YAKEEN NEET 2.0

2026

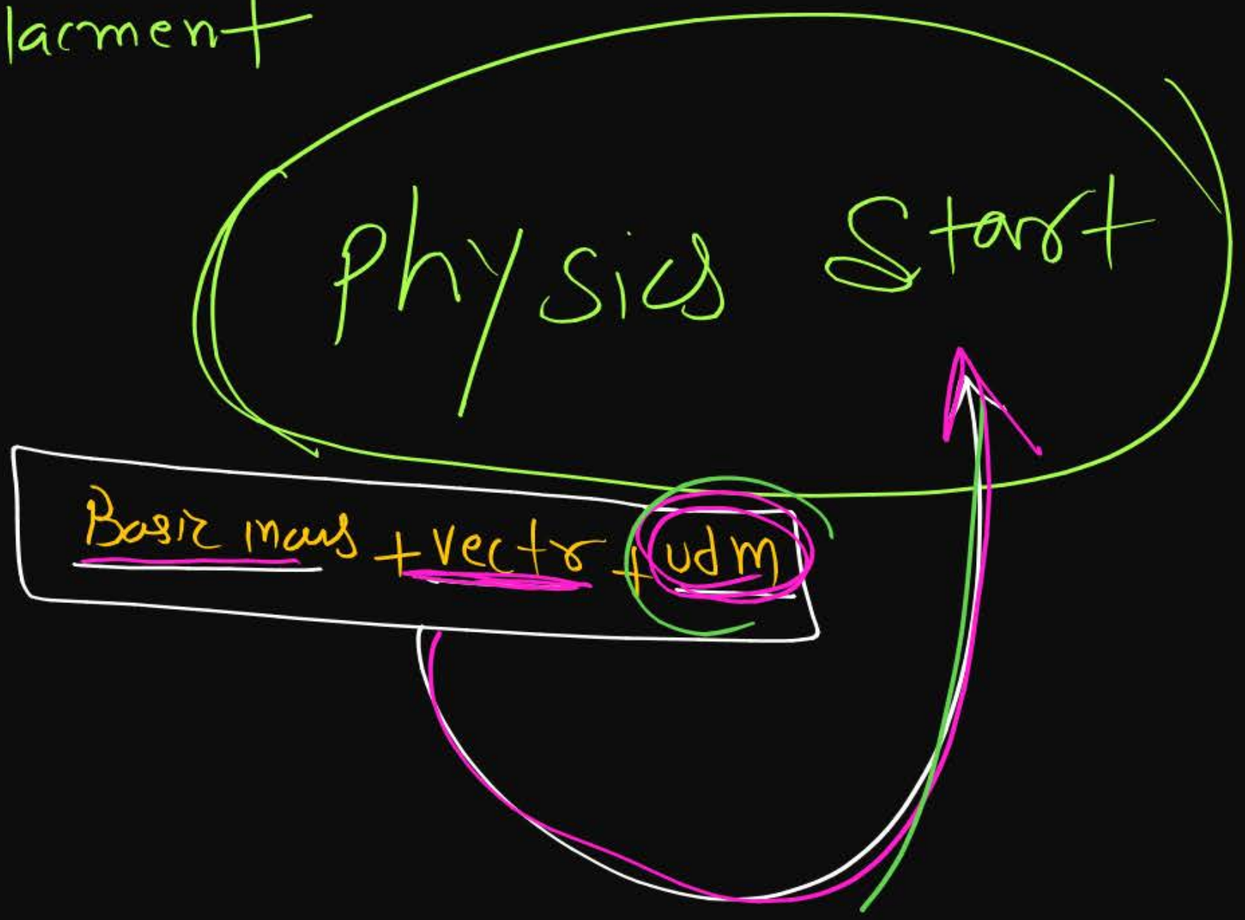
Motion in a Straight Line

Physics | Lecture - 01

By- Manish Raj (MR Sir)

Topics to be covered

1. # distance & displacment
2.
3.
4.



@MRPHYSICSS

Maha-manthan
(sheet)
Smart pdf

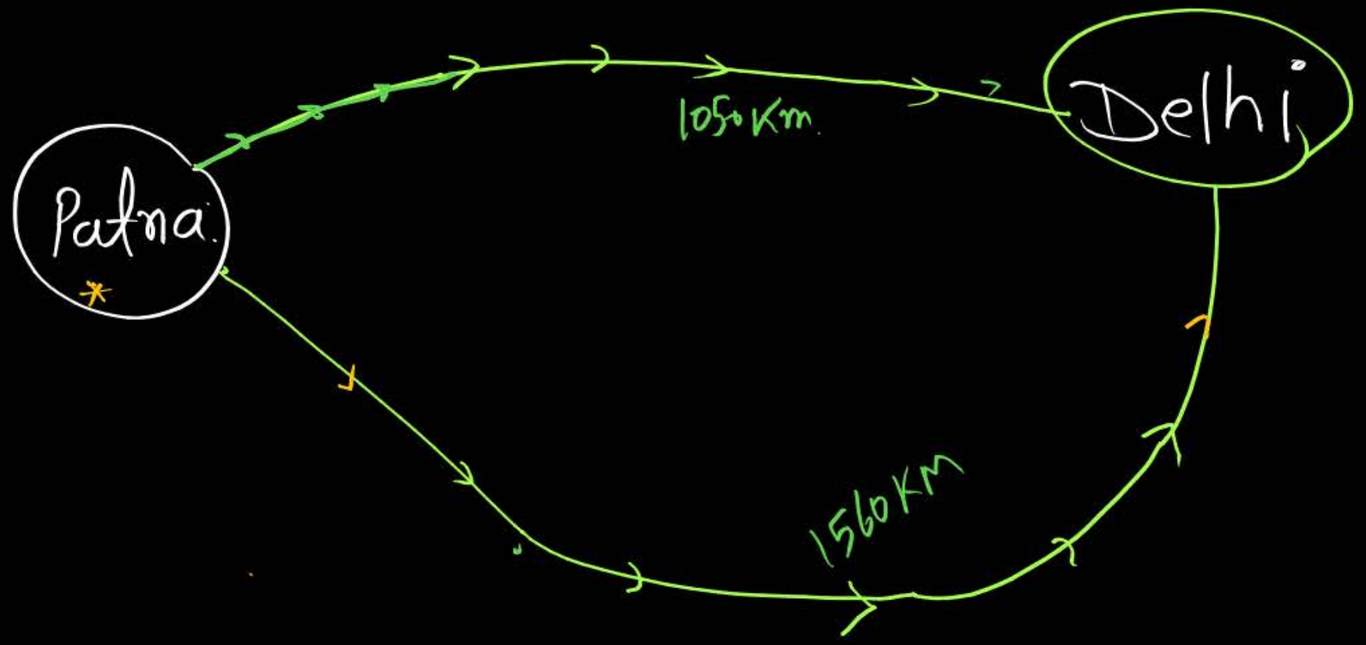
(Q) distance of delhi railways station is ??

Ans → wrong question. (frame or obstion given nahi hai)

(Q) distance of delhi railways station from Patna ??

