YAKEEN NEET 2.0

2026

Motion in a Plane

PHYSICS | Lecture – 08

By – Saleem Ahmed Sir

Todays Goal

- Relative motion.

ques →

Saturday को $\int$ वाला lecture भेजा था

(A) Dekh lia poora

(B) (50-70)% dekha

(C) (10-50)% "

(D) Dekha Nahi hai

36%

KPP-17
KPP-18 (Kal)

(A) Full try = 27%.

(B) Partial = 26%.

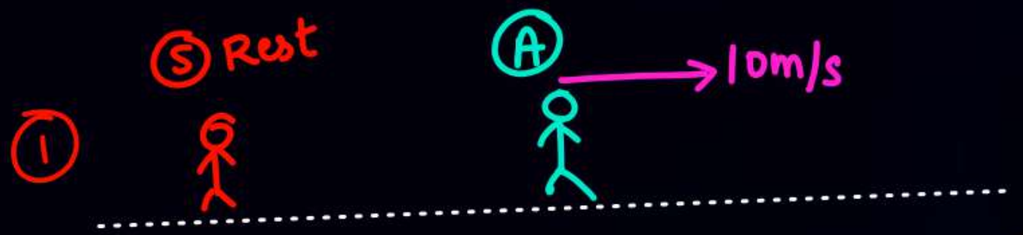
(C) Try hi Nahi Kia 41%.

April 8-10%.

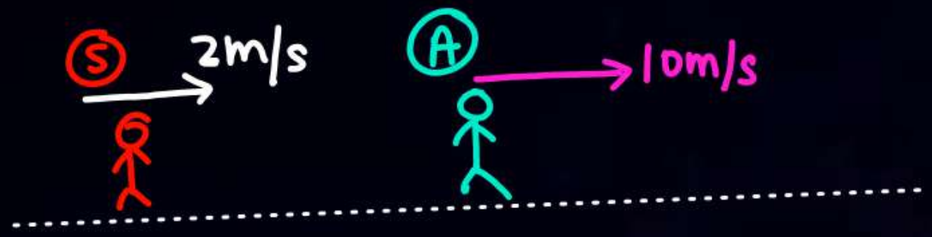
सभी का Selection
All 100%.

Relative motion

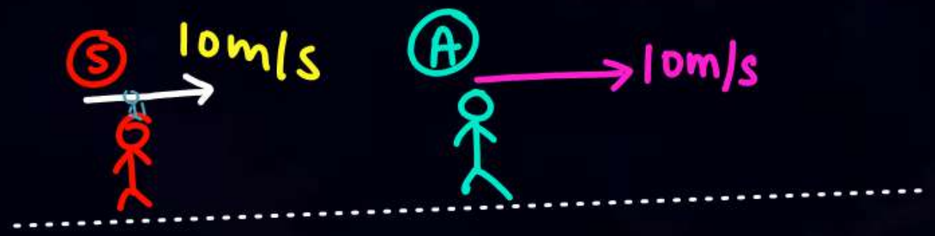
- Rest & motion are relative term.



Velocity of A wrt S = $10\,m/s\,\hat{i}$



Velocity of A wrt S = $10 - 2 = 8\,m/s$

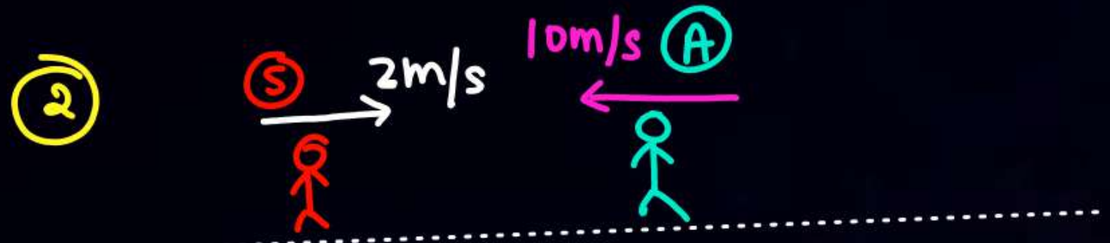


Velocity of A wrt S = 0

Relative motion

- Rest & motion are relative term.

Velocity of A wrt S = 10m/s (Peeche) $= -10\hat{i}$



Velocity of A wrt S = 12 (Peeche) $= 12(-\hat{i})$

$$\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B$$

→ Velocity of A wrt B

- A ki velocity B ke respect me
- B की खोपड़ी पर बैठकर A को ताड़ना
  " " " " " observe karna
- B ki khopdi par baithkar A KO observe karna.

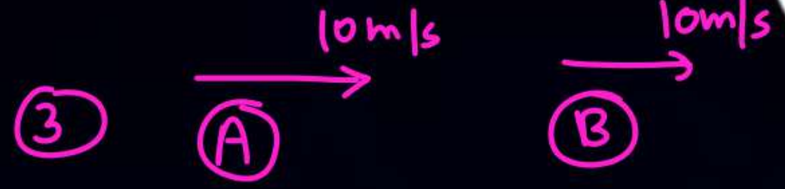
Q

① 

$$\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B = 10\hat{i} - 0 = 10\hat{i}$$

② 

$$\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B = 10\hat{i} - 2\hat{i} = 8\hat{i}$$

③ 

$$\vec{v}_{B/A} = 10\hat{i} - 10\hat{i} = 0$$

④ 

$$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A$$

$$= (+10) - (-2) = 12\hat{i}$$

- $\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B$ = B के Respect में A की Velocity
- $\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A$ = A के Respect में B की Velocity
- $\vec{v}_{P/Q} = \vec{v}_P - \vec{v}_Q$
- $\vec{v}_{P/T} = \vec{v}_P - \vec{v}_T$
- $\vec{v}_{G/B} = \vec{v}_G - \vec{v}_B$

(5)

$\vec{v}_{B/A} = 15-10 = 5\hat{i}$

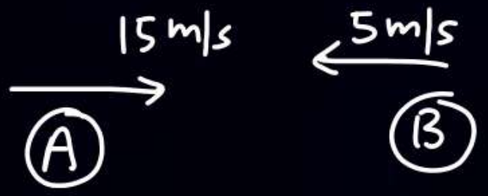
$\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B = 10-15 = -5$

(6)

$\vec{v}_{B/A} = 4-20 = -16$

$\vec{v}_{A/B} = 20-4 = 16$

(7)



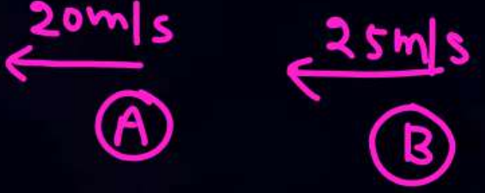
$\vec{v}_{B/A} = (-5\hat{i}) - (+15\hat{i}) = -20\hat{i}$

$\vec{v}_{A/B} = 15\hat{i} - (-5\hat{i}) = 20\hat{i}$

(8)

$\vec{v}_{B/A} = 5-(-20) = 25\hat{i}$

(9)



