YAKEEN NEET 2.0

2026

Motion in a Plane

PHYSICS | Lecture – 09

By – Saleem Ahmed Sir

Topics to be covered

Relative motion (part 02)

Notes me ye sab likho . . . .

Next '4' ques

(1) note करो.

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.

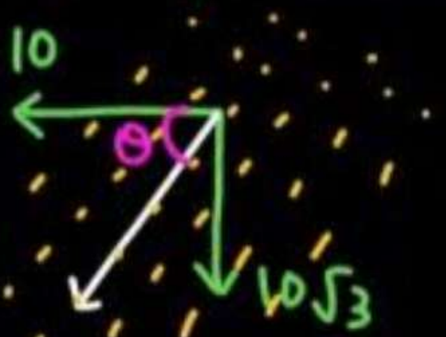
$\vec{v}_{man} = 10\hat{i}$

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

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

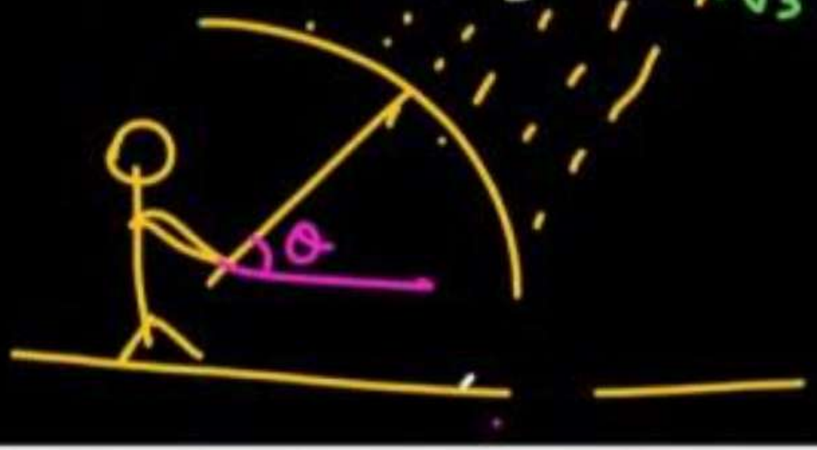
$\vec{v}_{r/m} = -10\sqrt{3}\hat{j} - 10\hat{i} = -10\hat{i} - 10\sqrt{3}\hat{j}$

Draw करो



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

$\theta = 60$

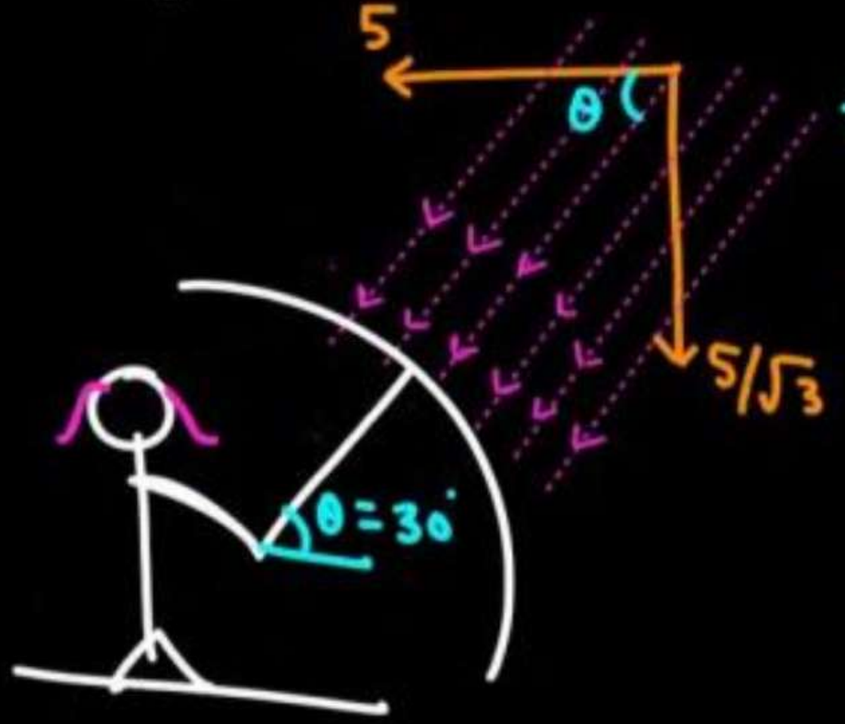


2 Rain Man Problem

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

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

note करो



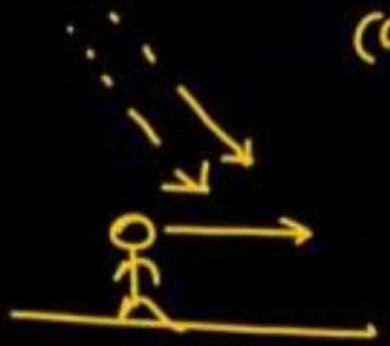
$$\tan\theta = \frac{5/\sqrt{3}}{5}$$

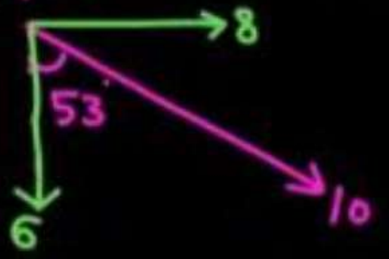
$$\theta = 30^\circ$$

3 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 himself.