Ans → 1050 km (wrong)

↳ also depend on path taken



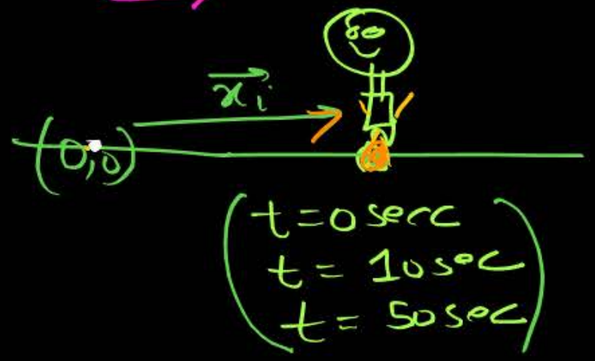
Frame of refrence → A place from where we take observation.

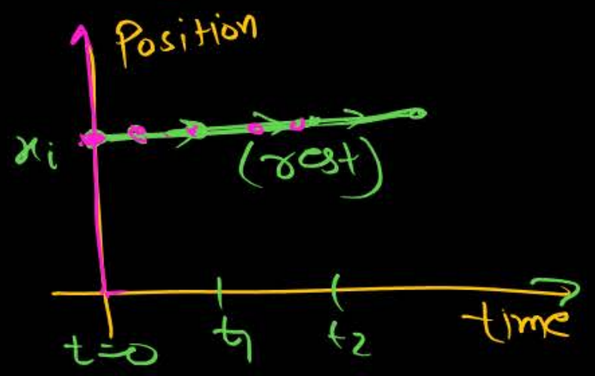
→ A person who take observation is called (observer).

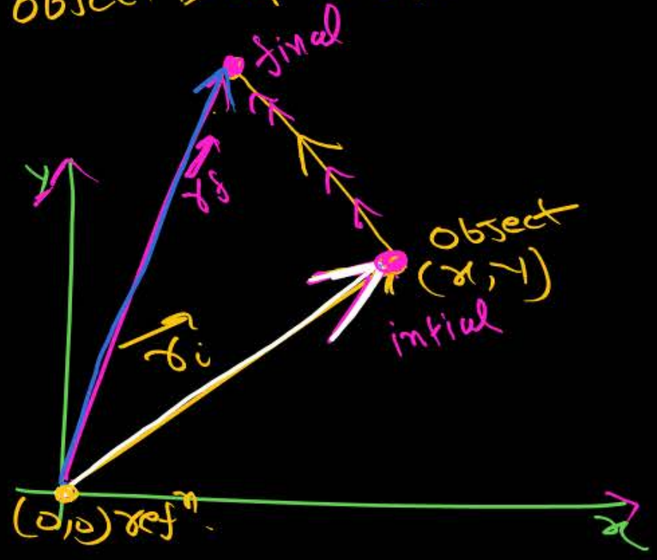
lift (frame of ref")

Position :⟶ Location of object w.r.t. fram of refrence or obsern c/t Positia.

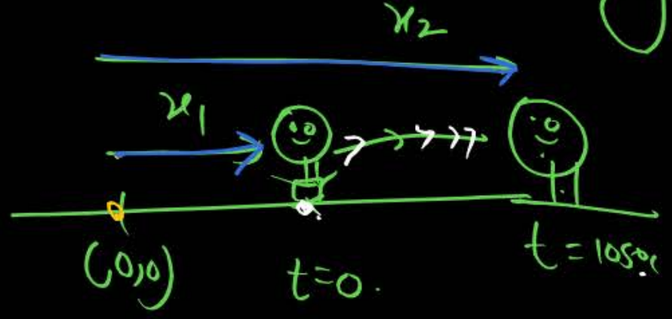
Position is Not changing with respect to time. then object is at rest :-

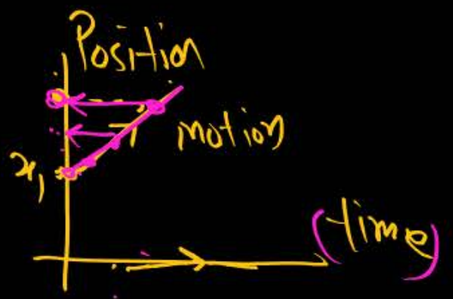


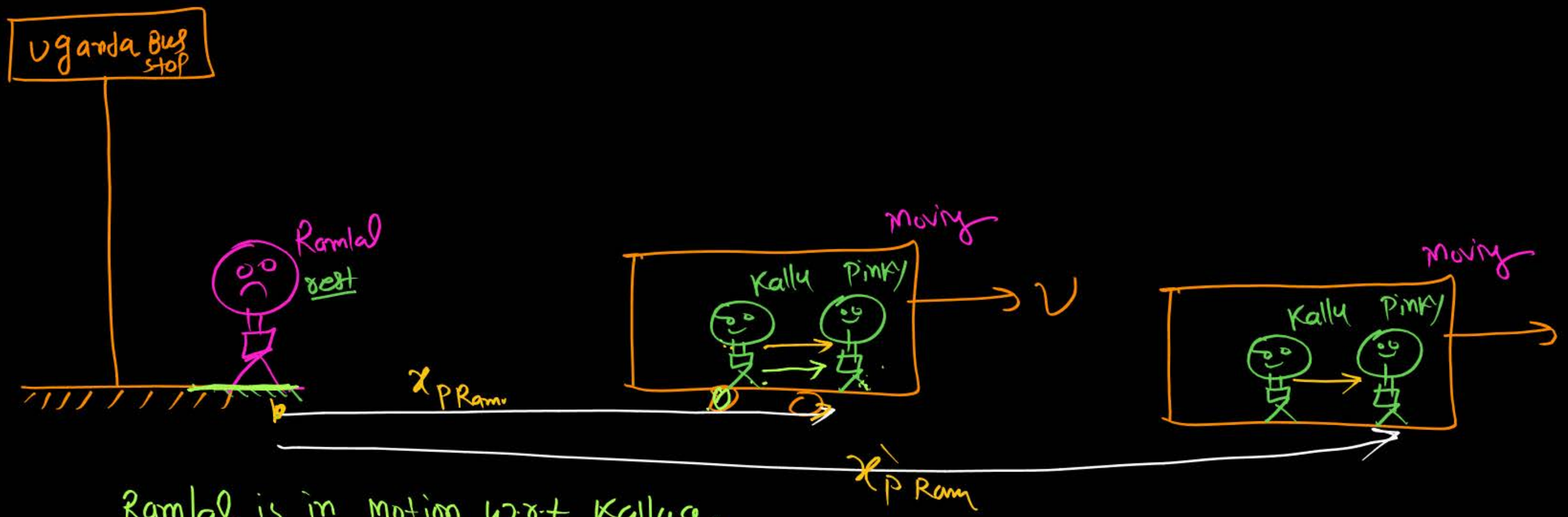




Position is changing with respect to time.
then Object is in motion.





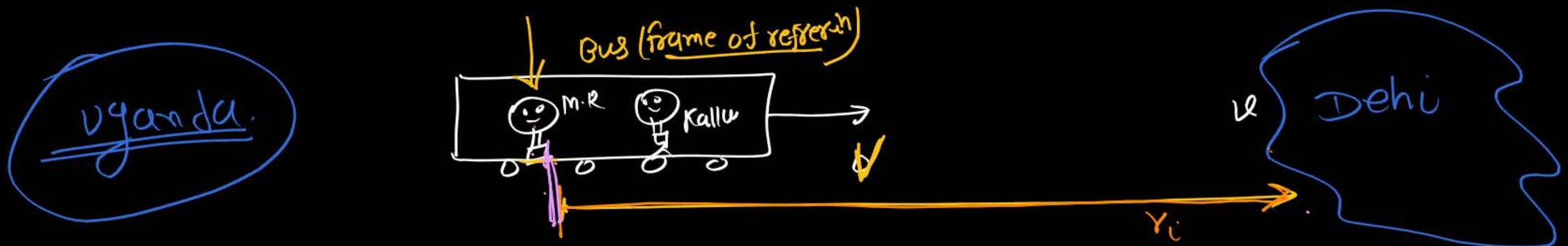


Ramlal is in motion w.r.t Kallua.

