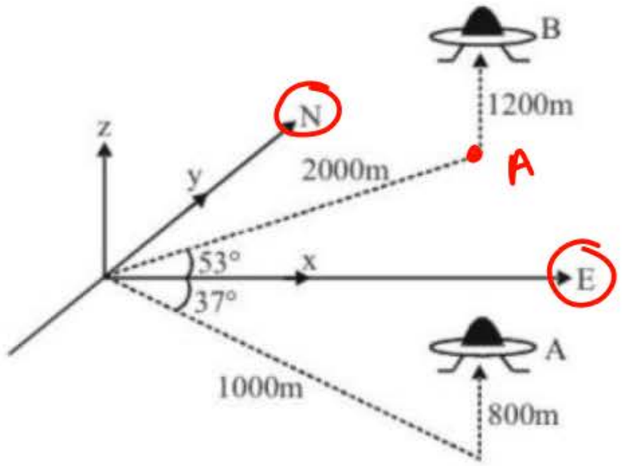
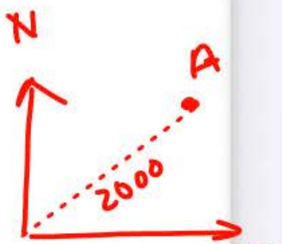
Home work

try Aga



top View



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(D) $400\hat{i}+1000\hat{j}+400\hat{k}$

Ans. (A)

$\frac{\Delta R_1}{R_1} \times 100 = 1$

Home work

Q $R_1 = 3\Omega \pm 1\%$

$R_2 = 6\Omega \pm 2\%$

Error को Bhool jao

$R_{eq} = \frac{R_1 R_2}{R_1 + R_2} = 2\Omega$

$\frac{1}{R_{eq}^2} \Delta R_{eq} = \frac{1}{R_1^2} \cdot \Delta R_1 + \frac{1}{R_2^2} \times \Delta R_2$

$\frac{\Delta R_{eq}}{R_{eq}} \times 100 = \frac{\Delta R_1}{R_1} \times 100 \times \frac{1}{R_1} + \frac{\Delta R_2}{R_2} \times 100 \times \frac{1}{R_2}$

$= \frac{1}{3} + \frac{2}{6} = \frac{2}{3}$

$\frac{(\%\ \text{error in } R_{eq})}{2} = \frac{2}{3}$

$\%$ error in $R_{eq} = \frac{4}{3}\% = 1.33\%$

$$\frac{\Delta R_{eq}}{R_{eq}^2} = \frac{\Delta R_1}{R_1^2} + \frac{\Delta R_2}{R_2^2}$$

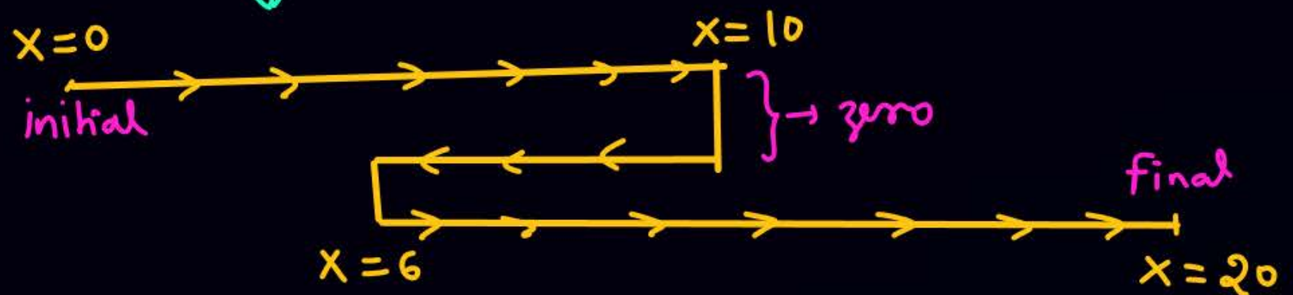
$$= \frac{\Delta R_1}{R_1} \times \frac{1}{R_1} + \frac{\Delta R_2}{R_2} \times \frac{1}{R}$$

$$\frac{\Delta R_{eq}}{R_{eq} \times R_{eq}} = \frac{(1\%)}{3} + \frac{2\%}{6}$$

$$\frac{\Delta R_{eq}}{R_{eq}} = \frac{2+2}{3}\% = 4/3\%$$

Find Displacement of particle.

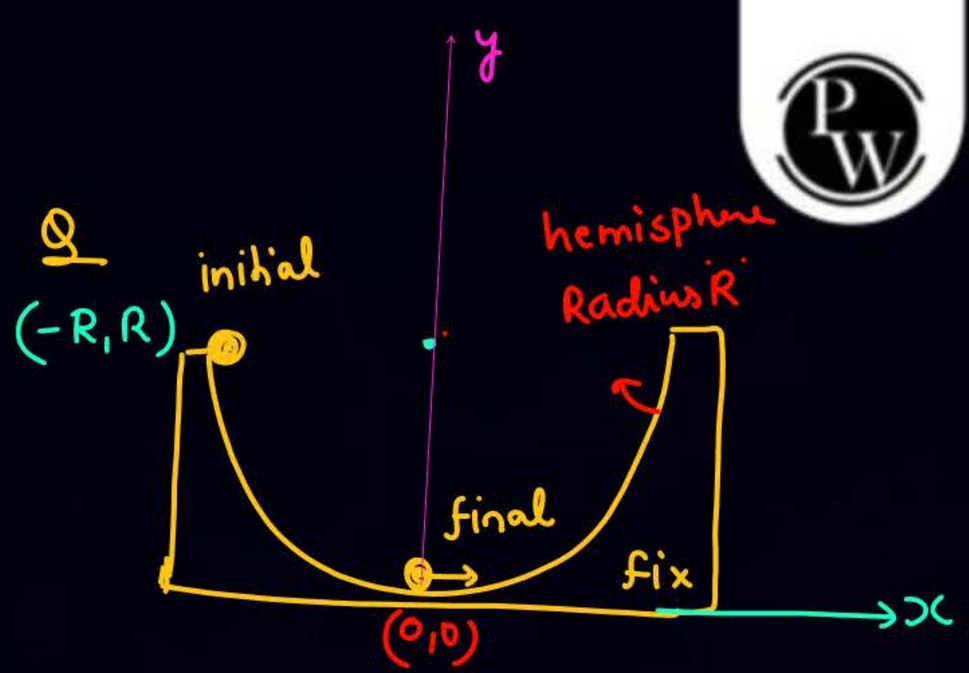
Q (1D motion)