$\vec{v}_{B/A} = -25-(-20) = -5$

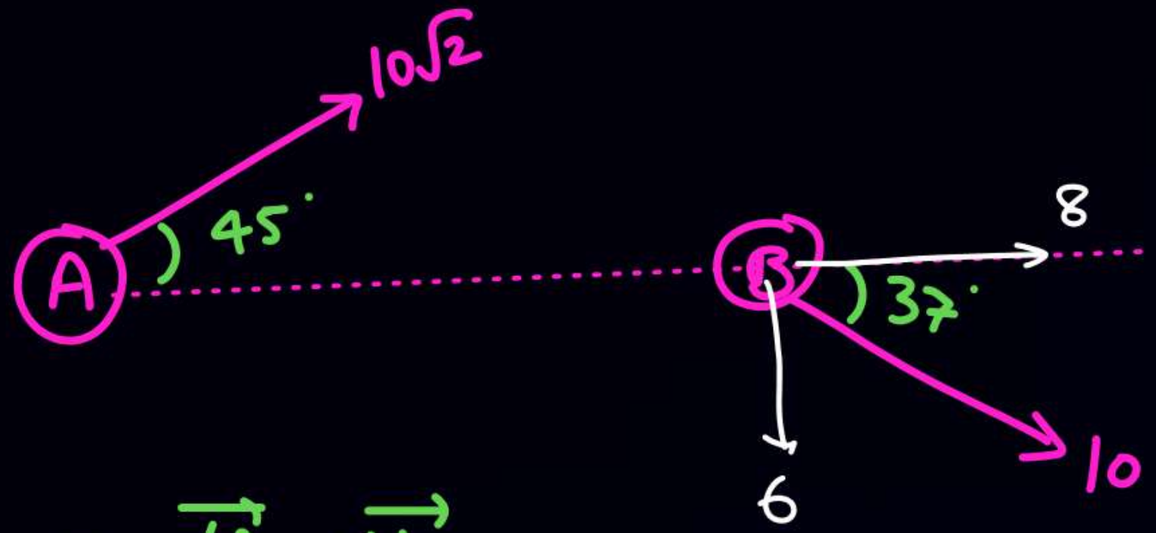
Q 

$$\vec{v}_{A/B} = v_A - v_B = 10 - 2 = 8$$

m-2 B की velocity reverse करके A में जोड़ दो

$$\vec{v}_{A/B} = 10 + (-2) = 8$$

Q



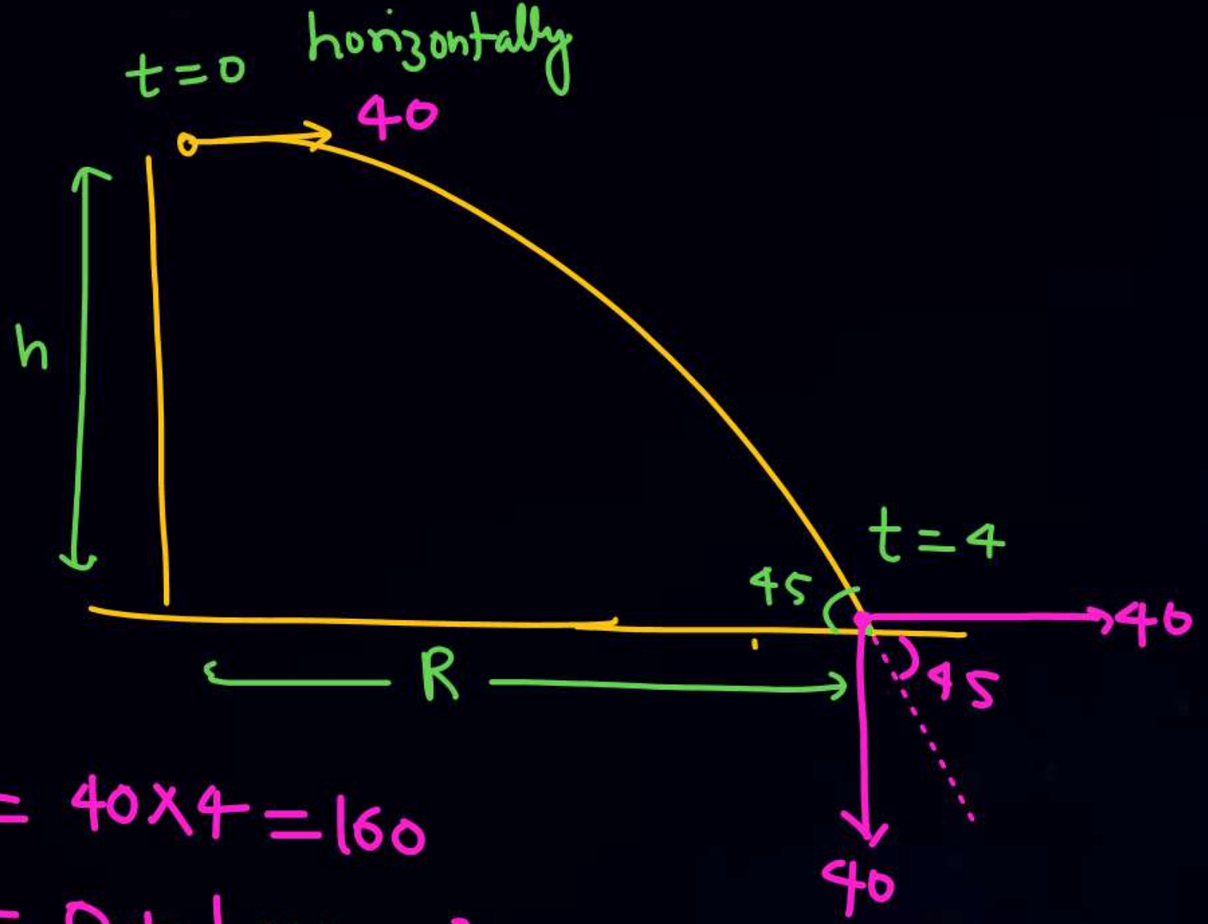
$$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A$$

$$= (8\hat{i} - 6\hat{j}) - (10\hat{i} + 10\hat{j})$$

$$= -2\hat{i} - 16\hat{j}$$

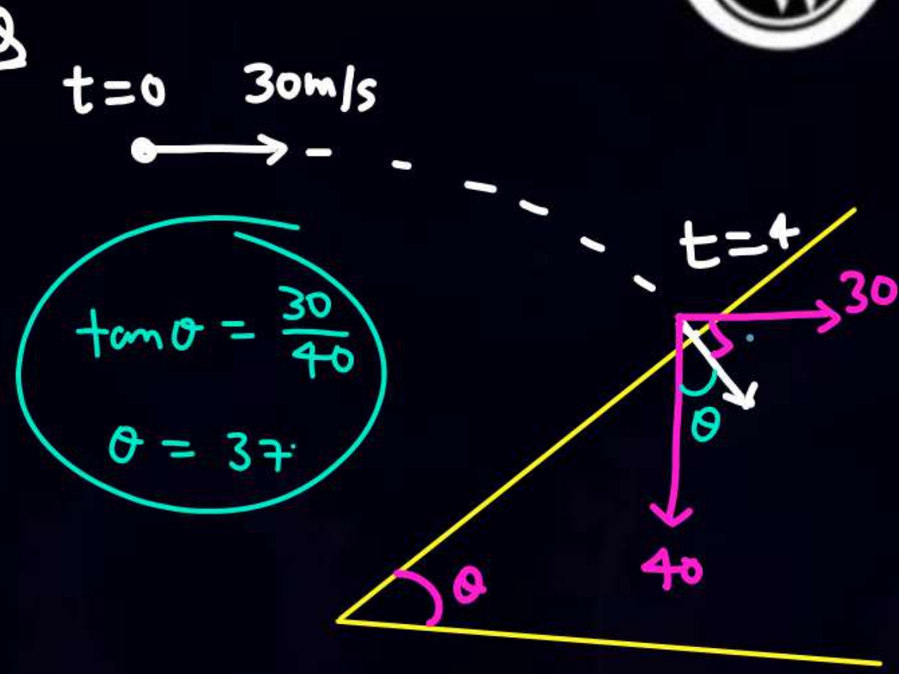
$$\vec{v}_{\text{गुब्बारा/man}} = (40\hat{i} + 40\hat{j}) - (-20\hat{i}) = \checkmark$$