- Pinky is in motion w.r.t. Ramlal.
- Pinky is at rest w.r.t Kallua.

(#) Rest and motion are relative term (Not abosolute) relative w.r.t. observer/frame

(#) In this universe Nothing is at absolute rest or in absolute motion.



Kallua ask → Hey MR (observer) sir when Delhi (object) will come ??

Correct statement

observer (MR) → delhi is coming closer.

Observer always assume to be at rest.

Distance

सच में kiya gaya Sangharsh (disp^{n} does not matter)

→ (actual) Path length. B/w intial & final Position.

→ How far you moved ✓

→ depends on Path taken. (diff^{n} for all three Path)

→ Can't decrease with time.

→ [Scalar]

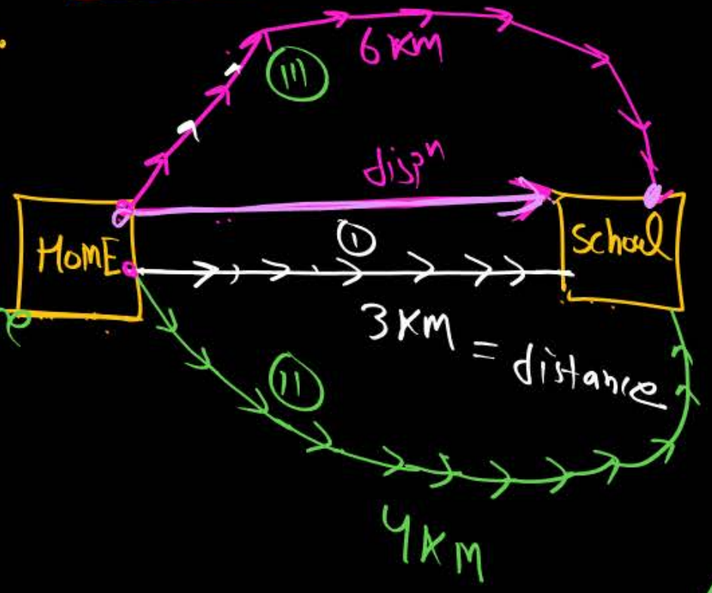
→ always additive in nature

→ Can't be -ve.

→ zero, or Positive value

→ Unit (metre) ✓

Mr. Box
Jab tak actual Path Nahi Pata distance moved Nahi Nikal Sakte.



Displacement

→ (does not depends on Path taken B/w Two Point.

→ vector

→ shortest distance B/w intial & final Position. ✓

→ [Change in Position]

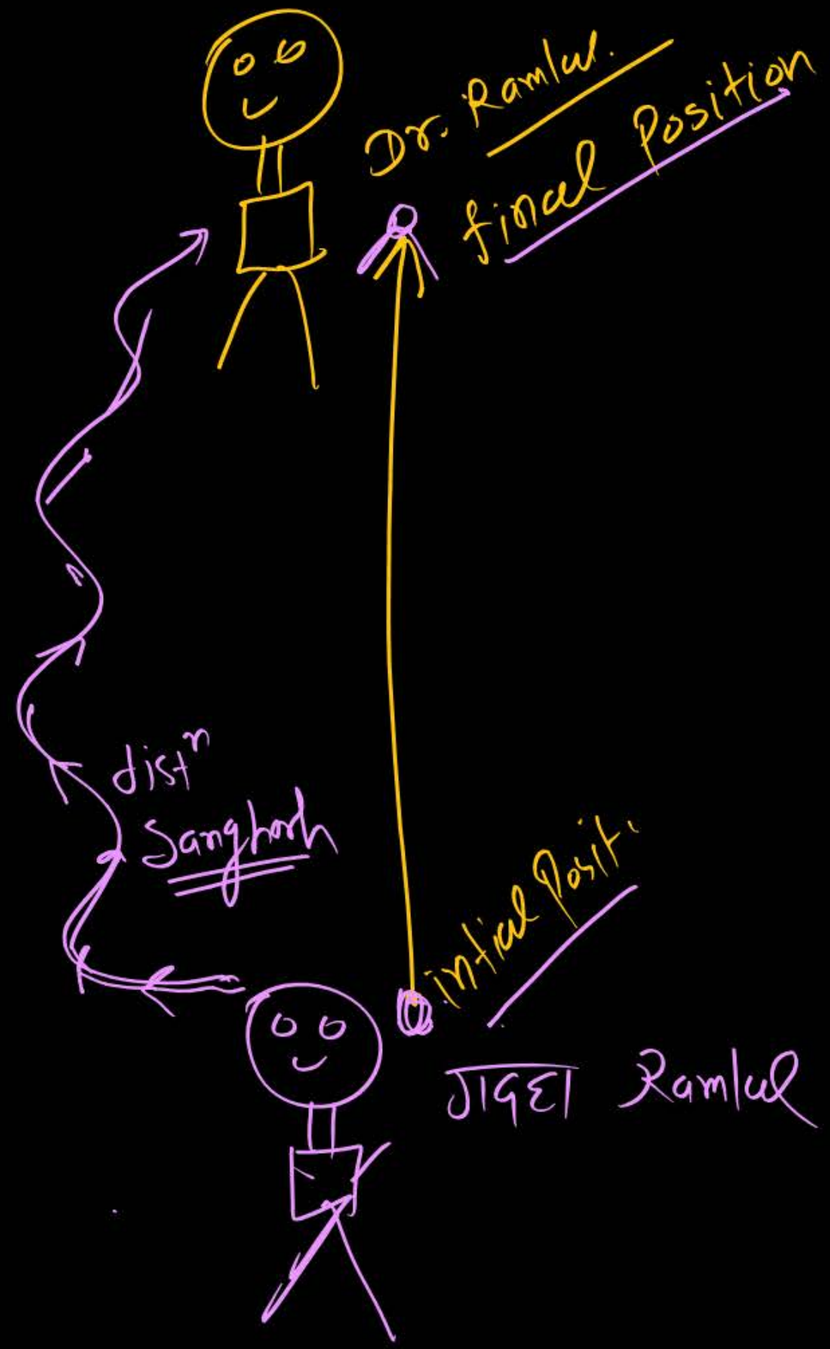
(intial Position se final Position ko straight line se mila do wo disp^{m} hoga)

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

Can be +ve, -ve or zero.

disp^{m} same in all three Path.

→ can decrease with time.



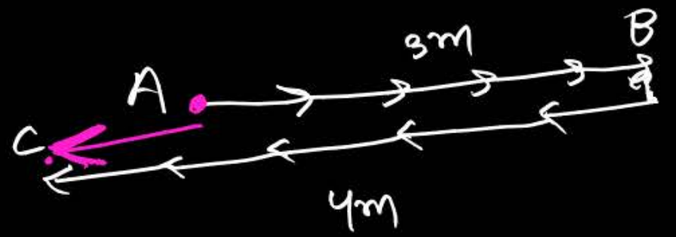
MR* → displm Calculate Karne ke liye intial & final Position pata hona chahiye.