note करो



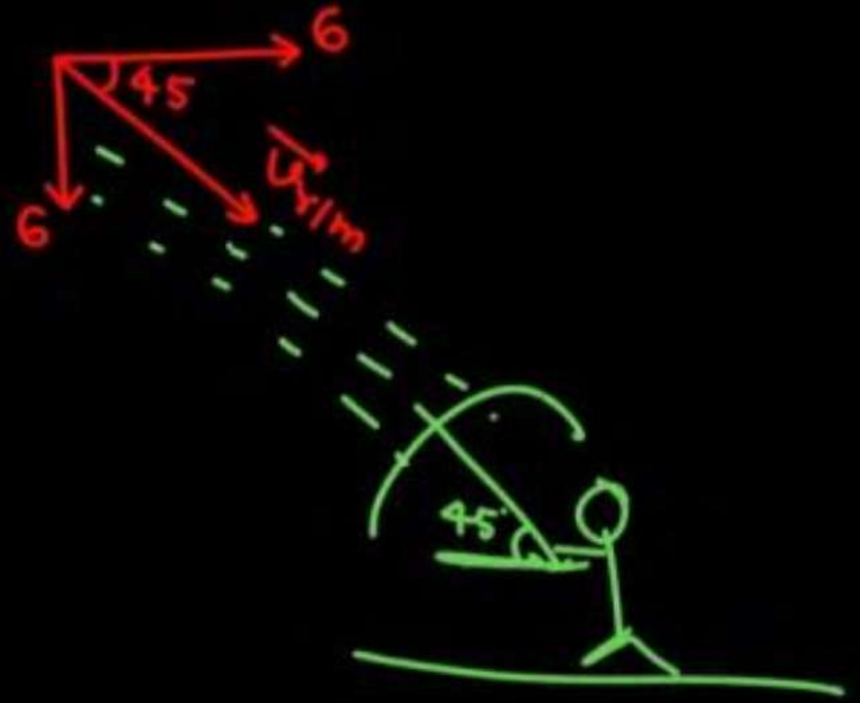


$\vec{v}_r = 8\hat{i} - 6\hat{j}$

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

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

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



Ans (8)

4

SKC

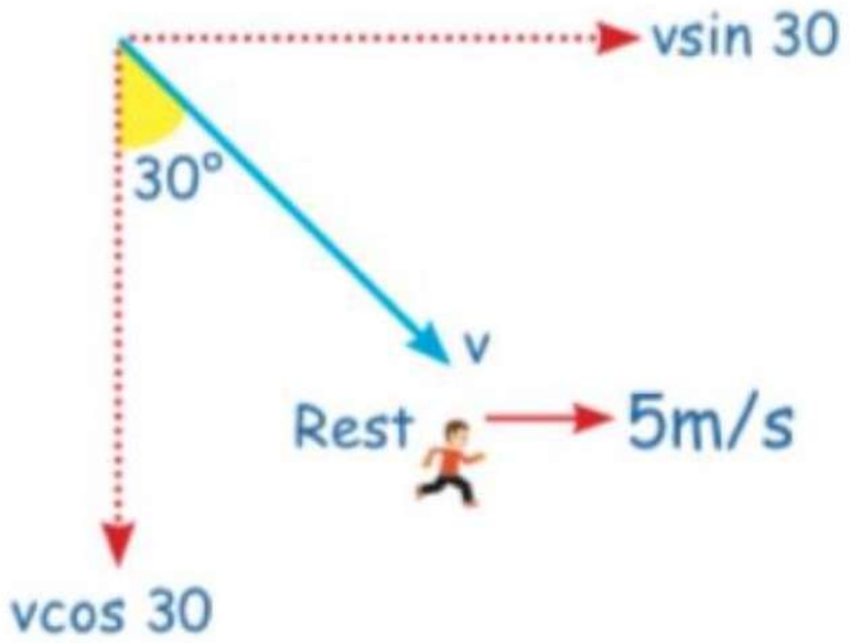
Rainman prob. जैसे ques के लिए ये 4 step follow करो

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

5

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

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

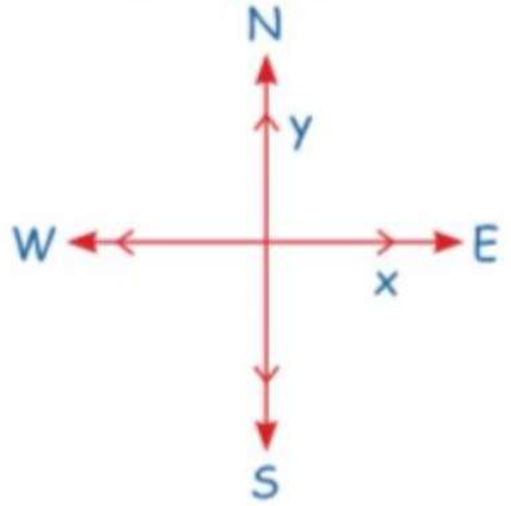
$\vec{v}_{bird} = -10\sqrt{3}\,\hat{j}$

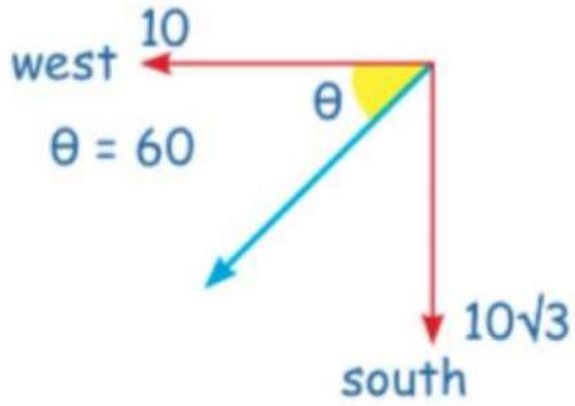
$\vec{v}_{b/m} = \vec{v}_b - \vec{v}_m$

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

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

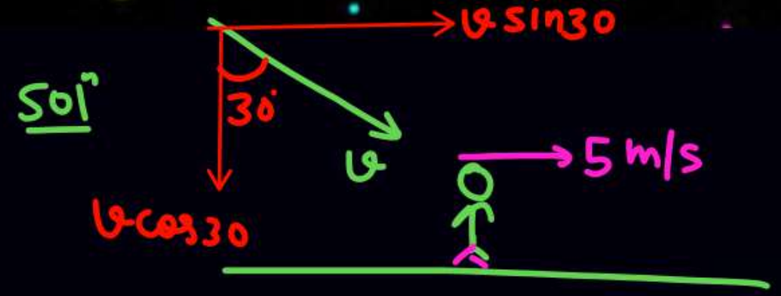
$= 20$ (60° south of west)





Imp Q*** EXPNEET 26

To a stationary man, rain appear to be falling at an angle 30° with the vertical. As he starts moving with speed of 5 m/s he find that rain is falling vertically. **Speed of rain wrt man.**