Distance = 10 + 4 + 14 = 28

Displacement = 20 − 0 = $20\hat{i}$

Q

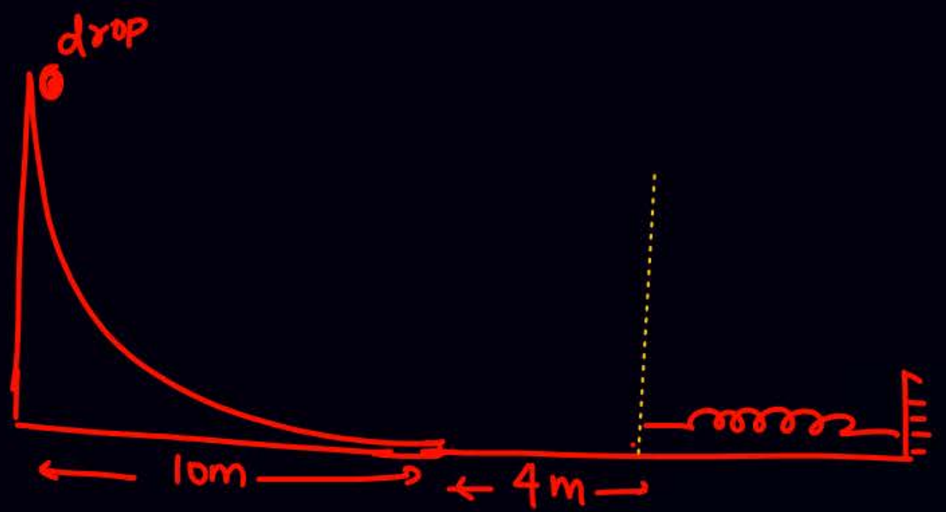


distance = $\frac{2\pi R}{4}$

Displacement = $R\hat{i} - R\hat{j}$ $\left(\equiv R\sqrt{2}\right)$

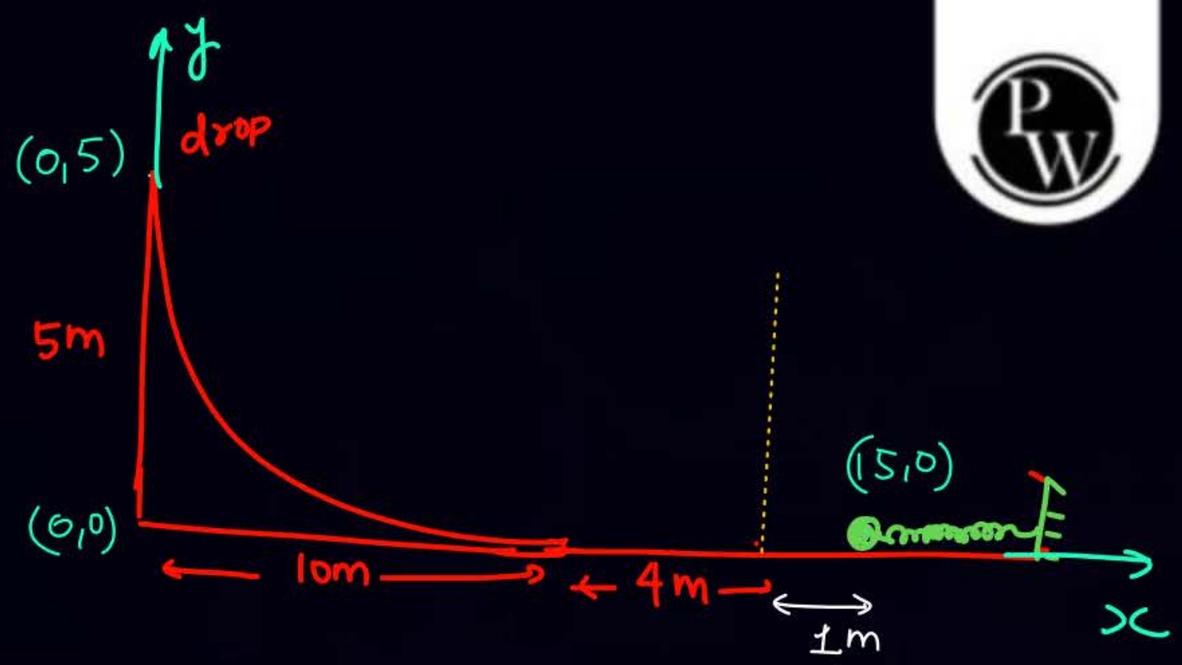
SSSB

Q



Finally If spring compress by 1 m.