$|\text{disp}^m|_{AC} = 3+4 = 7m$

distance $= 7m$

for any motion

$\text{dist}^n \geq |\text{disp}^n|$



$\text{disp}^m = 3+4 = 7m$

$\text{disp}^m = -1m$

$|\text{disp}^n| = 1m$

$|\text{disp}^n| < \text{dist}^n$

* distance $= |\text{disp}^m|$

→ If object is moving in 1-D without change in direction.

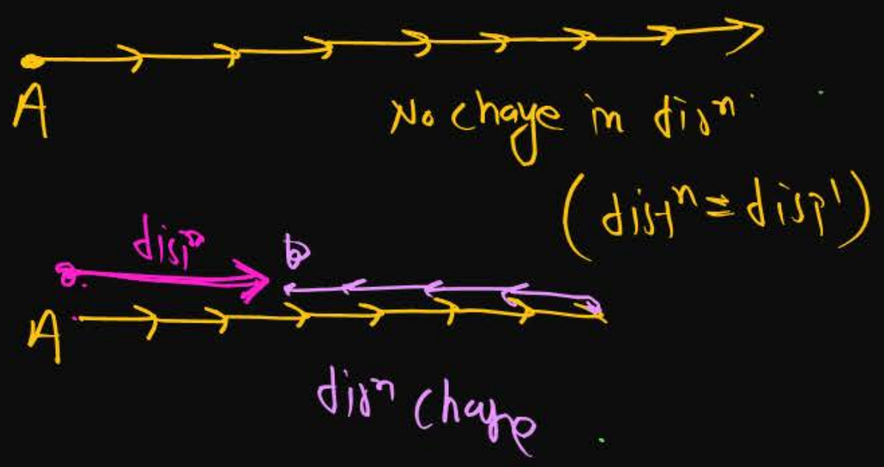
* If object is changing it dist^n

$|\text{disp}^m| < \text{dist}^n$

Question

Which of the following option is correct for motion in 1-D

1. distance = | disp^m | (53% wrong)
2. distance > | disp^m |
3. distance $\geq$ | disp^m | only (40%)
4. distance < | disp^m |



Question

Which of the following option is correct for motion in 1-D, without change in direction.

No chge in dirⁿ

1. distance = | dispᵐ |
2. distance > | dispᵐ |
3. distance ≥ | dispᵐ |
4. distance < | dispᵐ |

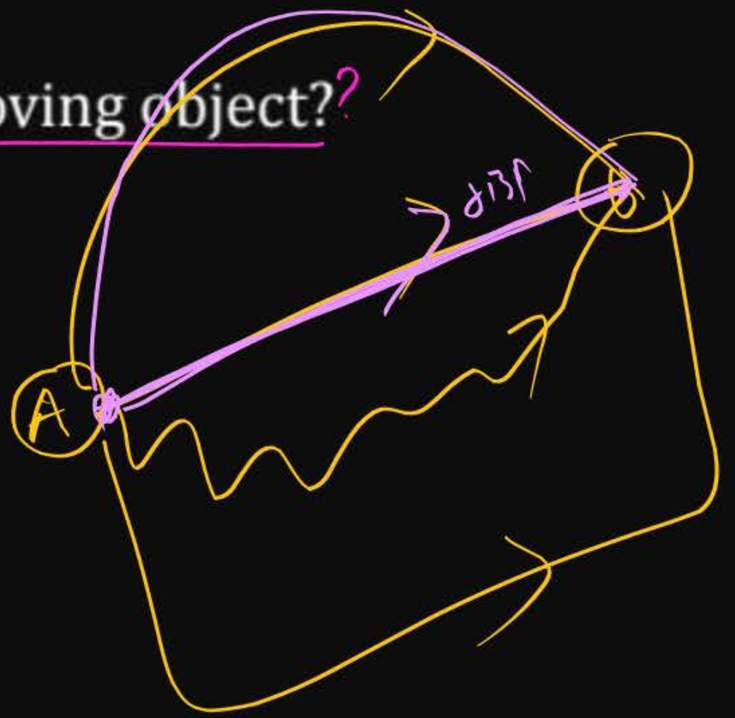
Question

Which of the following option is correct for motion in 1–D, with change in direction.

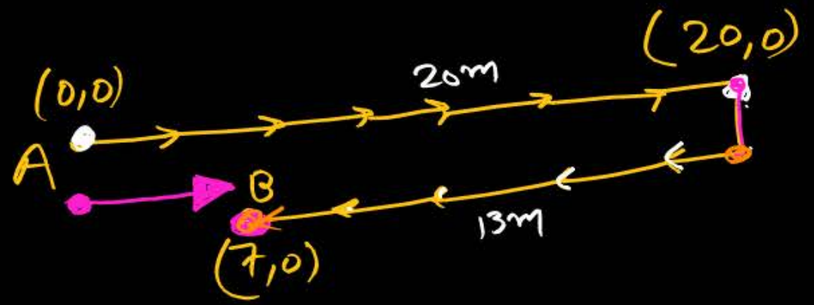
1. distance = | disp^m |
2. distance > | disp^m |
3. distance ≥ | disp^m |
4. distance < | disp^m |

Question

Which of the following option is never correct for a moving object?



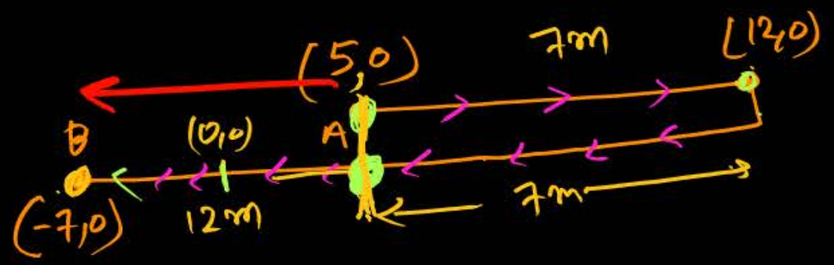
1. distance = | $disp^m$ |
2. distance > | $disp^m$ |
3. distance ≥ | $disp^m$ |
4. distance < | $disp^m$ | (always wrong)



distance = 33m (accutual Path length)

$disp^m$ = (7 − 0)

= 7m ($disp^m$)