$\vec{v}_r = 5\hat{i} - 5\sqrt{3}\hat{j}$

$\vec{v}_m = 5\hat{i}$

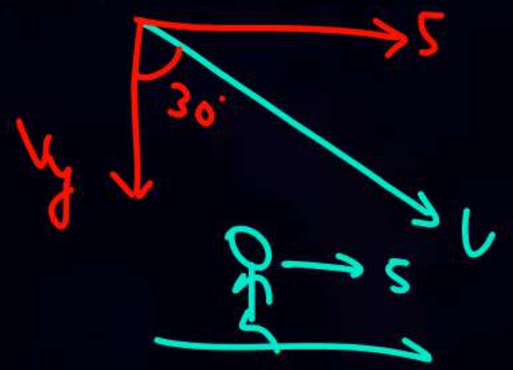
$\vec{v}_{rlm} = \vec{v}_r - \vec{v}_m = -5\sqrt{3}\hat{j}$

$v \sin 30 = 5$

$\boxed{v = 10}$

10 X
$5\hat{i}+5\hat{j}$ X
$5/\sqrt{3}$ X
$5\sqrt{3}$

m-2 very fast method



$\tan 30 = \frac{5}{v_y}$

$v_y = 5\sqrt{3}$

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

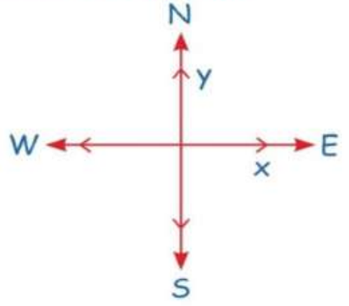
$\vec{v}_{bird} = -10\sqrt{3}\,\hat{j}$

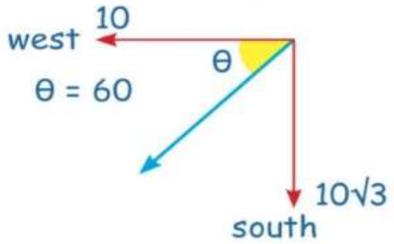
$\vec{v}_{b/m} = \vec{v}_b - \vec{v}_m$

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

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

$= 20$ (60° south of west)





SKC

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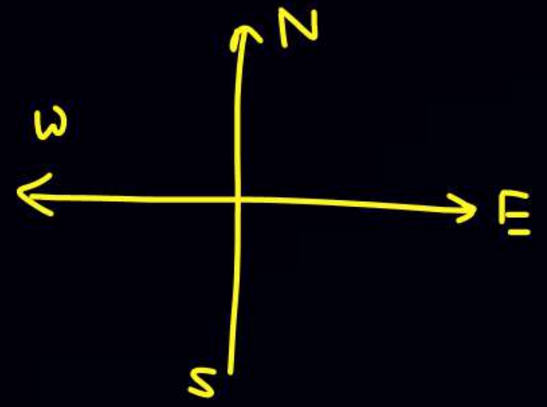
3. अब $\vec{V}_{r/m}$ को draw करके नया fig. बनाओ
4. अब हमे पता चल गया कि man को rain कहाँ आती दिख रही है so अब छाता लगा दो

Q A man is moving with speed 10 m/s inside a car along east dir^n.
A bird is flying with speed $10\sqrt{3}$ along south dir^n.
find velocity of bird as observed by man.

Sol^n



$v_m = 10\hat{i}$

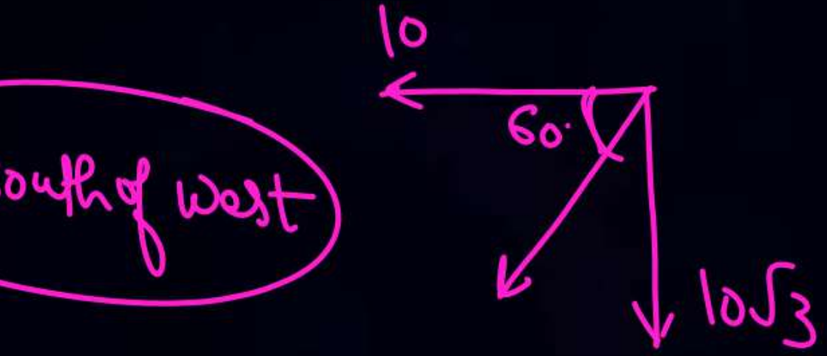
$v_{bird} = -10\sqrt{3}\hat{j}$

$v_{bird/man} = v_{bird} - v_{man} = -10\sqrt{3}\hat{j} - 10\hat{i}$

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

$|v_{bird/man}| = \sqrt{10^2 + (10\sqrt{3})^2}$

$= 20$



60° South of West

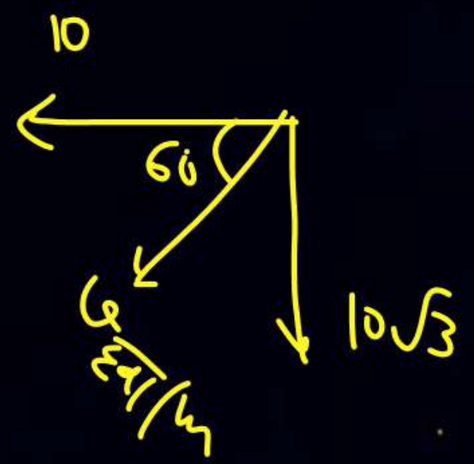
Q A man holding the flag is running with speed 10 m/s along east dir^n. If air is flowing with $10\sqrt{3}$ m/s along south. In which dir^n flag will flutter.

Sol^n $v_{man} = 10\hat{i}$

$v_{हवा} = -10\sqrt{3}\hat{j}$

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

An 60° south of west



**

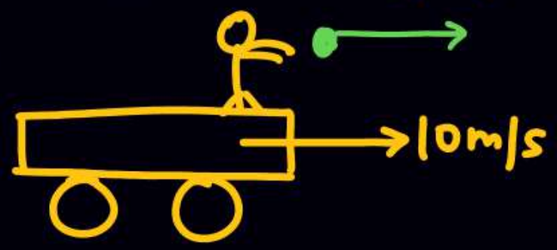
Q

H.W

River is flowing along east with velocity 10 m/s. A man is inside a boat holding flag. such that boat is moving with speed 20 m/s wrt river making angle 37° with dir^n of velocity of river.

If air start flowing along south with speed 5 m/s. Find in which dir^n flag will flutter.

Q



find velocity of particle wrt ground.