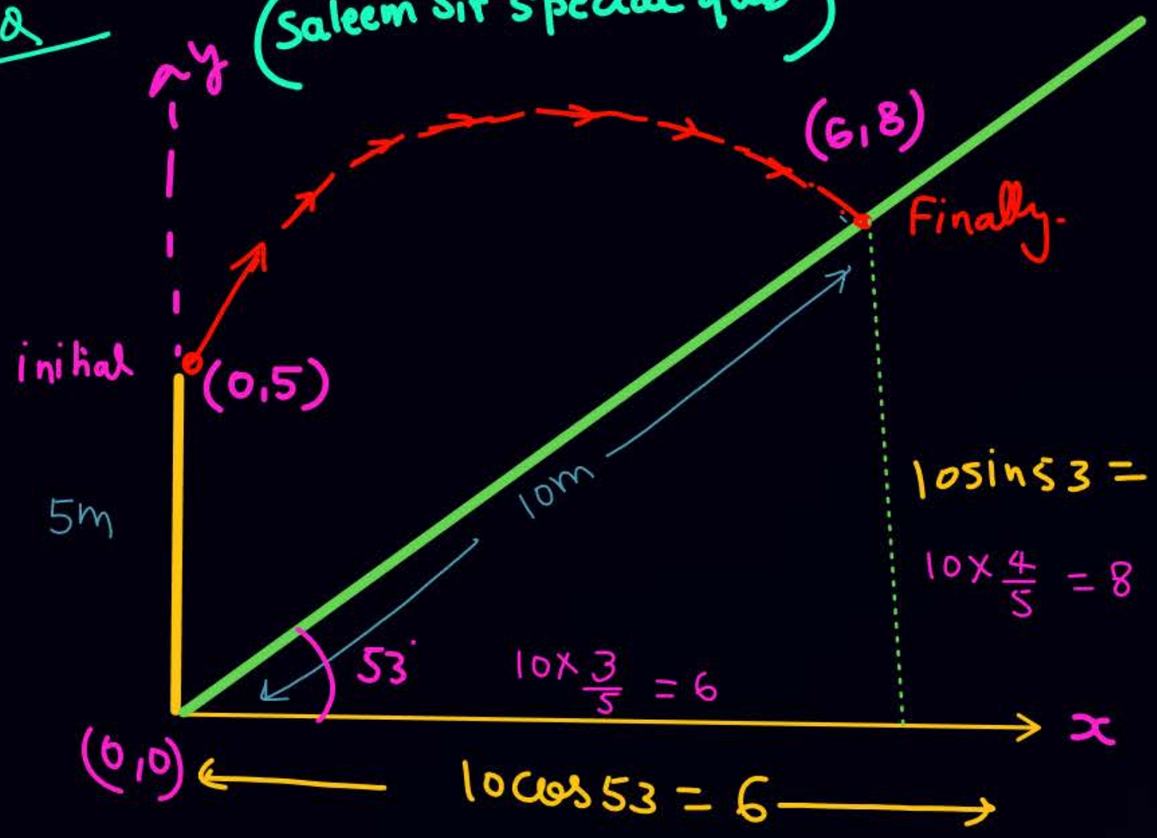
Find displacement of ball.



$\vec{d} = 15\hat{i} - 5\hat{j}$

SSSQ

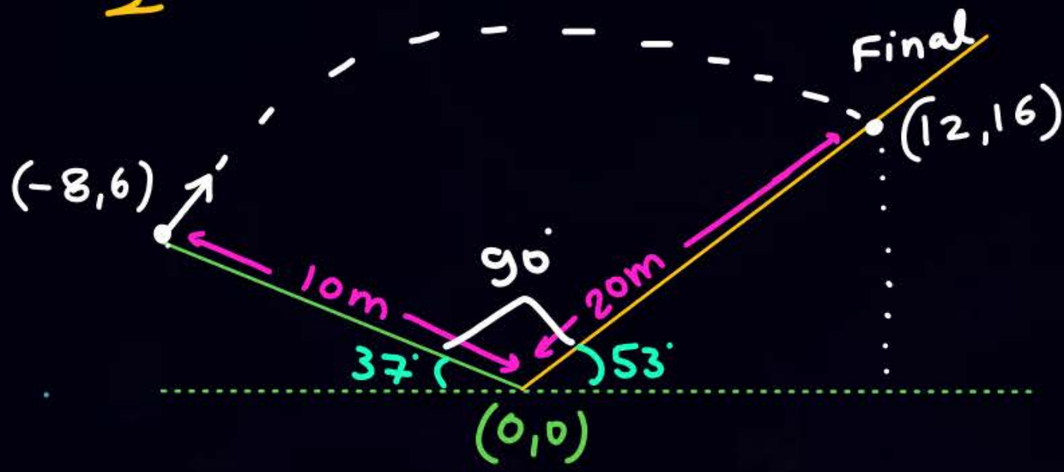
Q (Saleem Sir special ques)