distance = 7 + 7 + 12

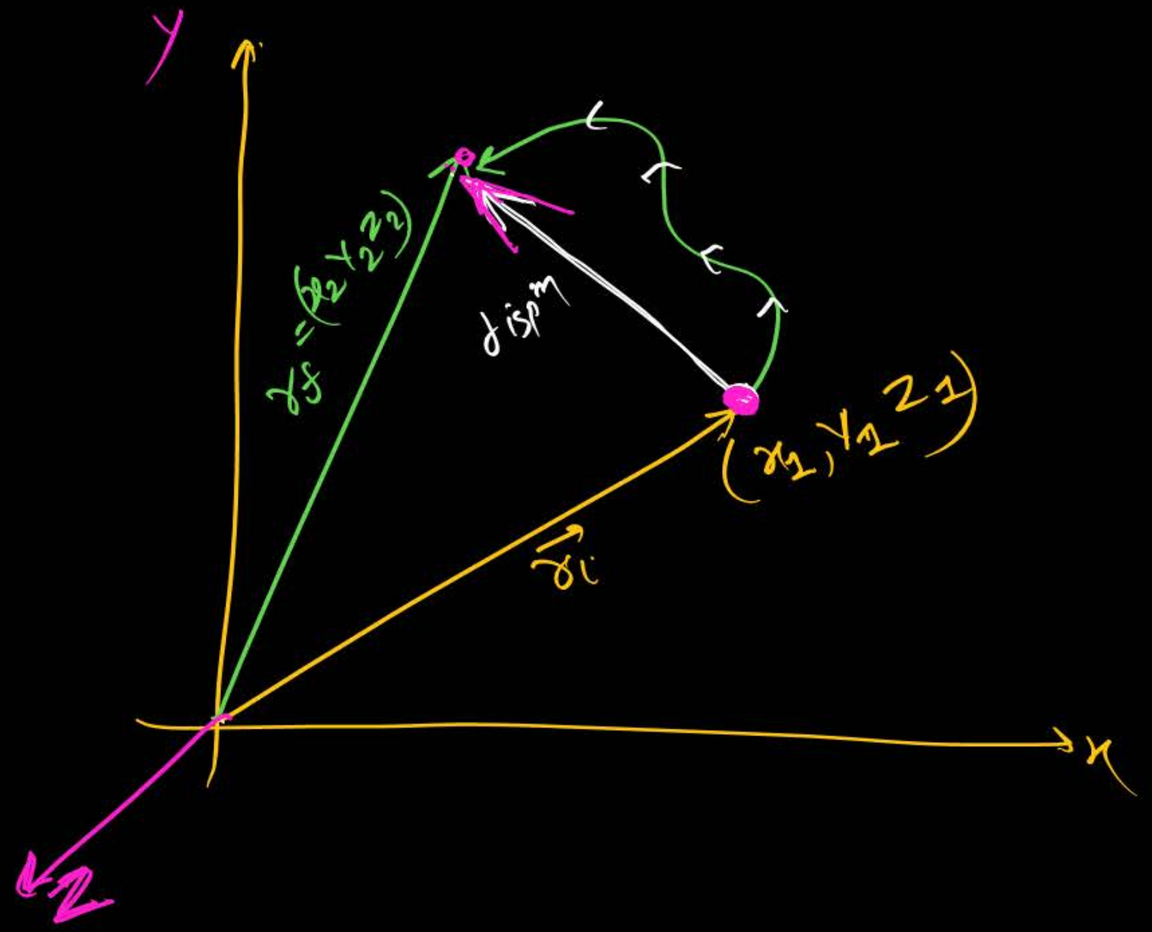
= 14 + 12 = 26m

$disp^n$ = −7 − (+5)

= −7 − 5

= −12m

displacemt in vectog form



$$\vec{r}_i + \vec{s} = \vec{r}_f$$

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

$$= (x_2 i + y_2 \hat{j} + z_2 \hat{k}) - (x_1 i + y_1 \hat{j} + z_1 \hat{k})$$

$$\vec{s} = (x_2 - x_1) i + (y_2 - y_1) \hat{j} + (z_2 - z_1) \hat{k}$$

$$|\vec{s}| = \sqrt{(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2}$$

(Q) intial position of object $(2,3,7)$ & final position is $(5,7,7)$ then find distance & disp^{m}.

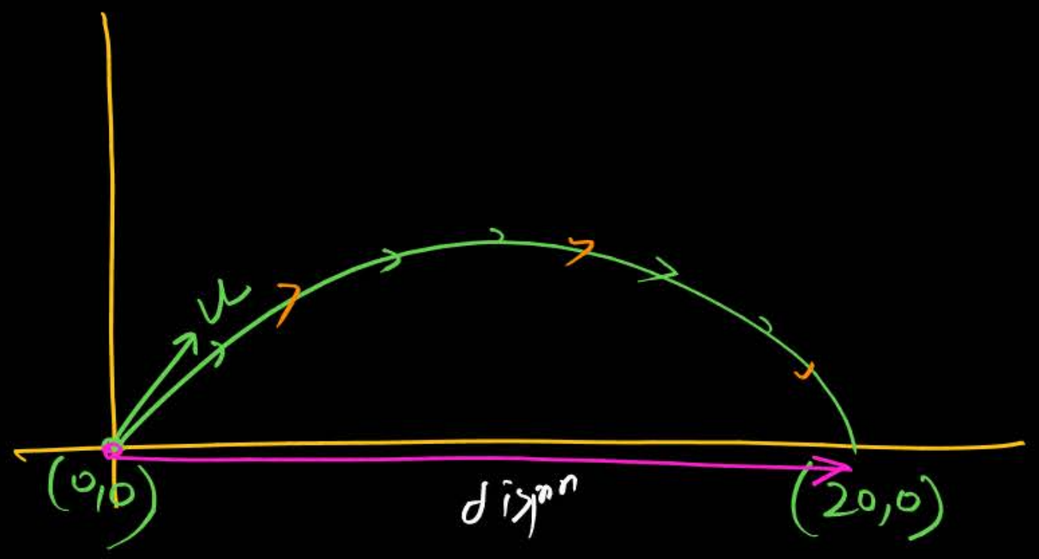
Sol^{n}

distance → can't be calculate ✓ because Path is not given.