Sol

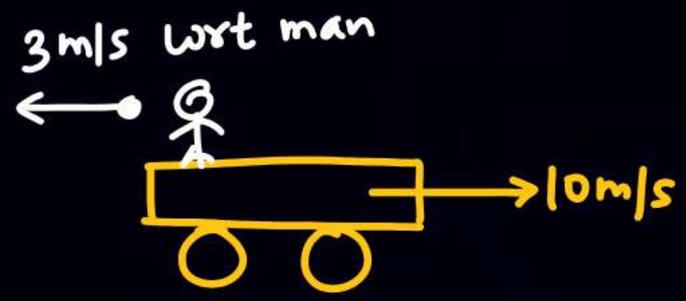
$$\vec{v}_{P/man} = 2\hat{i}$$

$$\vec{v}_P - \vec{v}_{man} = 2\hat{i}$$

$$\vec{v}_P - 10\hat{i} = 2\hat{i}$$

$$\vec{v}_P = 10\hat{i} + 2\hat{i} = 12\hat{i}$$

Q



find velocity of particle wrt ground.

Sol

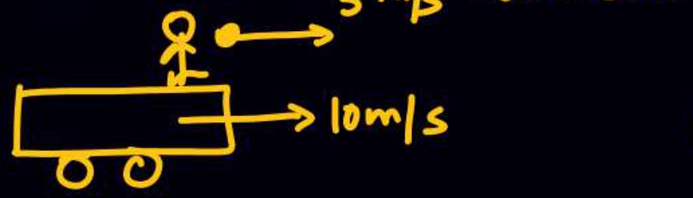
$$\vec{v}_{P/m} = -3\hat{i}$$

$$\vec{v}_P - \vec{v}_m = -3\hat{i}$$

$$\vec{v}_P - 10\hat{i} = -3\hat{i}$$

$$\vec{v}_P = 10\hat{i} - 3\hat{i} = 7\hat{i}.$$

③

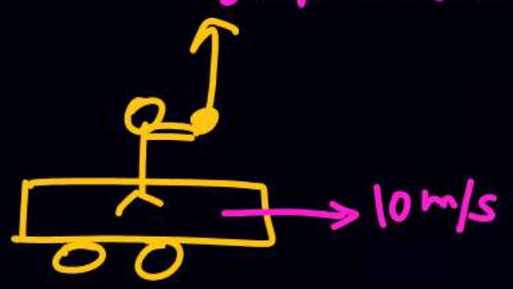


$v_{p/c} = 5\hat{i}$

$v_p - 10\hat{i} = 5\hat{i}$

$\boxed{v_p = 15\hat{i}}$

④

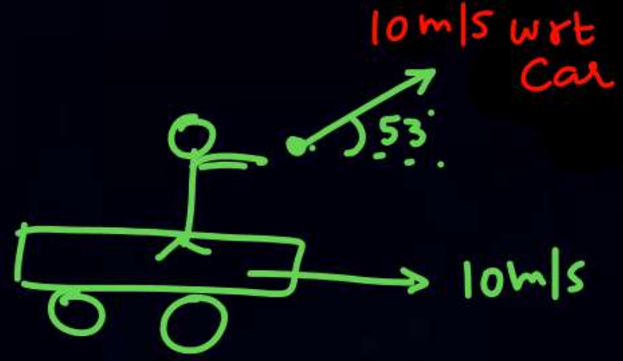


$v_{p/c} = 8\hat{j}$

$v_p - 10\hat{i} = 8\hat{j}$

$v_p = 10\hat{i} + 8\hat{j}$

⑤



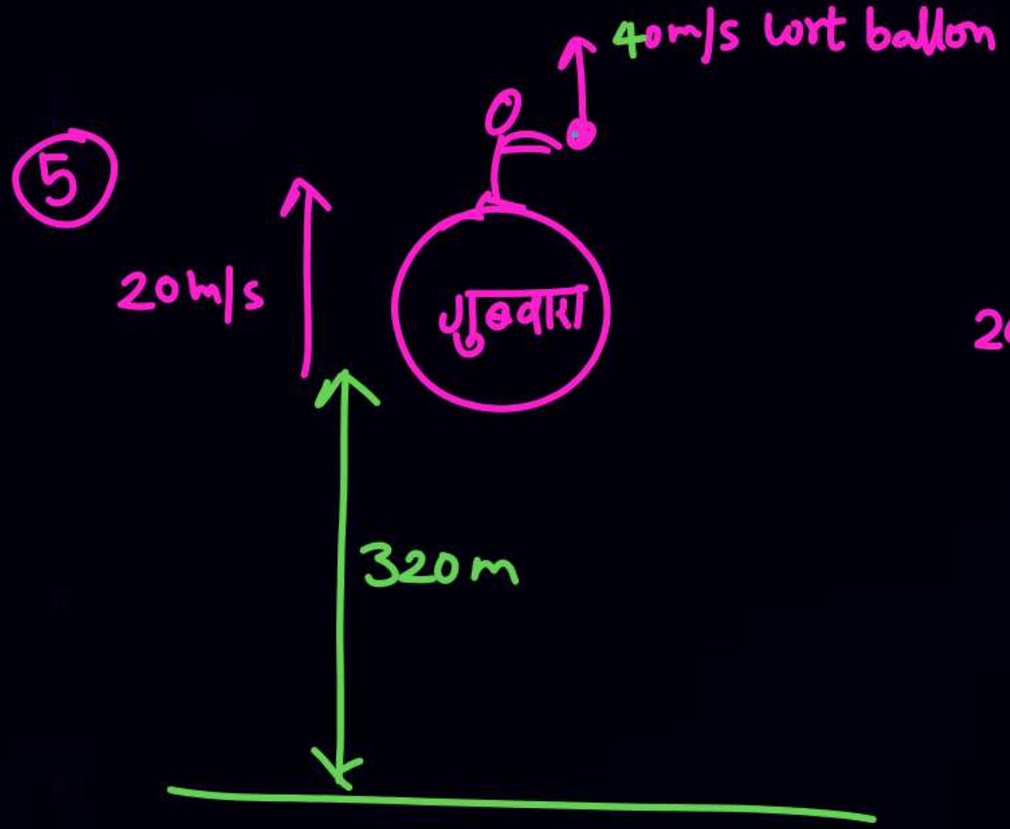
$v_{p/c} = 6\hat{i} + 8\hat{j}$