θ

① 

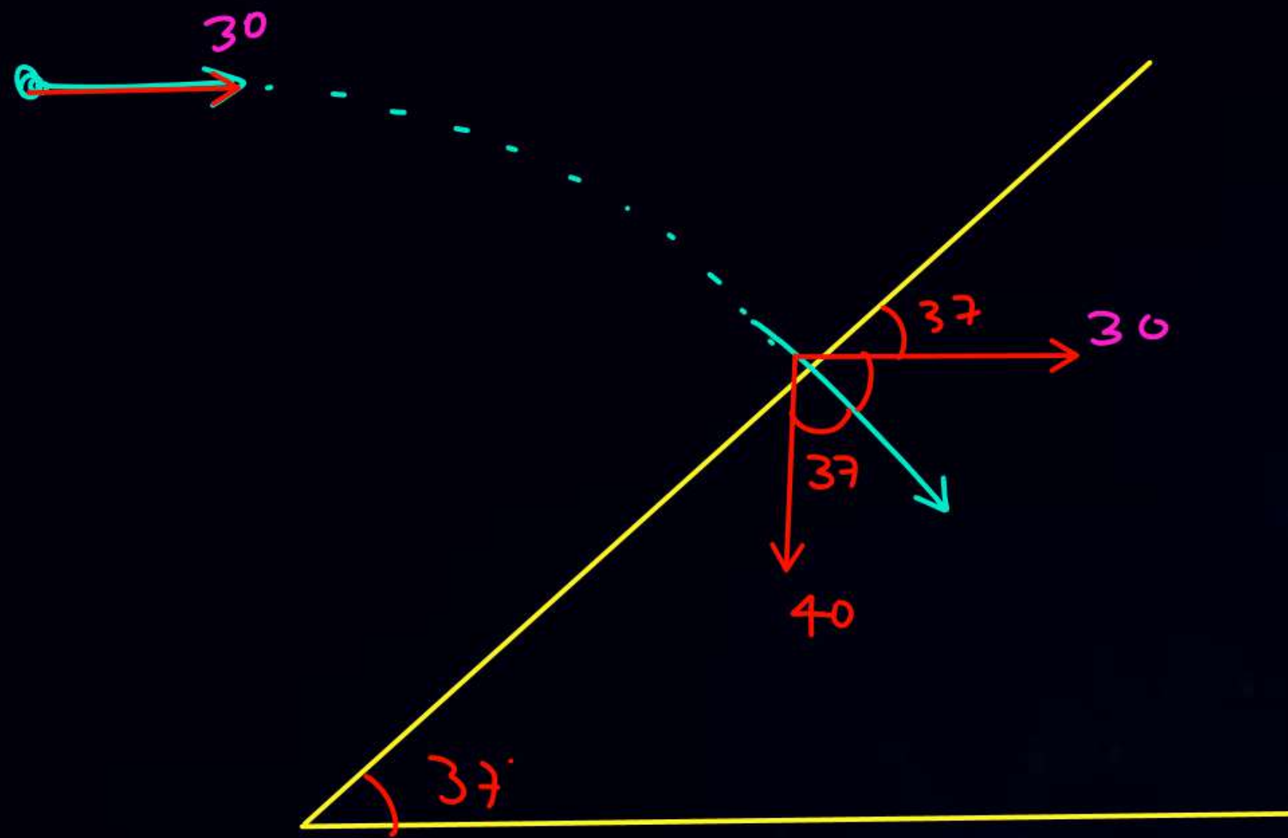
$R = 40 \times 4 = 160$

$h = 0 + \frac{1}{2} \times 10 \times 4^2 = 80$

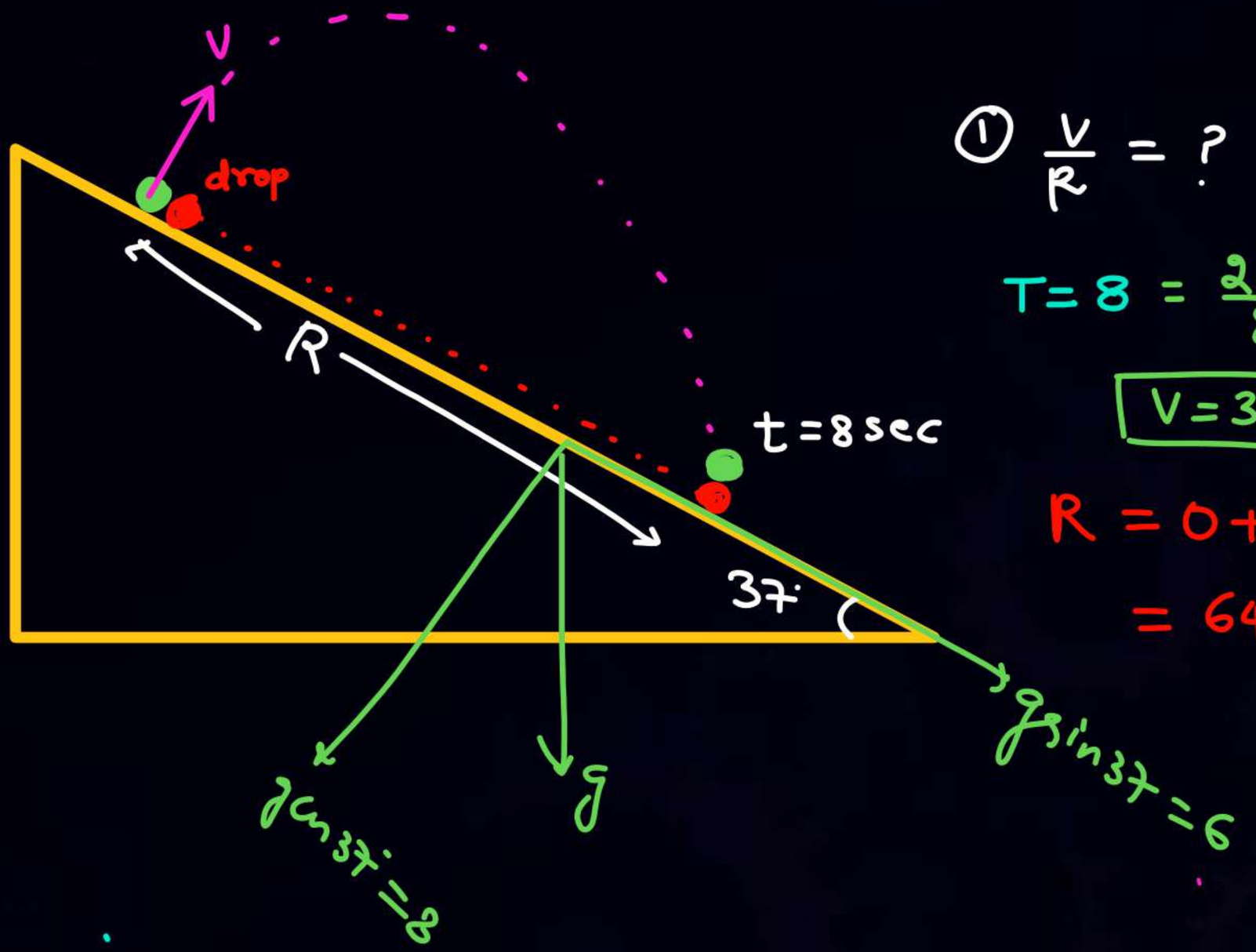
② 

$\tan\theta = \frac{30}{40}$

$\theta = 37^\circ$


30
37
30
37
40
37

Q



① $\frac{V}{R} = ?$

$T = 8 = \frac{2V}{8}$

$\boxed{V = 32}$

$R = 0 + \frac{1}{2} \times 6 \times 8^2$

$= 64 \times 3 = 192$

$\frac{V}{R} = \frac{32}{192}$

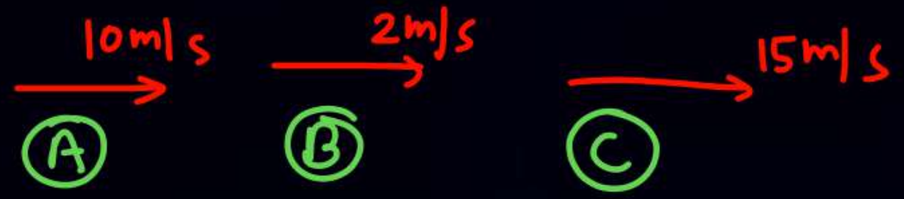
$= \frac{1}{6}$

(10)

$\vec{v}_{A/B} = 20 - 20 = 0$

* $\vec{v}_{A/B} = -\vec{v}_{B/A}$
* $\vec{v}_{A/B} = \vec{v}_A - \vec{v}_B$
* $\vec{v}_{A/B} = \vec{v}_{A/g} - \vec{v}_{B/g}$
* $\vec{v}_{A/B} = \vec{v}_{A/C} - \vec{v}_{B/C}$

(11)



$\vec{v}_{A/C} = 10 - 15 = -5\hat{i}$

$\vec{v}_{C/A} = 15 - 10 = 5\hat{i}$

$\vec{v}_{C/B} = 15 - 2 = 13\hat{i}$

$\vec{v}_{A/B} = 10 - 2 = 8\hat{i}$

$\vec{v}_{B/A} = 2 - 10 = -8\hat{i}$

$\vec{v}_{A/C} = -5\hat{i}$

$\vec{v}_{B/C} = 2 - 15$

$= -13\hat{i}$

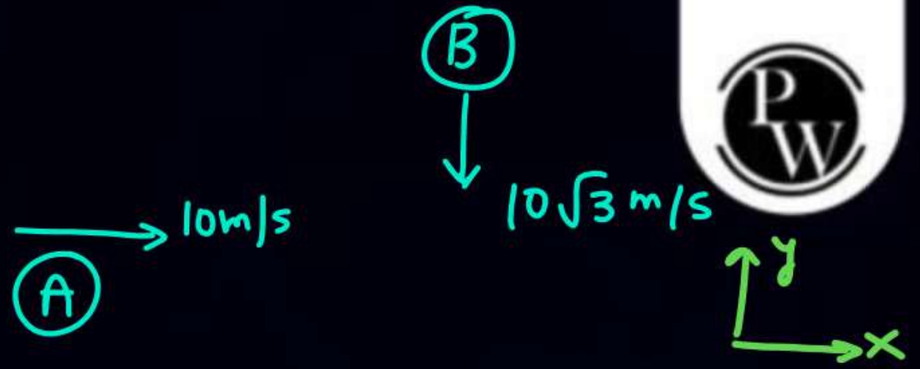
(12)

$$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A = 10\hat{j} - 0 = 10\hat{j}$$