$\vec{d} = 6\hat{i} + 3\hat{j}$

SSSQ

Q

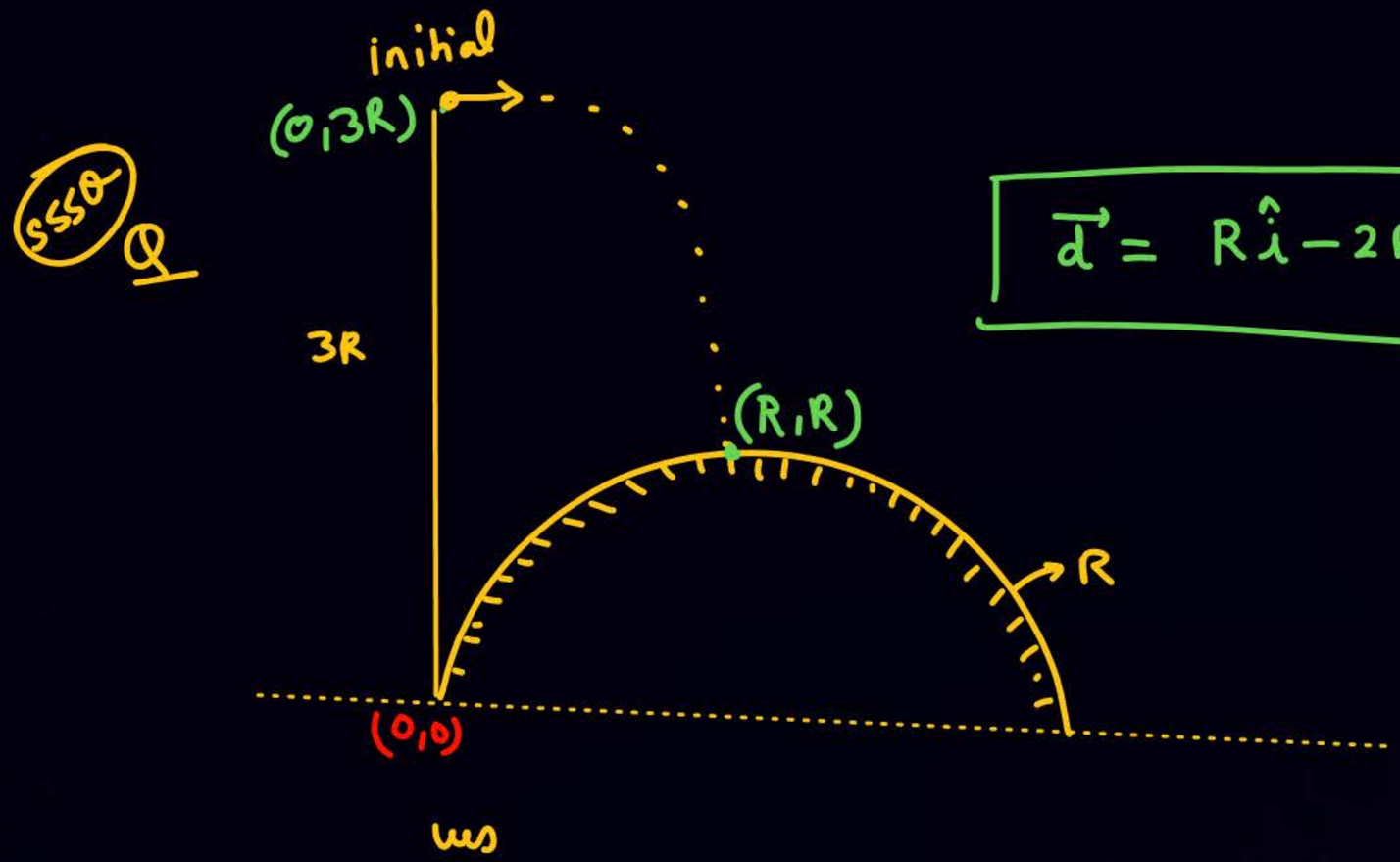


$20\cos 53 = 20 \times \frac{3}{5} = 12$

$\vec{d} = 12-(-8)\hat{i} + (16-6)\hat{j}$

$\boxed{\vec{d} = 20\hat{i} + 10\hat{j}}$

$d = \sqrt{(10)^2 + (20)^2} = 10\sqrt{5}$



$$\vec{d} = R\hat{i} - 2R\hat{j}$$

* Average velocity = $\frac{\text{Displacement}}{\text{time}} = \frac{\vec{r}_f - \vec{r}_i}{\text{total time}}$. (हर जगह)

If particle is moving on x-Axis

Avrg velocity = $\frac{\vec{x}_f - \vec{x}_i}{\text{total time}}$.

* Average speed = $\frac{\text{Total Distance}}{\text{total time}}$.

①

Distance = 4 + 3 = 7

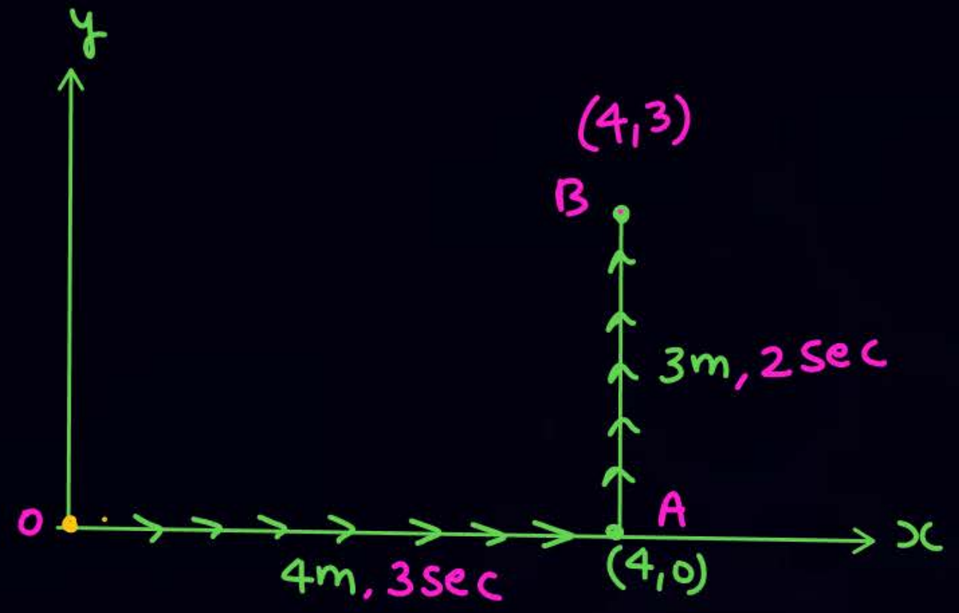
Displacement = 5 (magnitude)