$v_c = 10\hat{i}$

$v_{p/c} = v_p - v_c$

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

$\vec{v}_p = 16\hat{i} + 8\hat{j}$

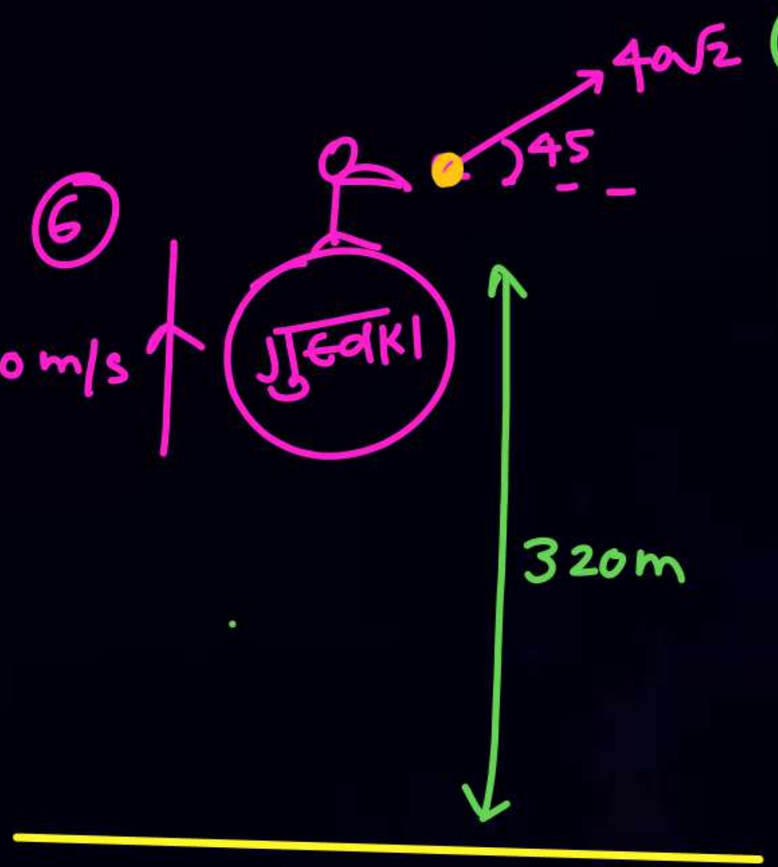


$$v_{p/\text{गुब्बारा}} = 40\hat{j}$$

$$v_p - v_{\text{गुब्बारा}} = 40\hat{j}$$

$$v_p - 20\hat{j} = 40\hat{j}$$

$$\boxed{v_p = 60\hat{j}}$$



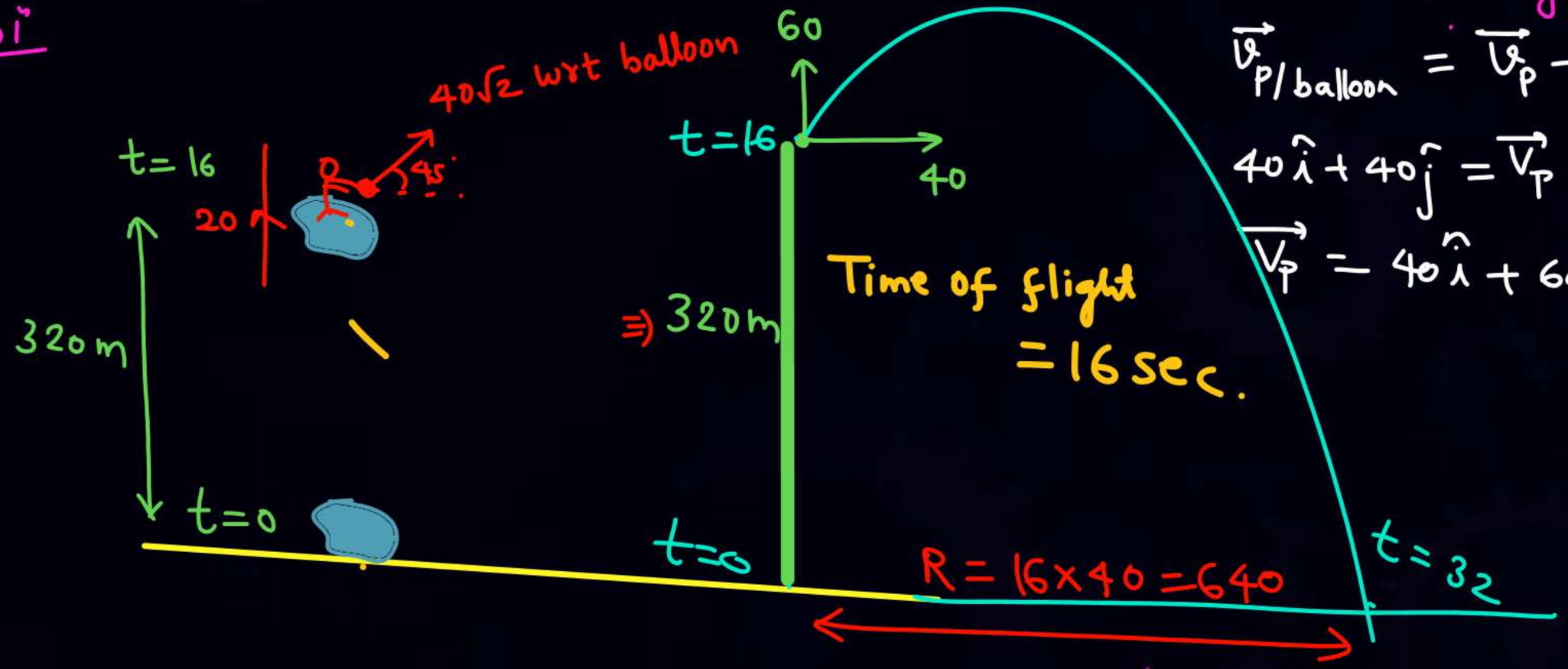
$$\vec{v}_{p/\text{गुब्बारा}} = \vec{v}_p - \vec{v}_{\text{गुब्बारा}}$$

$$\Rightarrow 40\hat{i} + 40\hat{j} = V_p - 20\hat{j}$$

$$\boxed{\vec{V_p} = 40\hat{i} + 60\hat{j}}$$

Q A balloon start rising from ground with const velocity 20m/s up. at $t=0$. If at $t=16$ sec. a particle is thrown with velocity $40\sqrt{2}$ m/s wrt balloon at angle 45° with horizontal. find when & where particle will strike the ground.