(13)

$$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A = 20\hat{j} - 10\hat{i}$$

(14)

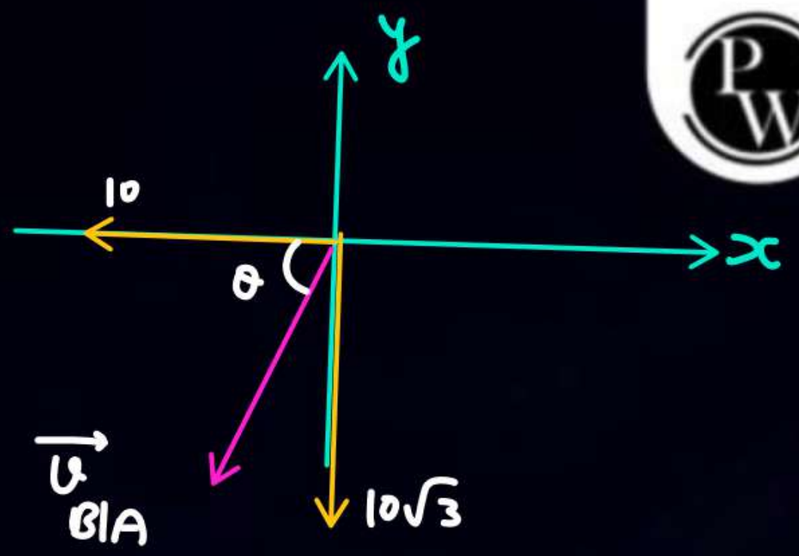


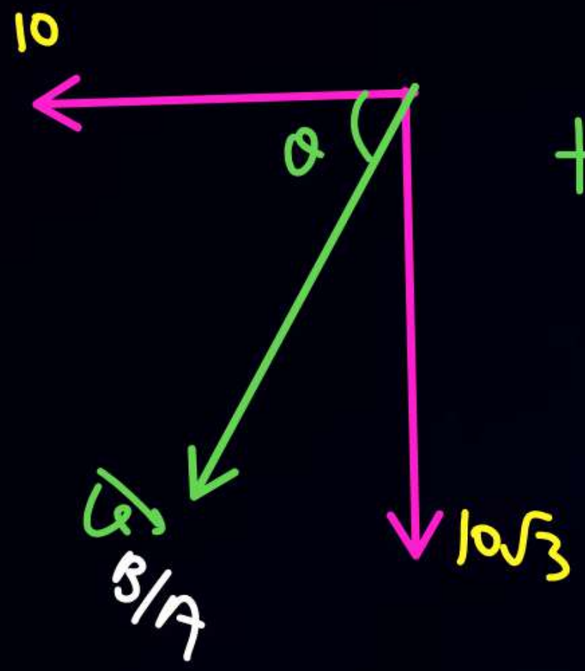
$$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A = -10\sqrt{3}\hat{j} - 10\hat{i}$$