$\vec{d} = 4\hat{i} + 3\hat{j}$

Avrg speed = $\frac{7}{3+2} = \frac{7}{5}$

Avrg Velocity = $\frac{5}{5} = 1$ (magnitude)

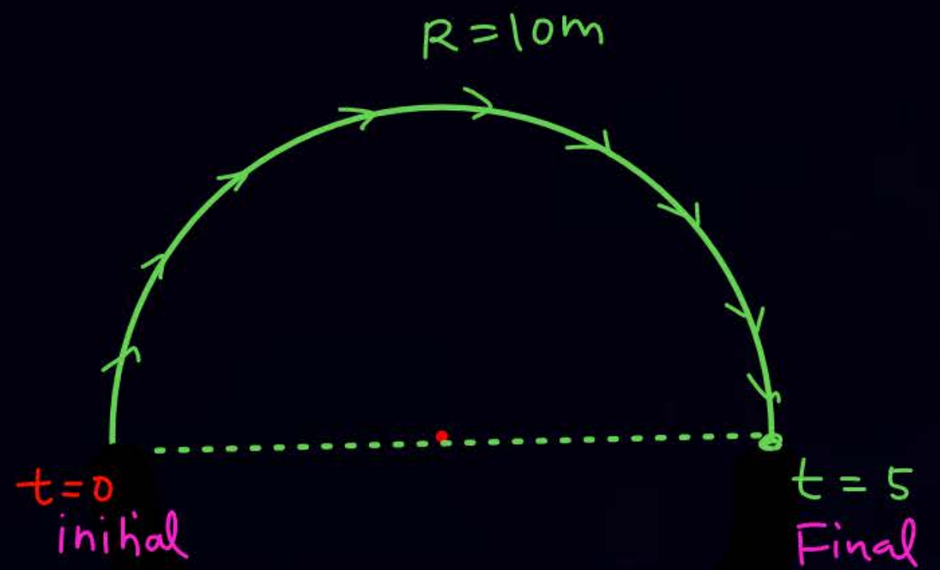
$\langle \vec{v} \rangle = \frac{\vec{d}}{\text{time}} = \frac{4\hat{i}+3\hat{j}}{5}$



$t_{OA} = 3$ sec

$t_{AB} = 2$ sec

Q



$$\text{Avrg velocity} = \frac{\text{Displ.}}{\text{time}} = \frac{2R}{5}$$

$$= \frac{2 \times 10}{5} = 4$$

$$\text{Avrg Speed} = \frac{\text{Distance}}{\text{time}} = \frac{2\pi R/2}{5} = \frac{\pi \times 10}{5} = 2\pi = 6.28$$

notes

Q A man start moving from origin and travel 10m towards east and turn left & move 20m towards north. Then he turn right and travel 15m and then he turn again right and traul 30m. find distance & displacement

Sol^n Distance $= 10 + 20 + 15 + 30$

$= 75$

Displacement $= 10\hat{i} + 20\hat{j} + 15\hat{i} - 30\hat{j}$

$= 25\hat{i} - 10\hat{j}$

(b) In last que if man took a lift at last and traul 20m distance upward. by lift in air. find