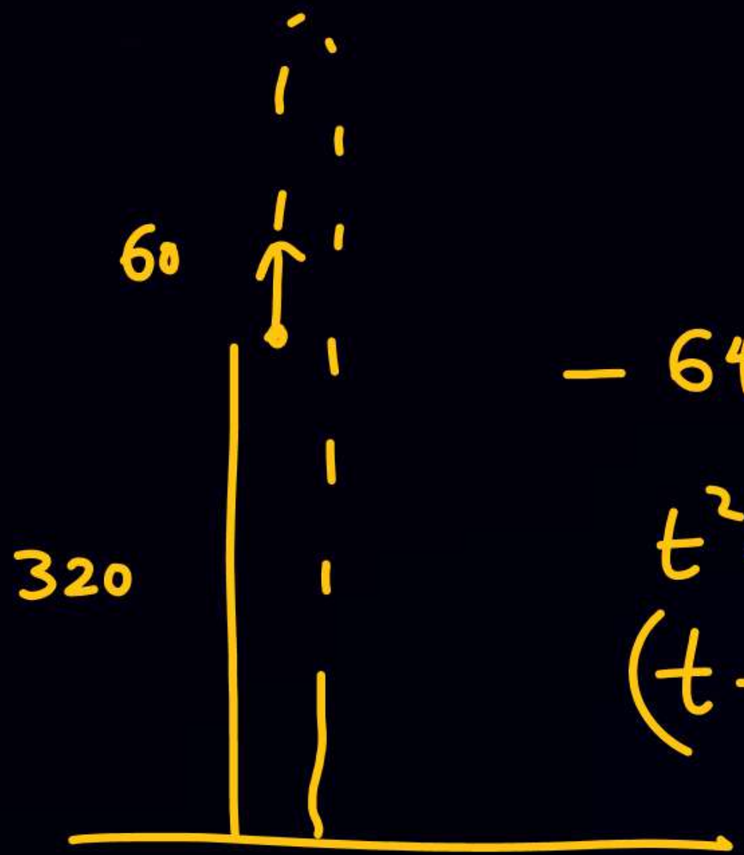
Sol



$$\vec{v}_{P/balloon} = \vec{v}_P - \vec{v}_{balloon}$$

$$40\hat{i} + 40\hat{j} = \vec{V}_P - 20\hat{j}$$

$$\vec{V}_P = 40\hat{i} + 60\hat{j}$$



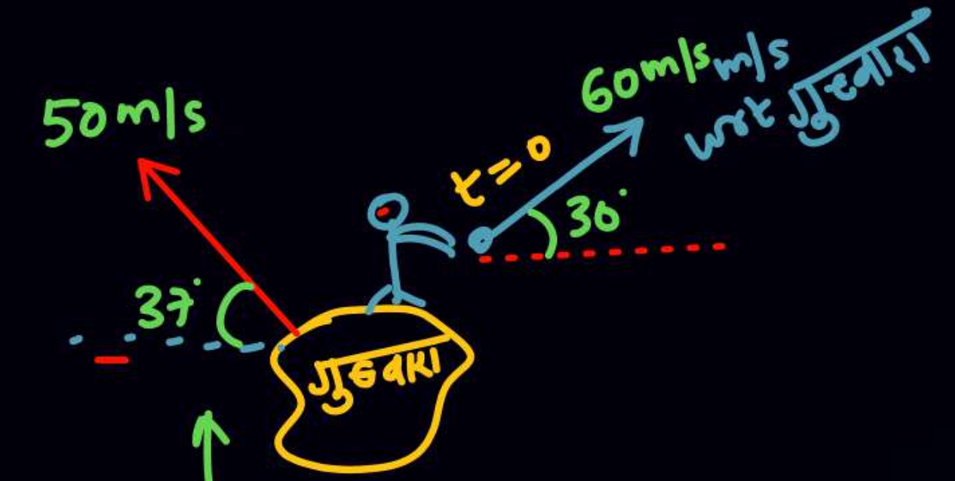