A की खोपड़ी पर बैठकर B को observe करना

$$\vec{v}_{B/A} = -10\hat{i} - 10\sqrt{3}\hat{j}$$

Draw this vector

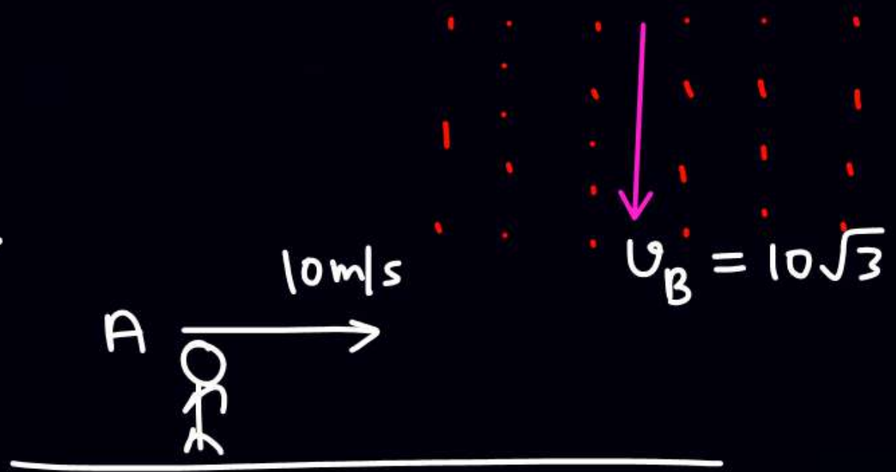


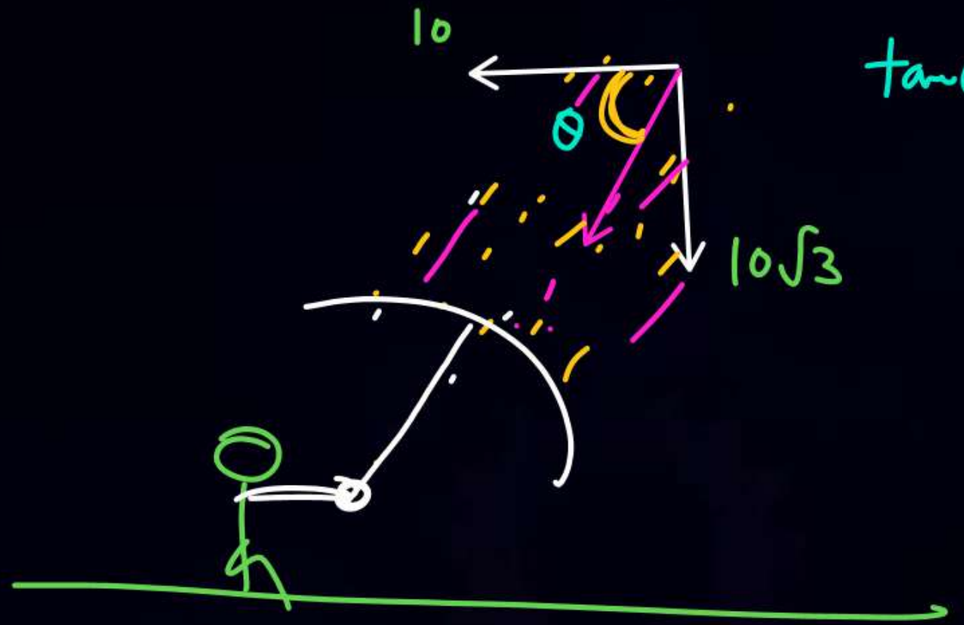


$$\tan\theta = \frac{10\sqrt{3}}{10} = \sqrt{3}$$

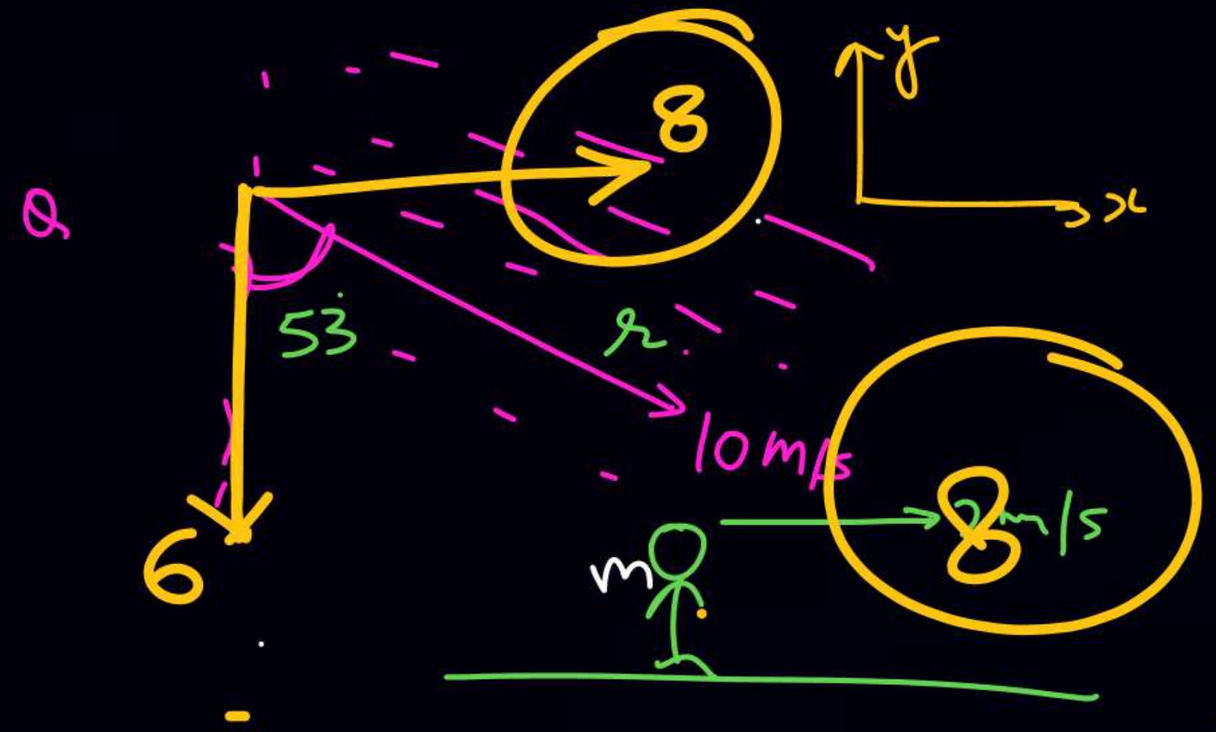
$$\theta = 60^\circ$$

Q





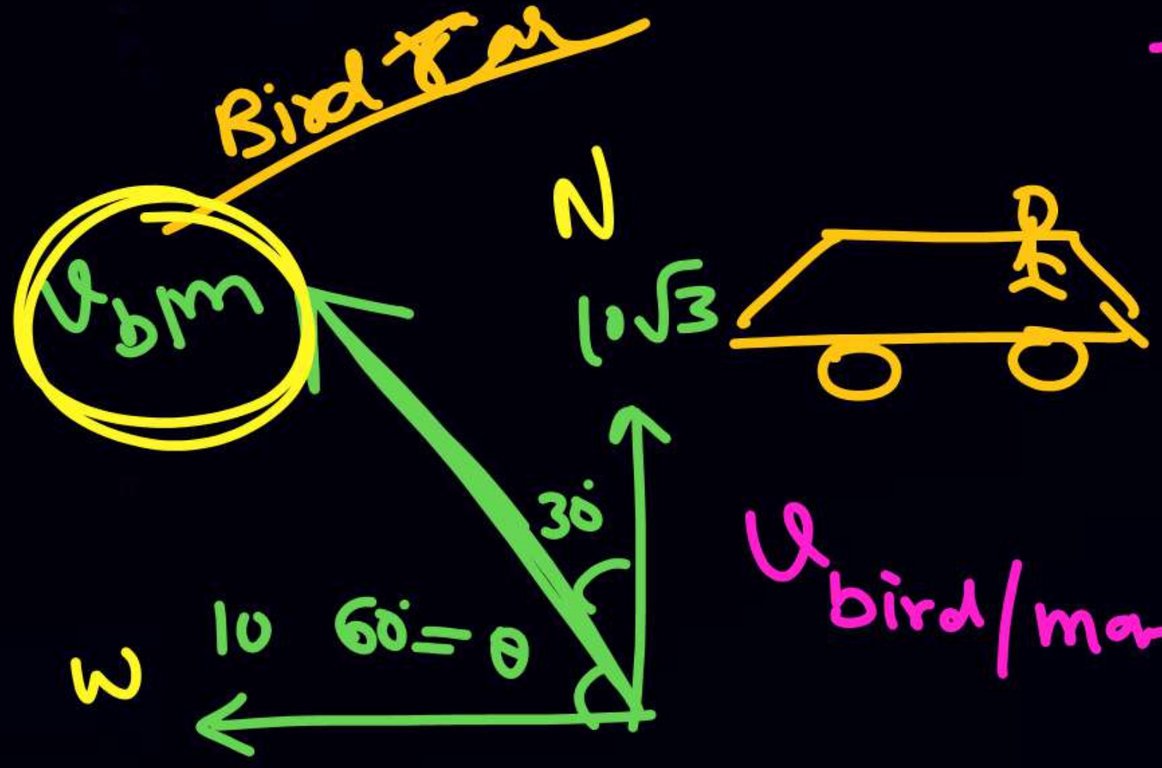
$$\tan\theta = \frac{10\sqrt{3}}{10}$$
$$= \sqrt{3}$$

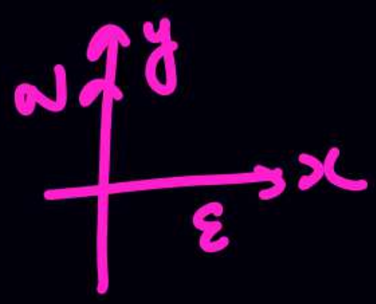


$$\vec{v}_{r/m} = \vec{v}_r - \vec{v}_m$$

$$= (8\hat{i} - 6\hat{j}) - (2\hat{i})$$

$$\vec{v}_{r/m} = 6\hat{i} - 6\hat{j}$$





$v_c = 10$ (east)

$v_{bird} = 10\sqrt{3}$ (north)

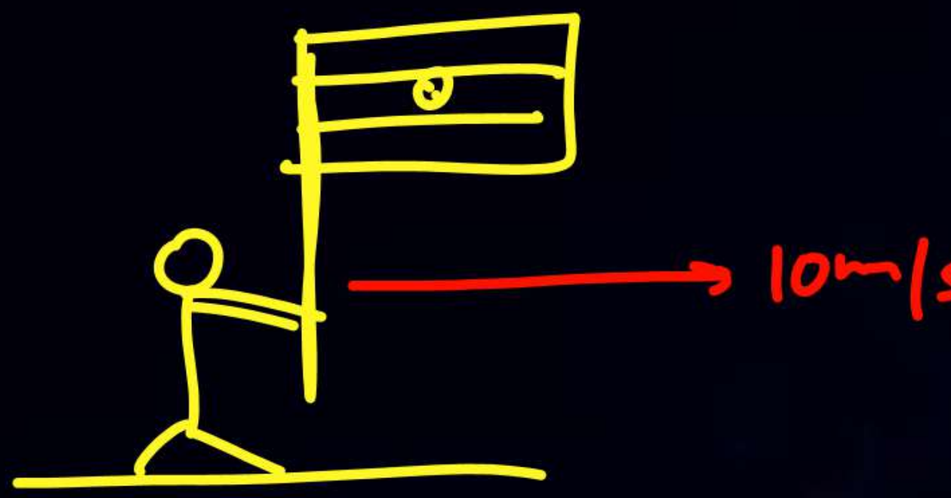
$v_{bird/man} = v_{bird} - v_{man}$

$= 10\sqrt{3}\,\hat{j} - 10\,\hat{i}$

$v_{b/m} = -10\,\hat{i} + 10\sqrt{3}\,\hat{j}$

झंडे वाला प्रश्न

Air ≡ हवा ≡ $10\sqrt{3}$ (North)