distance $= 75+20 = 95$

displacement $= 25\hat{i} - 10\hat{j} + 20\hat{k}$

Q If a particle travel such that

$\vec{d}_1 = 3\hat{i} - 4\hat{j}$

$\vec{d}_2 = 6\hat{i} + 8\hat{j} + 10\hat{k}$

$\vec{d}_3 = 2\hat{i} - 3\hat{j} - 5\hat{k}$

$\vec{d}_4 = \hat{i} + \hat{j} + \hat{k}$

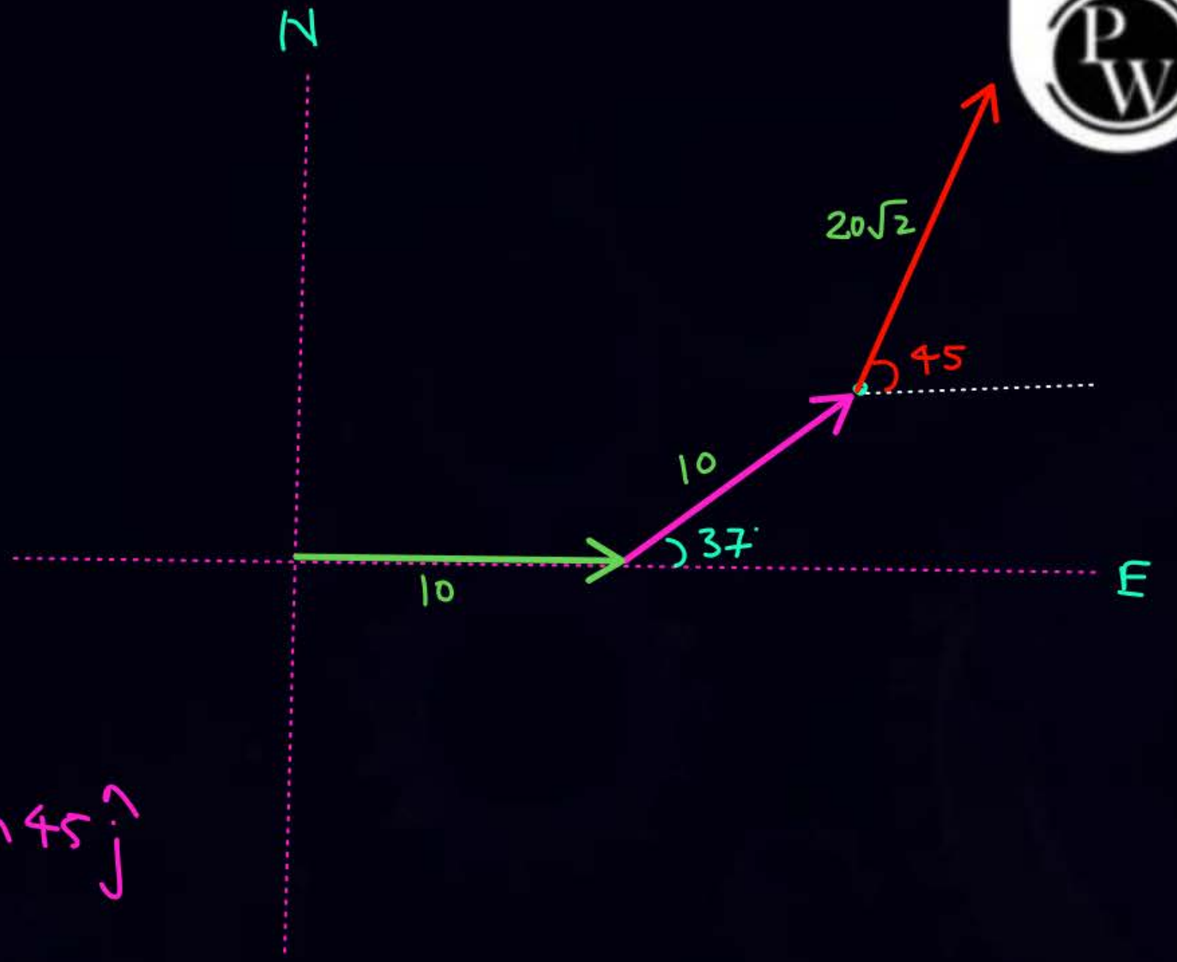
$\vec{d}_{net} = \vec{d}_1 + \vec{d}_2 + \vec{d}_2 + \vec{d}_3 + \vec{d}_4$

$= 12\hat{i} + 2\hat{j} + 6\hat{k}$

Q A man start motion from origin and travel 10m along east and then he turn 37° north of east and move 10m. And then he travel $20\sqrt{2}$ meter along North-east find displacement

Soln

Q A man start motion from origin and travel 10m along east and then he turn 37° north of east and move 10m. And then he travel $20\sqrt{2}$ meter along North-east find displacement



Sol^n

$$\vec{d}_1 = 10\hat{i}$$

$$\vec{d}_2 = 8\hat{i} + 6\hat{j}$$

$$\vec{d}_3 = 20\sqrt{2}\cos 45\,\hat{i} + 20\sqrt{2}\sin 45\,\hat{j}$$

$$\vec{d}_3 = 20\hat{i} + 20\hat{j}$$

$$\vec{d}_{net} = 38\hat{i} + 26\hat{j}$$

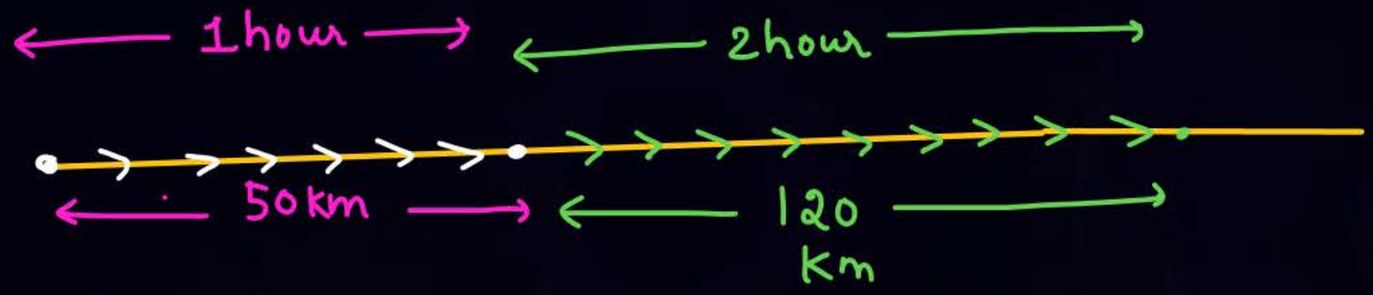
note

Q A car start moving from origin along east dir^{n}. If it travel with velocity 50 km/hr for one hour and with 60 km/hr for next two hour. find averge velocity.