$$-64 = 12t - t^2$$

$$t^2 - 12t - 64 = 0$$

$$(t-16)(t+4) = 0$$

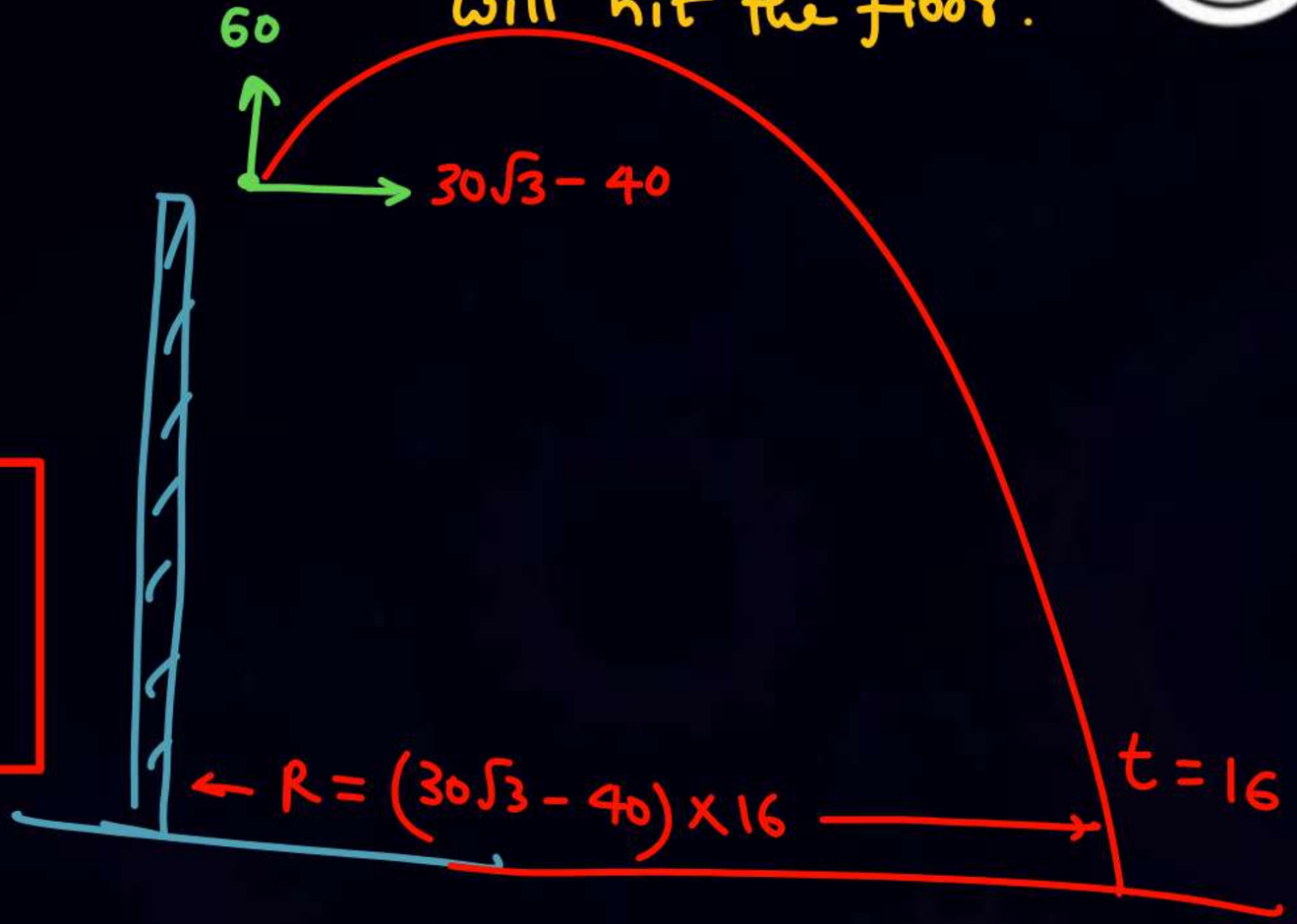
$$t = 16$$

Q



320m

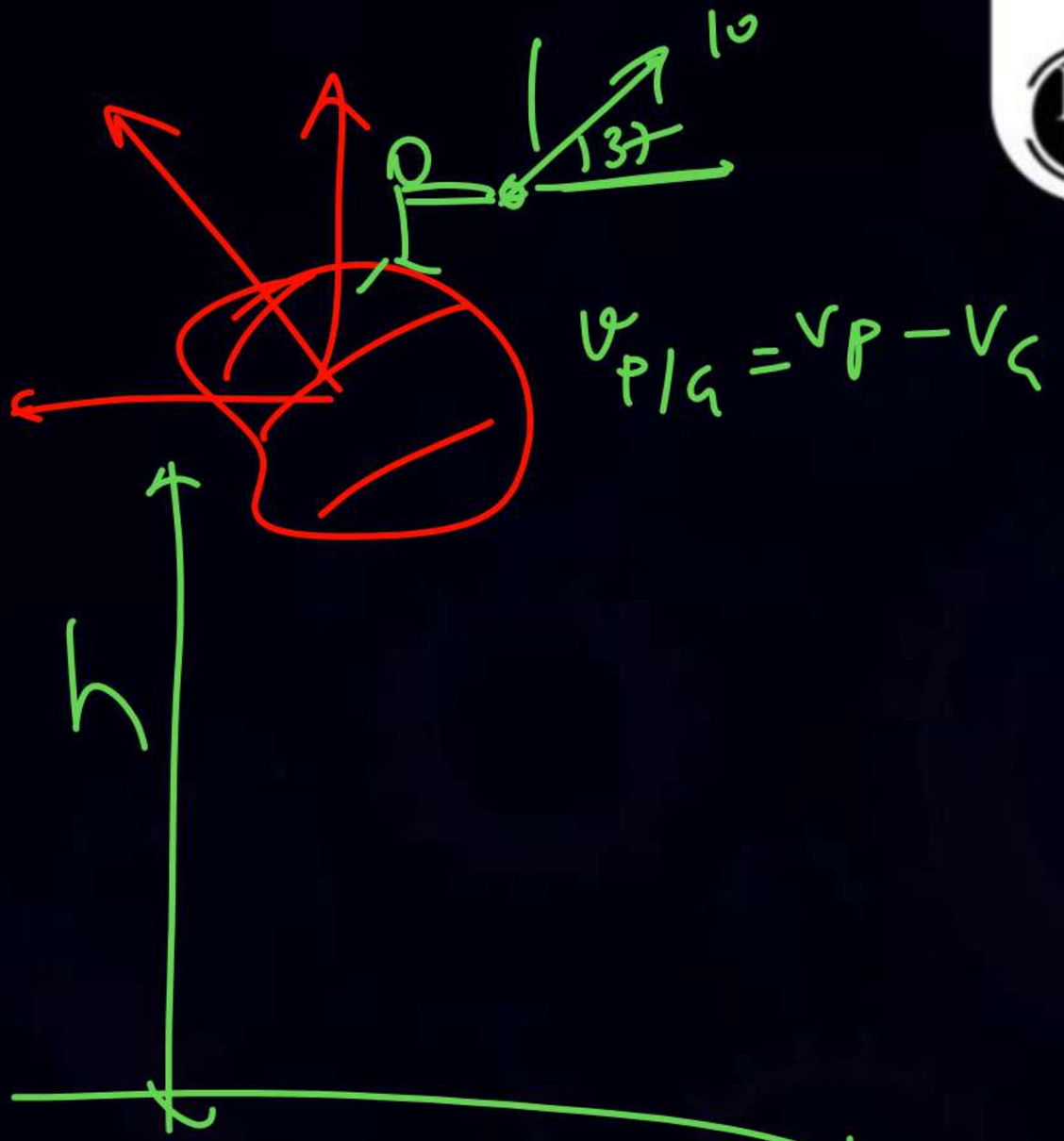
≡



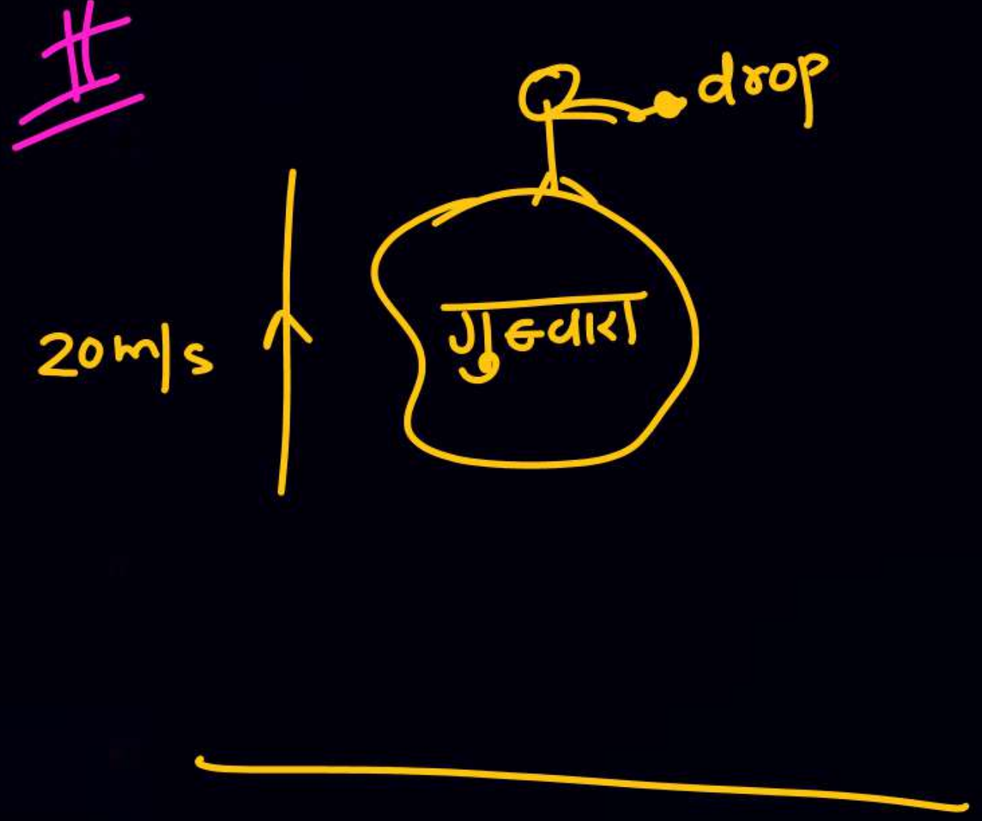