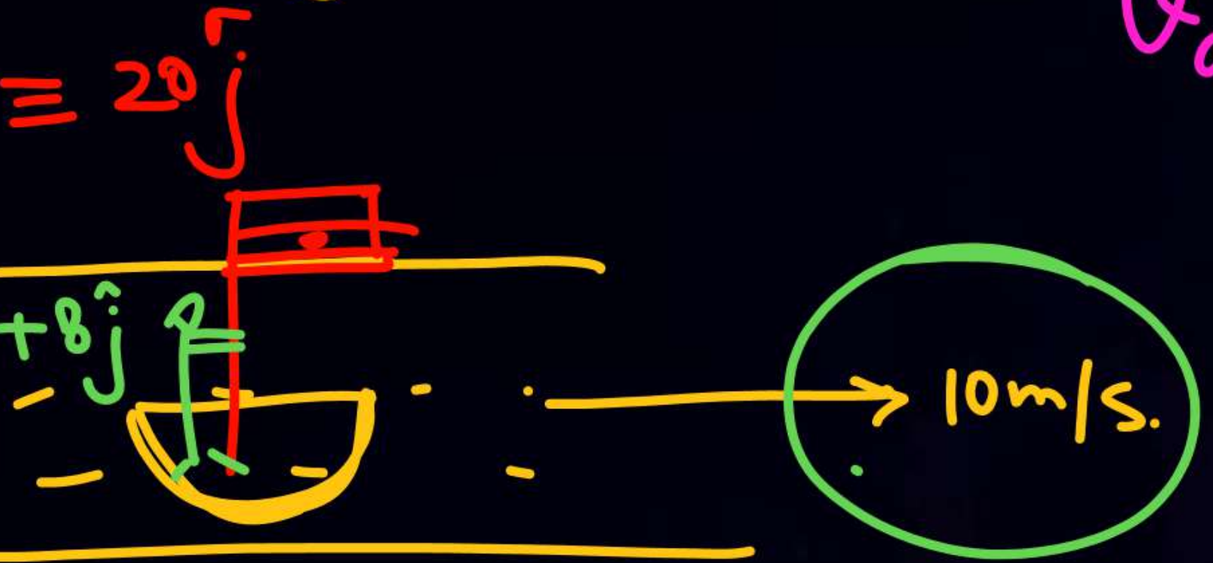


$$v_{\text{हवा/man}}_{\text{hold}} = 10\sqrt{3}\hat{j} - 10\hat{i}$$

$v_{boat/river} = 6\hat{i} + 8\hat{j}$

$v_{air/man}$

हवा ⟶ North $\equiv 20\hat{j}$



$v_{boat} - v_{river} = 6\hat{i} + 8\hat{j}$

$v_{boat} = 16\hat{i} + 8\hat{j}$

$v_{air/man} = v_{हवा} - v_{man}$

$= 20\hat{j} - (16\hat{i} + 8\hat{j})$

- $v_{rain/man} =$
- $v_{हवा/man}$
- $v_{bird/man}$.

SKC

$$\vec{v}_{A/B} = \vec{v}_{A/C} - \vec{v}_{B/C}$$

$$= (\vec{v}_A - \vec{v}_C) - (\vec{v}_B - \vec{v}_C)$$

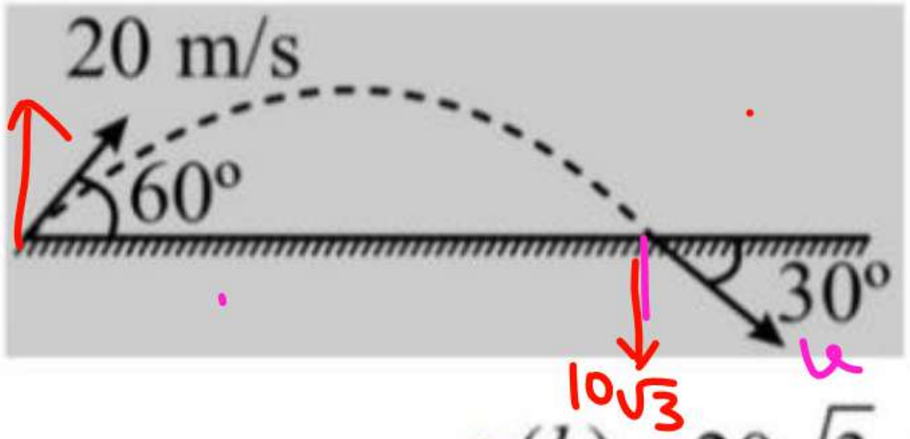
$$= \vec{v}_A - \vec{v}_C - \vec{v}_B + \vec{v}_C$$

$$= \vec{v}_A - \vec{v}_B$$

Velocity of A wrt B is frame independent

32. A particle is projected from a horizontal surface with a velocity of 20 m/s at an angle of 60° with the horizontal. When it hits the horizontal surface, its velocity makes an angle of 30° with the horizontal. Apart from gravity, a horizontal force acts on the particle during the motion. The speed of the particle when it hits the ground is