Sol^{n}

$$\text{Avrg velocity} = \frac{50+120}{3}$$

$$= \frac{170}{3} = 56.6 \text{ km/hr}$$



① 48.6 ✗
② 40.6 ✗
③ 56.6
④ 62.6 ✗

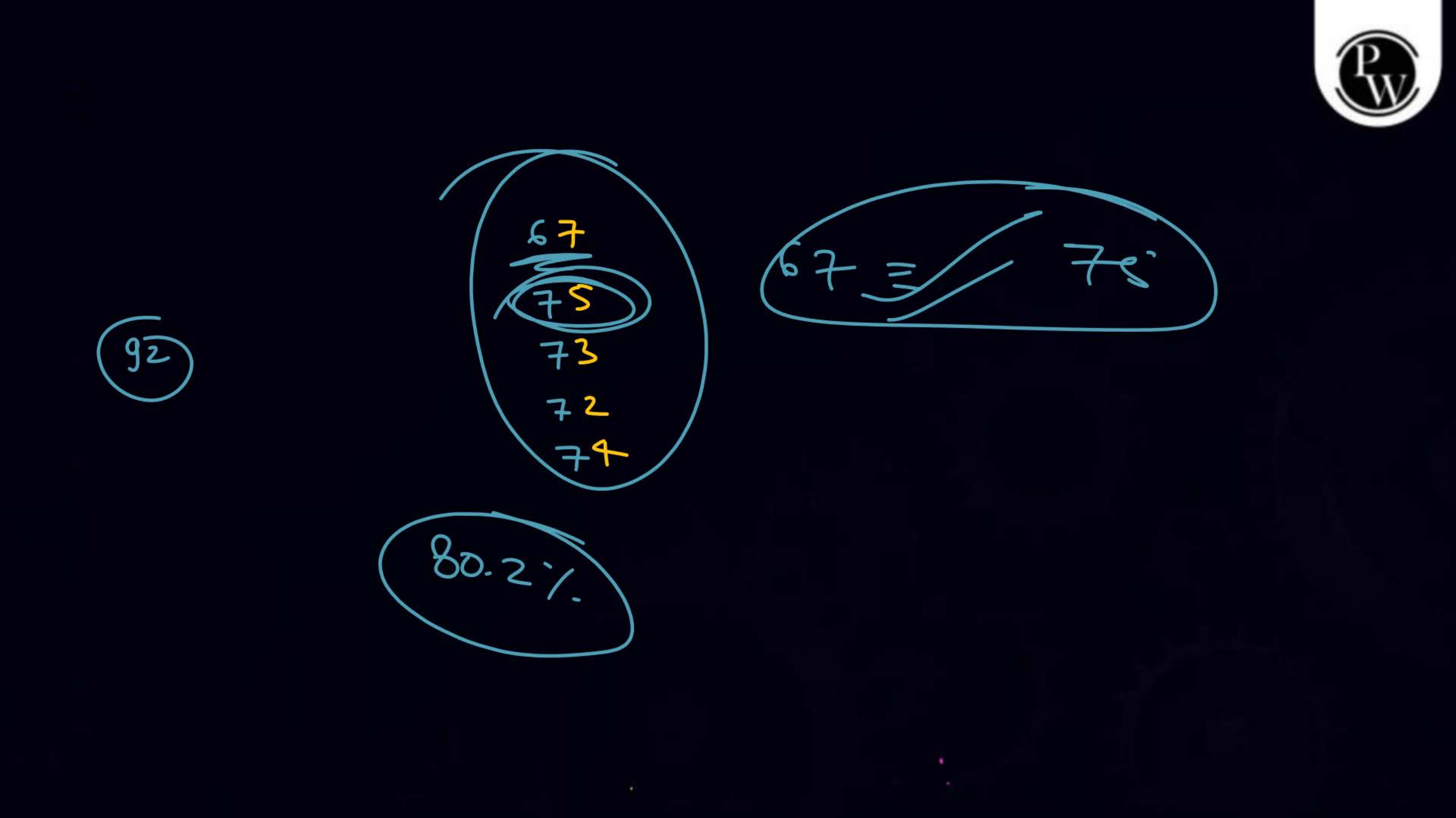
① 48.6 ✗
② 40.6 ✗
③ 56.6
④ ~~52.6~~

Q If a car travel in east dir^n. If car move with velocity v_1 for time t_1 and then it travel with speed v_2 for time t_2 - find Avg. velocity/speed.

Sol^n

$$\text{Avg speed} = \frac{\text{Distance}}{\text{total dist}} = \frac{x_1 + x_2}{t_1 + t_2} = \frac{v_1 t_1 + v_2 t_2}{t_1 + t_2}$$

distance = speed x time


67
75
73
72
74
92
67 ≡ 75
80.2%

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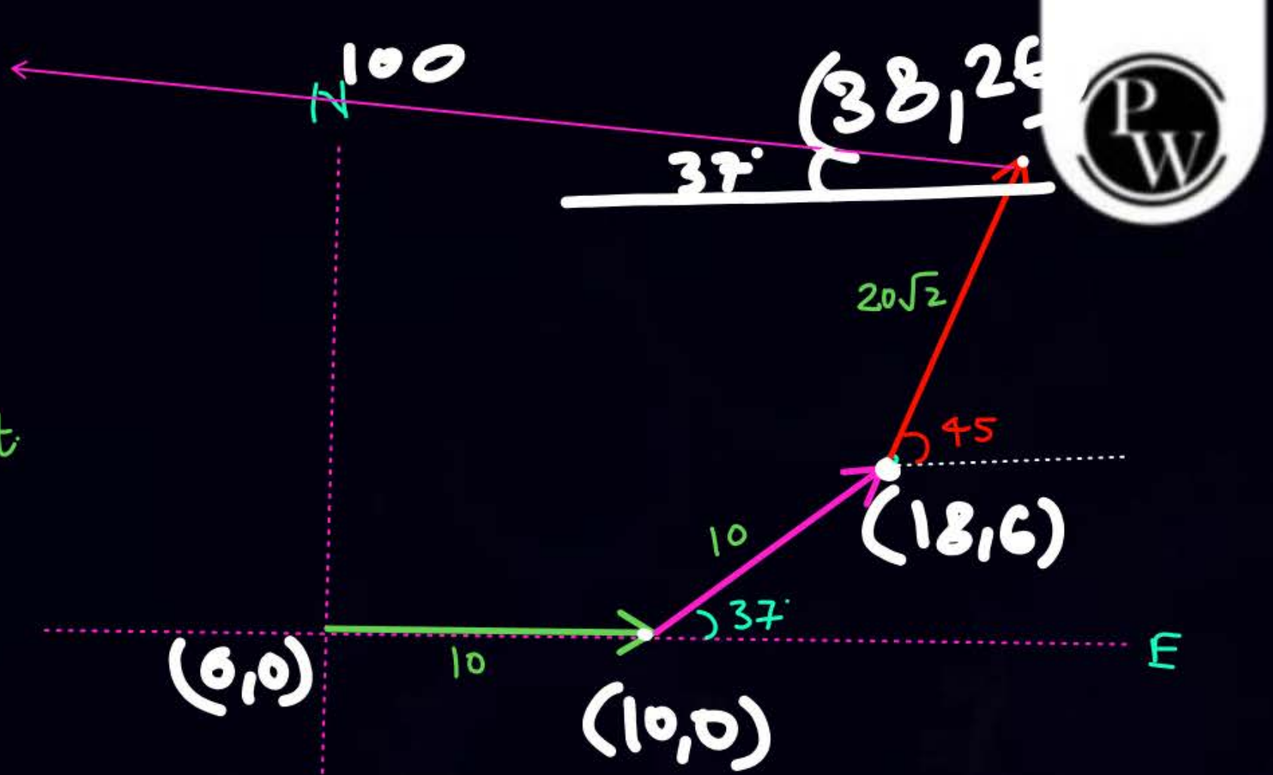
Soln