$$\text{disp}^{m} = (5-2)\,i + (7-3)\,\hat{j} + (7-7)\,\hat{k}$$

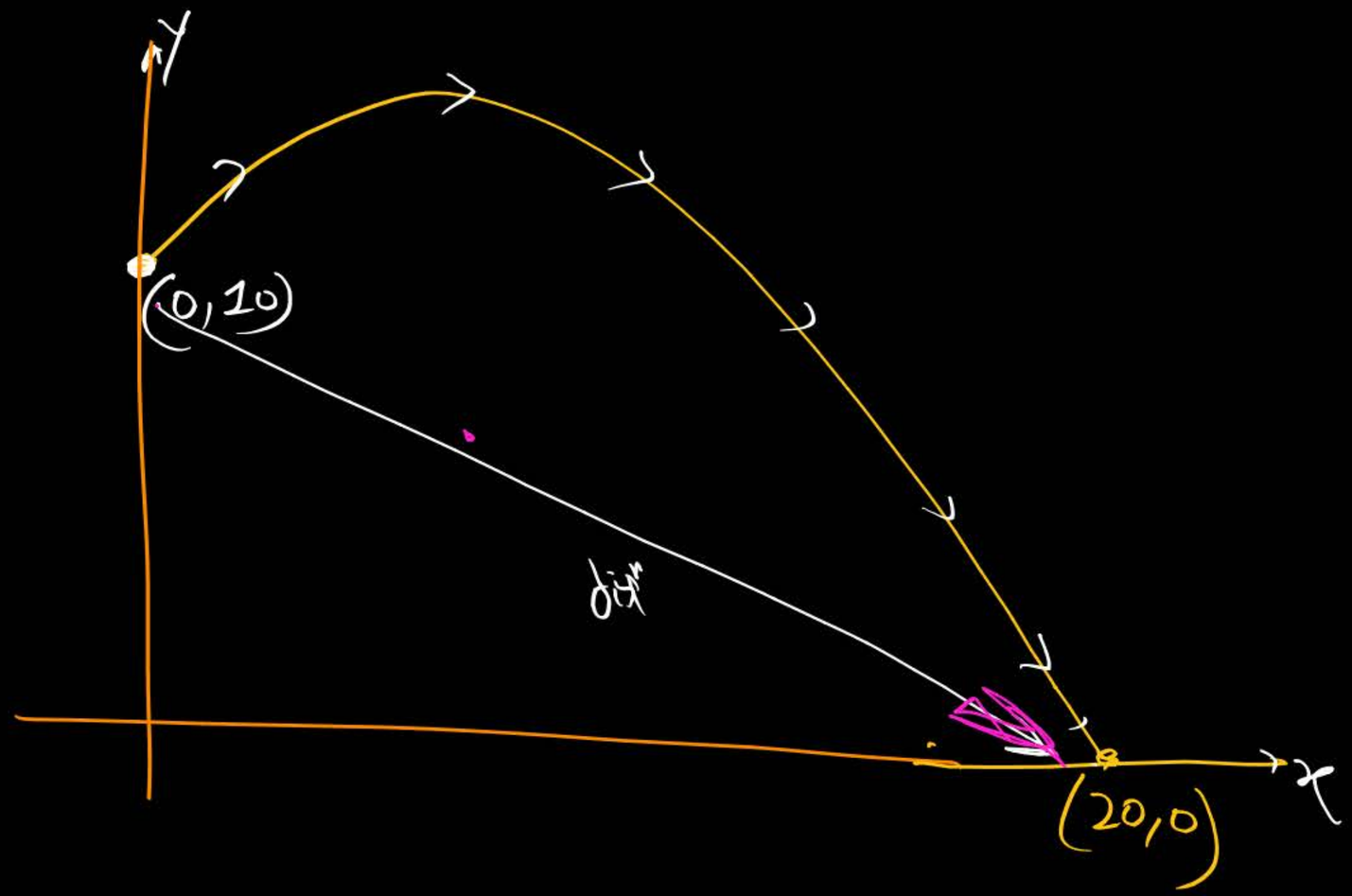
$$\vec{s} = 3i + 4\hat{j} + 0\hat{k}$$

$$|\vec{s}| = \sqrt{(3)^2 + (4)^2} = \sqrt{25} = 5\,m.$$



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

$$disp = 20\hat{i}$$



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

$$= 20\hat{i} - 10\hat{j}$$

$$|\text{disp}^n| = \sqrt{(20)^2 + (-10)^2}$$

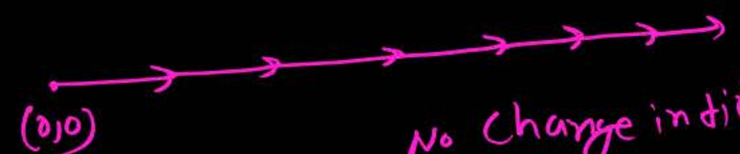
$$= \sqrt{500}\ \underline{\underline{m}}$$

rest (हिला हि नही)

•

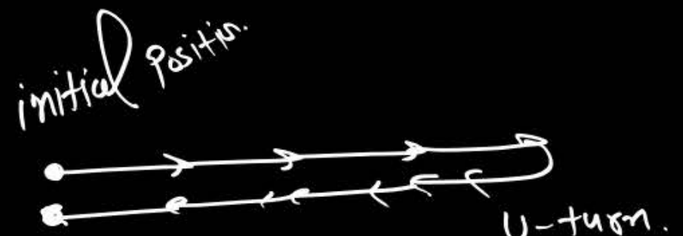
$dist^n = 0$

$disp^n = 0$



No Change in dir^n.

$dist^n = |disp^n| \neq 0$



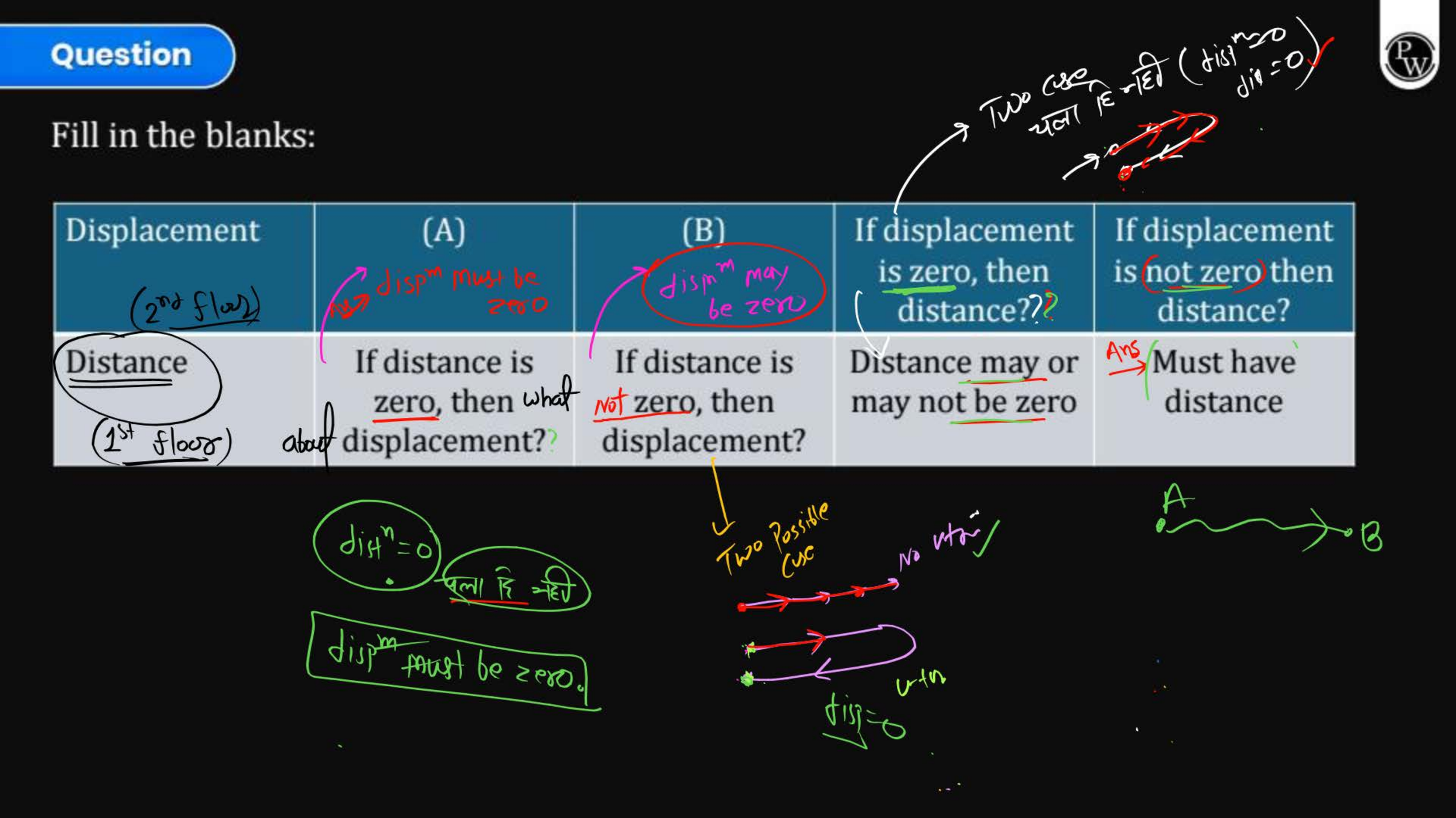
$disp^n = 0$

$dist^n \neq 0$

Question

Fill in the blanks:

Displacement	(A)	(B)	If displacement is zero, then distance??	If displacement is not zero then distance?
Distance	If distance is zero, then what about displacement?	If distance is Not zero, then displacement?	Distance may or may not be zero	Must have distance



Question

The displacement of a body is zero then distance??