$20\sin 60 = 10\sqrt{3}$



$v\sin 30 = 10\sqrt{3}$

$v = 20\sqrt{3}$

(a) 20 m/s

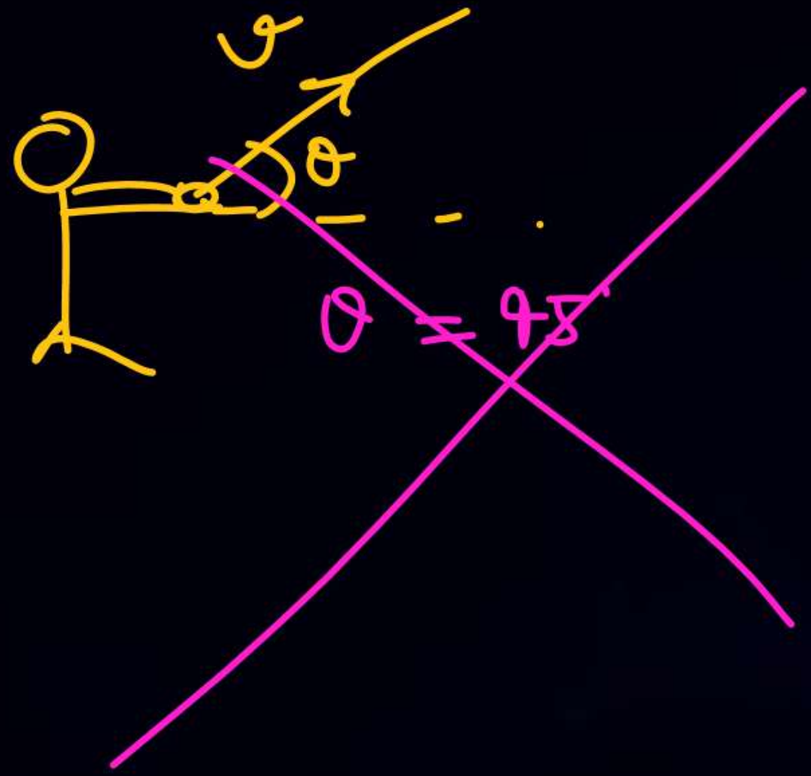
(b) $20\sqrt{3}$ m/s

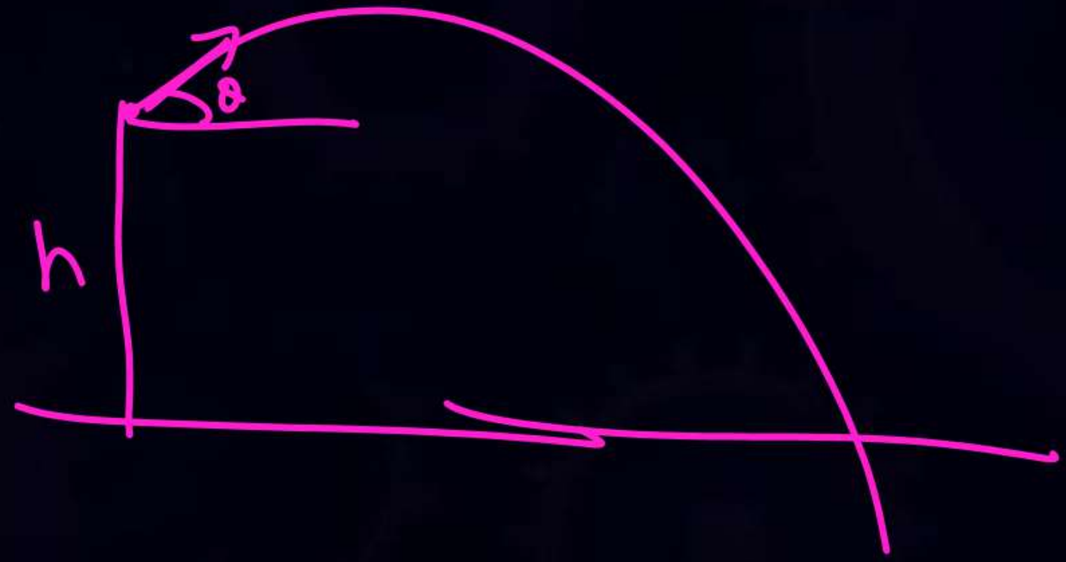
(c) 10 m/s

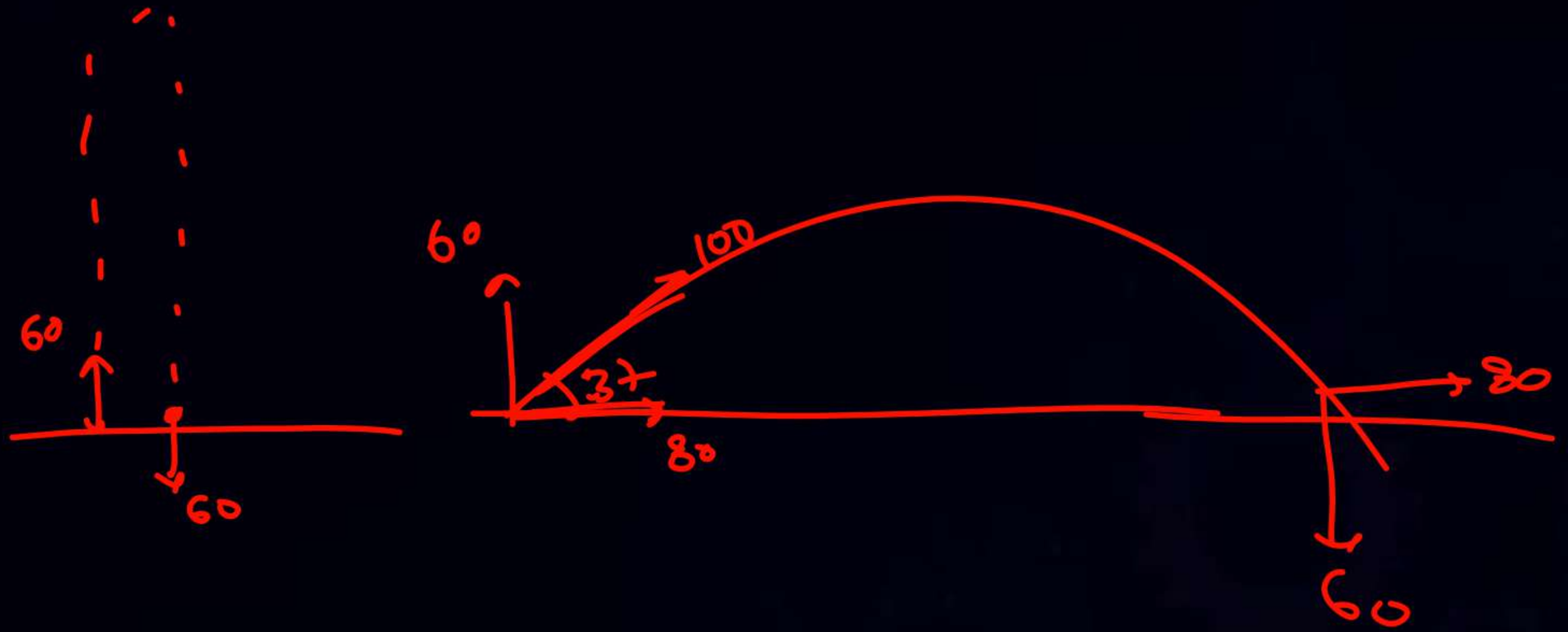
(d) $10\sqrt{3}$ m/s

① y में velocity दबाव कर दिया

②

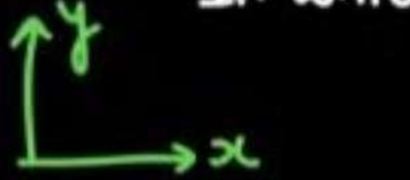


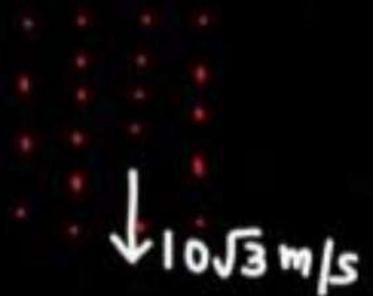



60
60
60
100
37°
80
80
60

Note down following ques in notes

Q A man is moving along +x-axis (east dir^n) with speed 10 m/s and rain is falling vertically downward with speed $10\sqrt{3}$ m/s. In which dir^n man should hold umbrella to protect himself.





$\vec{v}_{man} = 10\hat{i}$

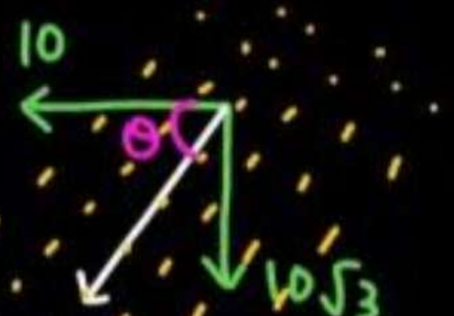
$\vec{v}_{rain} = -10\sqrt{3}\hat{j}$

$\vec{v}_{rain|man} = \vec{v}_r - \vec{v}_m$

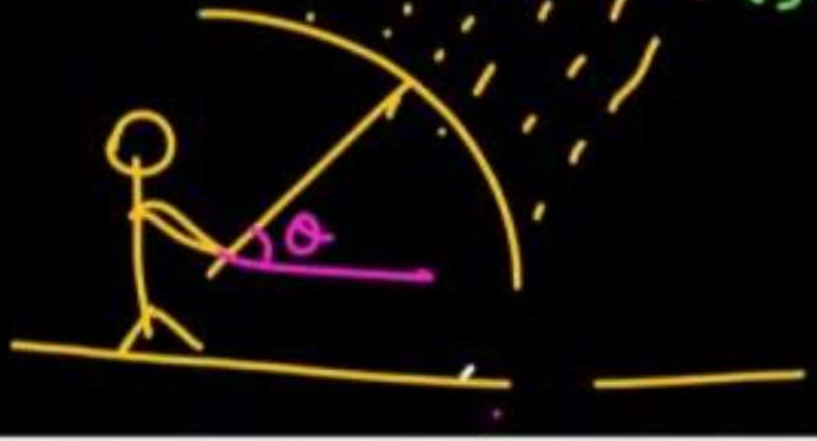
$\vec{v}_{r/m} = -10\sqrt{3}\hat{j} - 10\hat{i} = -10\hat{i} - 10\sqrt{3}\hat{j}$

$\tan\theta = \frac{10\sqrt{3}}{10}$

$\theta = 60$



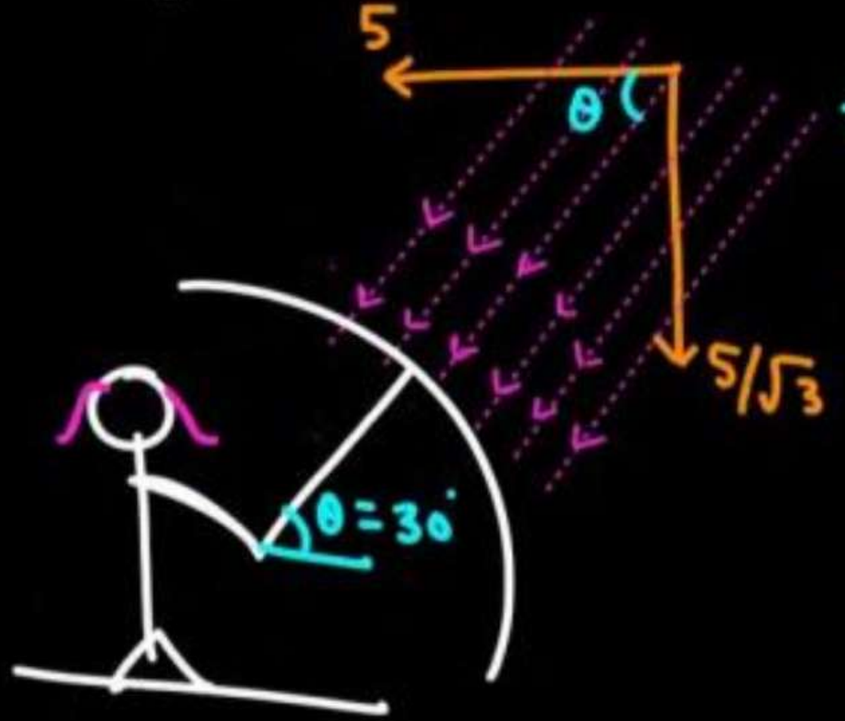
Draw करो



Rain Man Problem

Q A girl is moving horizontally with velocity 5m/s along east. rain is falling vertically downward with velocity $5/\sqrt{3}$ m/s. In which dir^n she should hold his umbrella to protect himself from rain

$$\vec{v}_{r/girl} = \vec{v}_r - \vec{v}_{girl} = -\frac{5}{\sqrt{3}}\hat{j} - 5\hat{i}$$

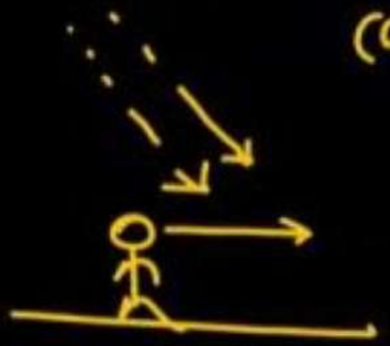


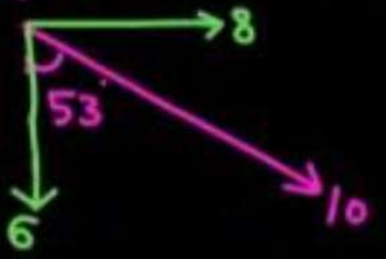
$$\tan\theta = \frac{5/\sqrt{3}}{5}$$

$$\boxed{\theta = 30^\circ}$$

Q Rain is falling with speed 10 m/s at angle 53° with vertical
A man is moving with speed 2 m/s along east as shown in diagram

(a) In which dir^n man should hold umbrella to protect him self.