Q A particle travel on X-Axis such that its x-t graph is given.

① Displacement

② Avg velocity

③ Distance

④ Avg speed

* ⑤ Rasta Banao.

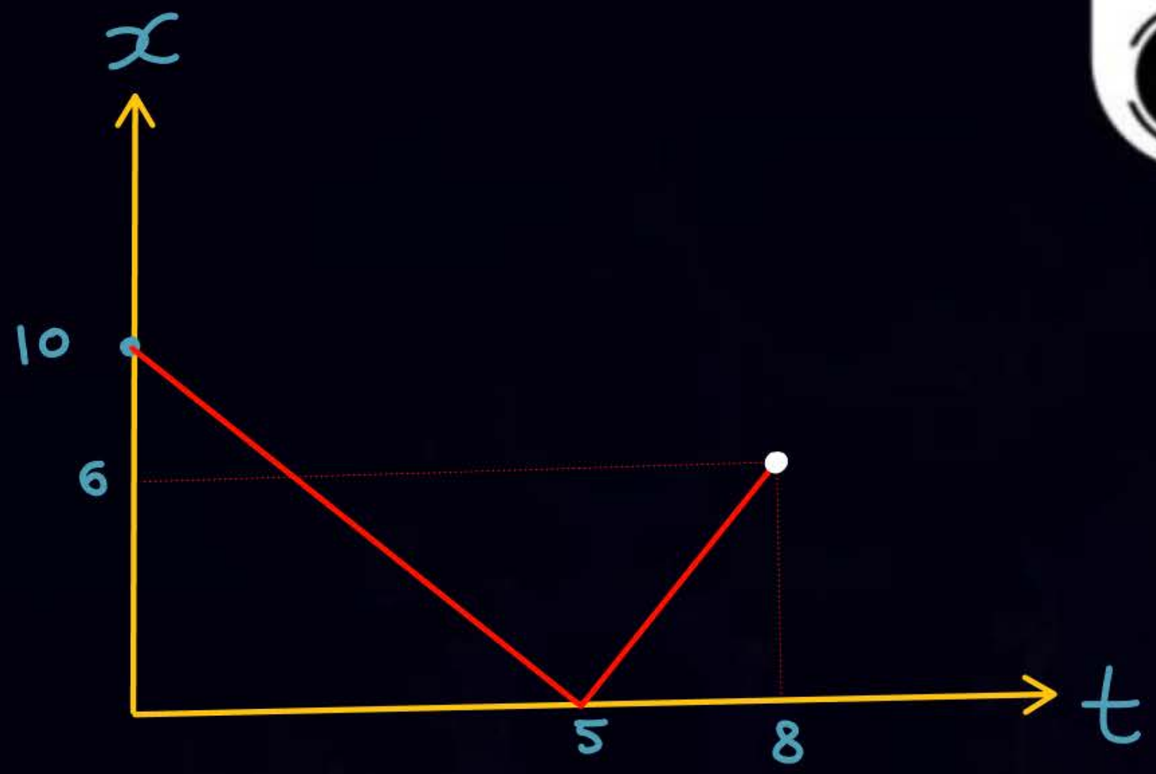
Displacement $= x_f - x_i$

$= 6 - 10 = -4\hat{i}$

Avrg Velocity $= \frac{-4\hat{i}}{8} = -\frac{1}{2}\hat{i}$

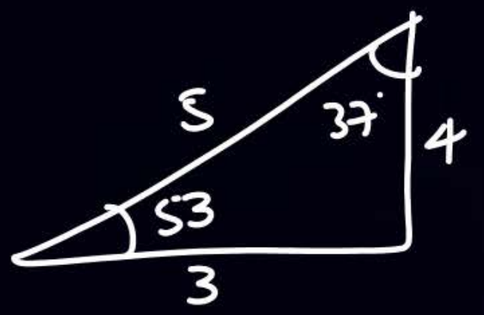
Distance =

Avrg speed =



$$10\cos 37^\circ = 8 = 10\sin 53^\circ$$

$$10\cos 53^\circ = 6 = 10\sin 37^\circ$$



$10\cos 53 = 10 \times \frac{3}{5} = 2 \times 3 = 6$

$\cos 37^\circ = \frac{4}{5}$

$\cos 53 = \frac{3}{5}$

$\sin 37 = \frac{3}{5}$

$\sin 53 = 4/5$

$\theta \uparrow \sin\theta \uparrow$

Home work

- Complete your backlog
- module Prarambh ⇒ Ex. 1

Prabal → Ex. 2 ⇒ 1, 2 (4)

→ think

THANK YOU