→ Ans → May have some dist^n

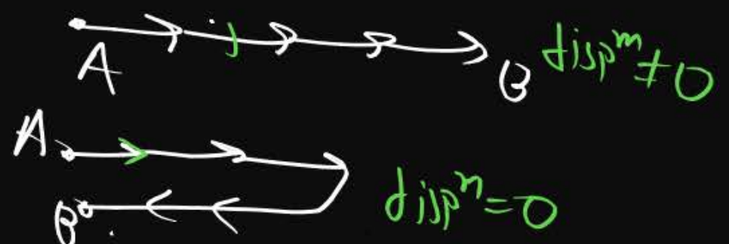
Two Possible case

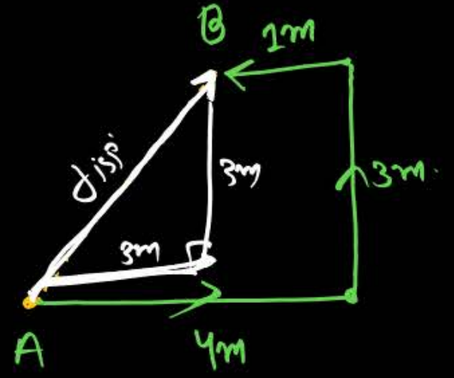
- object चलता है नहीं
- or, initial & final same है

The distance is not zero, then displacement?

→ may or may not be zero.

Two case



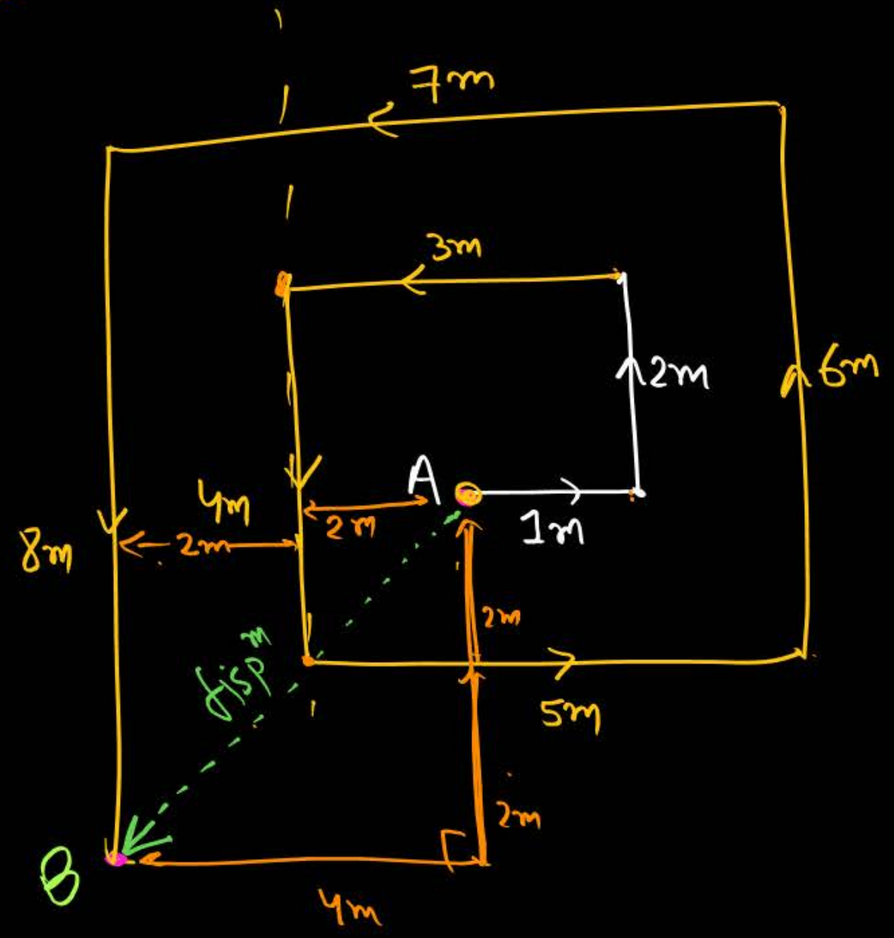


distance $= 8m$

$\text{disp}^m = 3\sqrt{2}$.

$= \sqrt{18}\ m$.