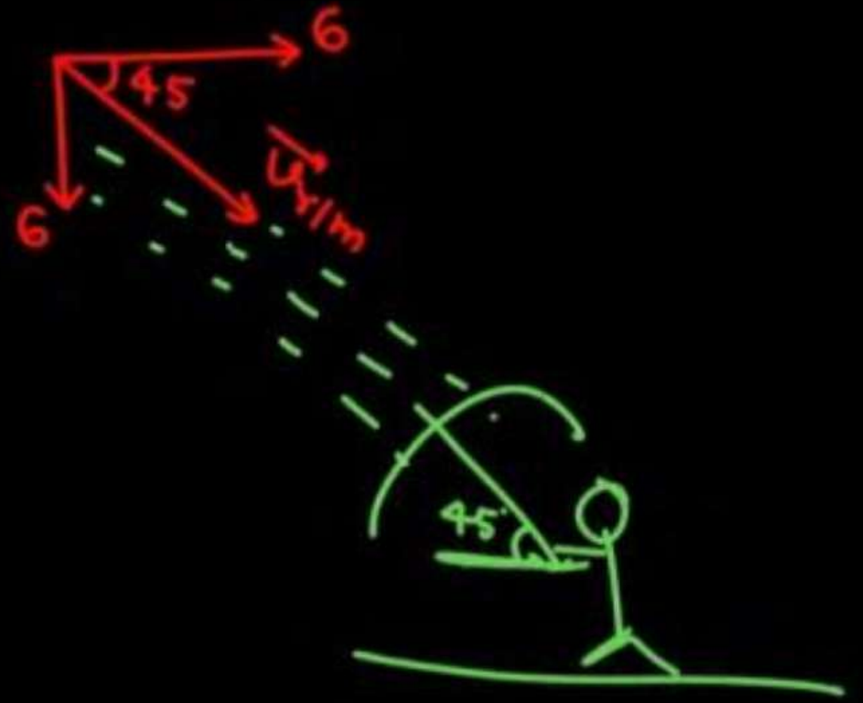


$\vec{v}_r = 8\hat{i} - 6\hat{j}$

$\vec{v}_m = 2\hat{i}$

$\vec{v}_{r/m} = 6\hat{i} - 6\hat{j}$

(b) what should be velocity of man so that rain appear falling vertically to him



Ans (8)

SKC

SKC

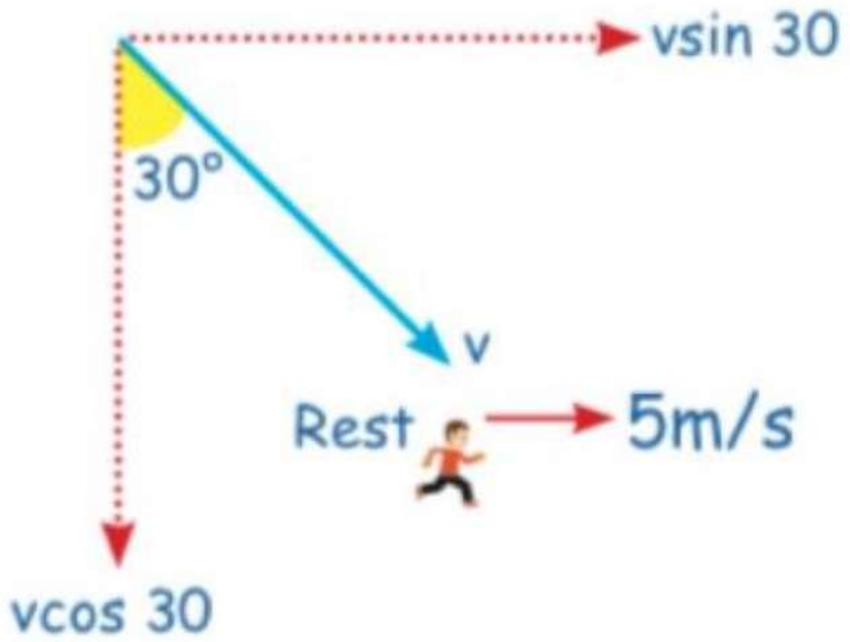
Rainman prob. जैसे ques के लिए ये 4 step follow करो

1. सबसे पहले velocity of man and rain निकालो
2. अब vectorly velocity of rain wrt man $\vec{V}_{r/m}$ निकालो
3. अब $\vec{V}_{r/m}$ को draw करके नया fig. बनाओ
4. अब हमे पता चल गया कि man को rain कहाँ आती दिख रही है so अब छाता लगा दो

Just see Dont write

Q. To a stationary man, rain appear to be falling at an angle 30° with the vertical As he start moving with speed of 5 m/s he feels that rain is falling vertically. Find speed of rain.

Sol.



v sin 30 = 5

v = 10 speed of rain

note it

Q. A man is moving in east direction with speed 10 m/s in a car A bird is flying with speed $10\sqrt{3}$ in south direction

(1) Find velocity of bird observed by man

Sol. $\vec{v}_{man} = 10\hat{i}$

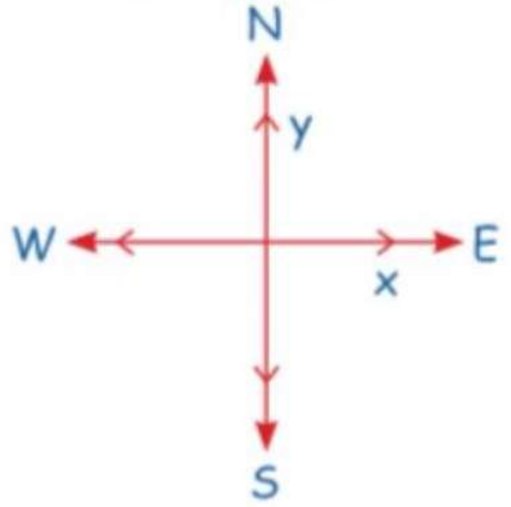
$\vec{v}_{bird} = -10\sqrt{3}\,\hat{j}$

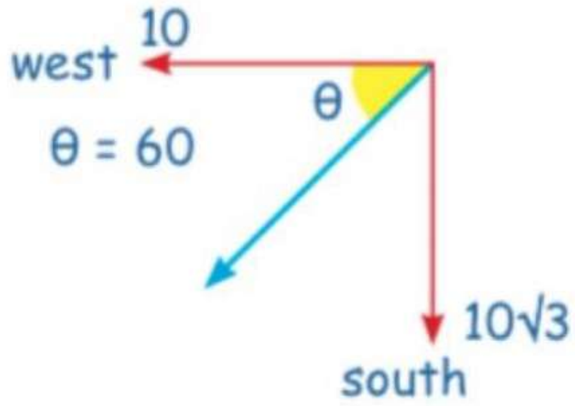
$\vec{v}_{b/m} = \vec{v}_b - \vec{v}_m$

$= -10\sqrt{3}\hat{j} - 10\hat{i}$

$|\vec{v}_{b/m}| = \sqrt{10^2 + (10\sqrt{3})^2}$

$= 20$ ($60°$ south of west)





Home Work

- PLs pLs pLs watch Saturday integration wallah Lecture.
- Solve KPP-18 (Discussion vedio already uploaded)
- Complete notes attached in Slide.
- Bus aaj itna hi . . .

THANK YOU