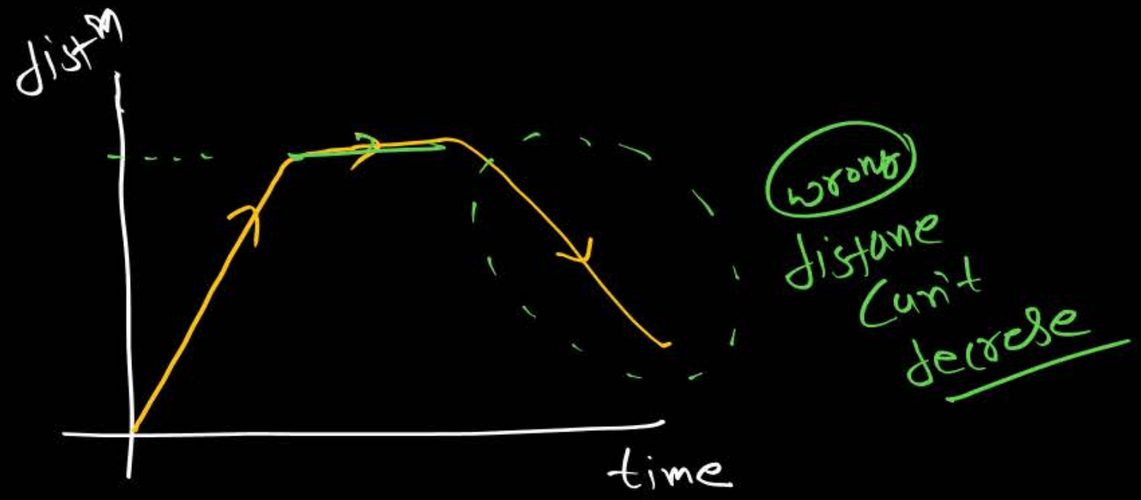
MR* question

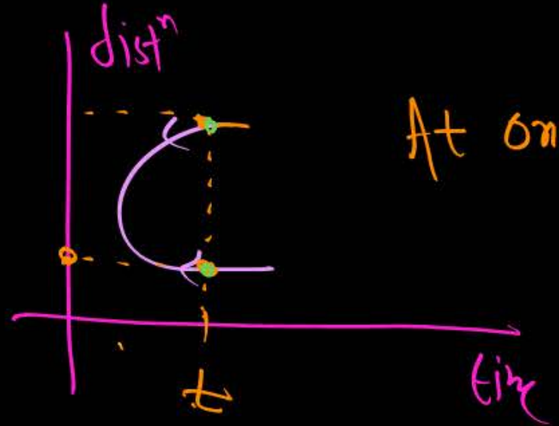


$dist^n = 15 + 11 + 7 + 3$

$= 36m$

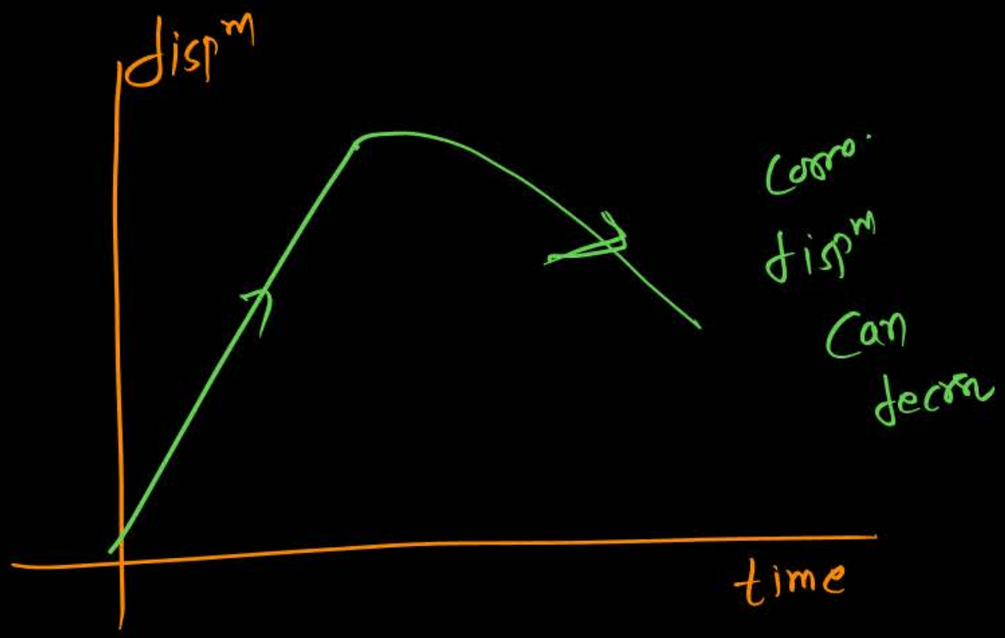
$|disp^n| = 4\sqrt{2}$

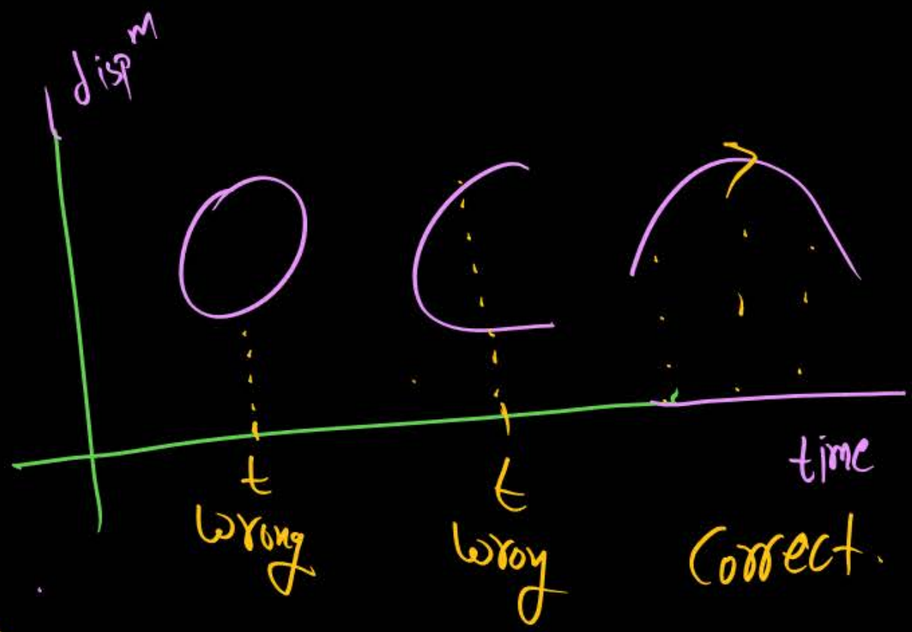




At one time two distance is not Possible

↑ Correct disp^m can be -ve





Question

H/W

The numerical ratio of displacement to distance is:

1. always less than 1
2. always greater than 1
3. always equal to 1
4. may be less than 1 or equal to 1

Question

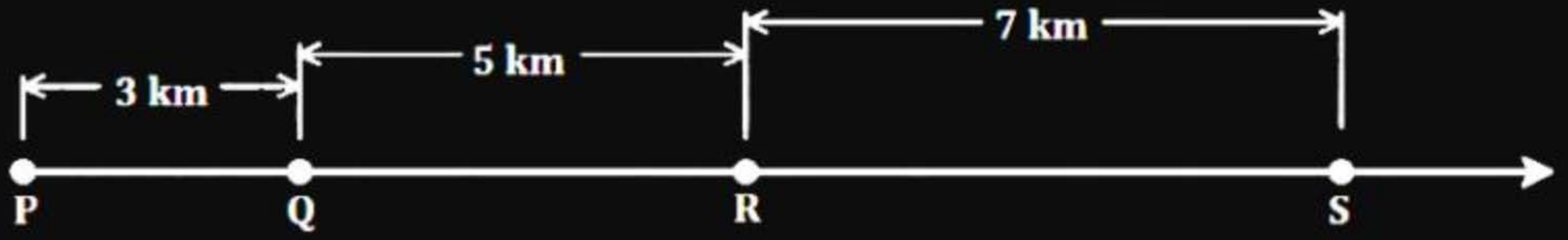
A particle starts from the origin, goes along the X-axis to the point (20m, 0) and then returns along the same line to the point (–20 m, 0). Find the distance and displacement of the particle during the trip.

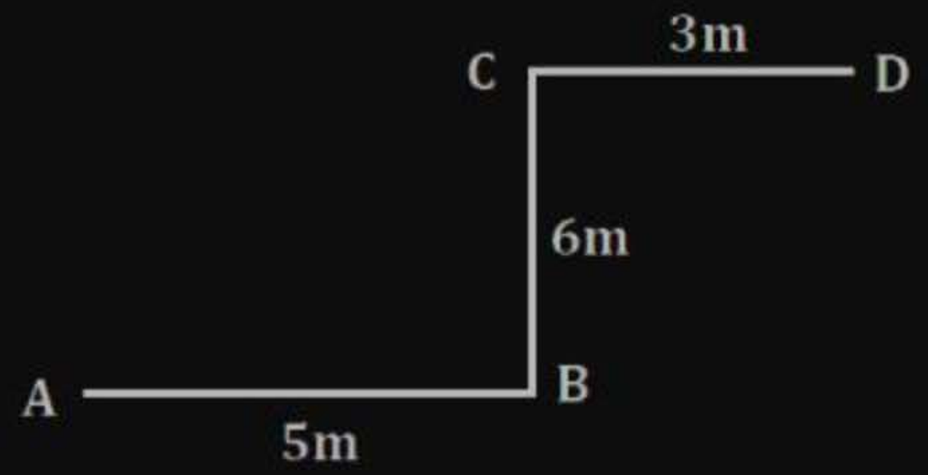
Question

A car moving along in a straight highway from point P to point Q to point R and to point S, then back to point Q and finally to the point R as shown in the figure below.

(a) Find the distance travelled by car.

(b) Find the displacement of the car.




3m
C
D
6m
A
B
5m

Question

A man has to go 50 m due North, 40 m due East and 20 m due South to reach the field?

(a) What distance he has to walk to reach the field?

(b) What is his displacement from his house to the field?

Question

A student moves 10m towards east then 20m south and then $20\sqrt{2}$ north east then find displacement?

Question

If initial position of object (2, 6, 9) and final position (8, –2, 19) then find displacement and distance

Question

A carrom board (4 ft × 4 ft square) has the queen at the centre. The queen, hit by the striker moves to the front edge, rebounds and goes in the hole behind the striking line. Find the magnitude of displacement of the queen

(a) From the centre to the front edge

(b) From the front edge to the hole and

(c) From the centre to the hole.

THANK YOU