when & where particle will hit the floor.

$$\vec{v} = \vec{u} + \vec{a}t$$

$$\vec{v} = \smile$$



$$v_{P/Q} = v_P - v_Q$$



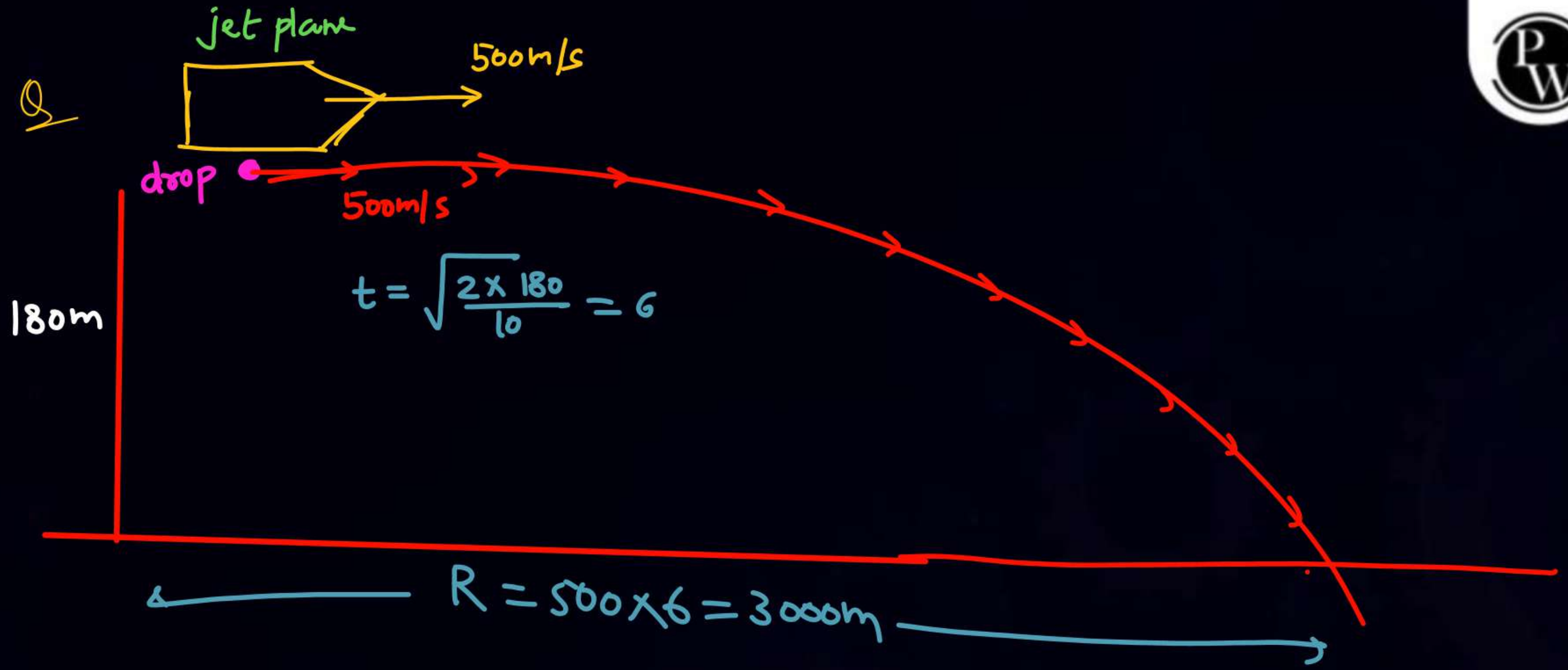
$$\vec{v}_{P/\text{गुब्बारा}} = 0$$

$$\vec{v}_P - \vec{v}_{\text{गुब्बारा}} = 0$$

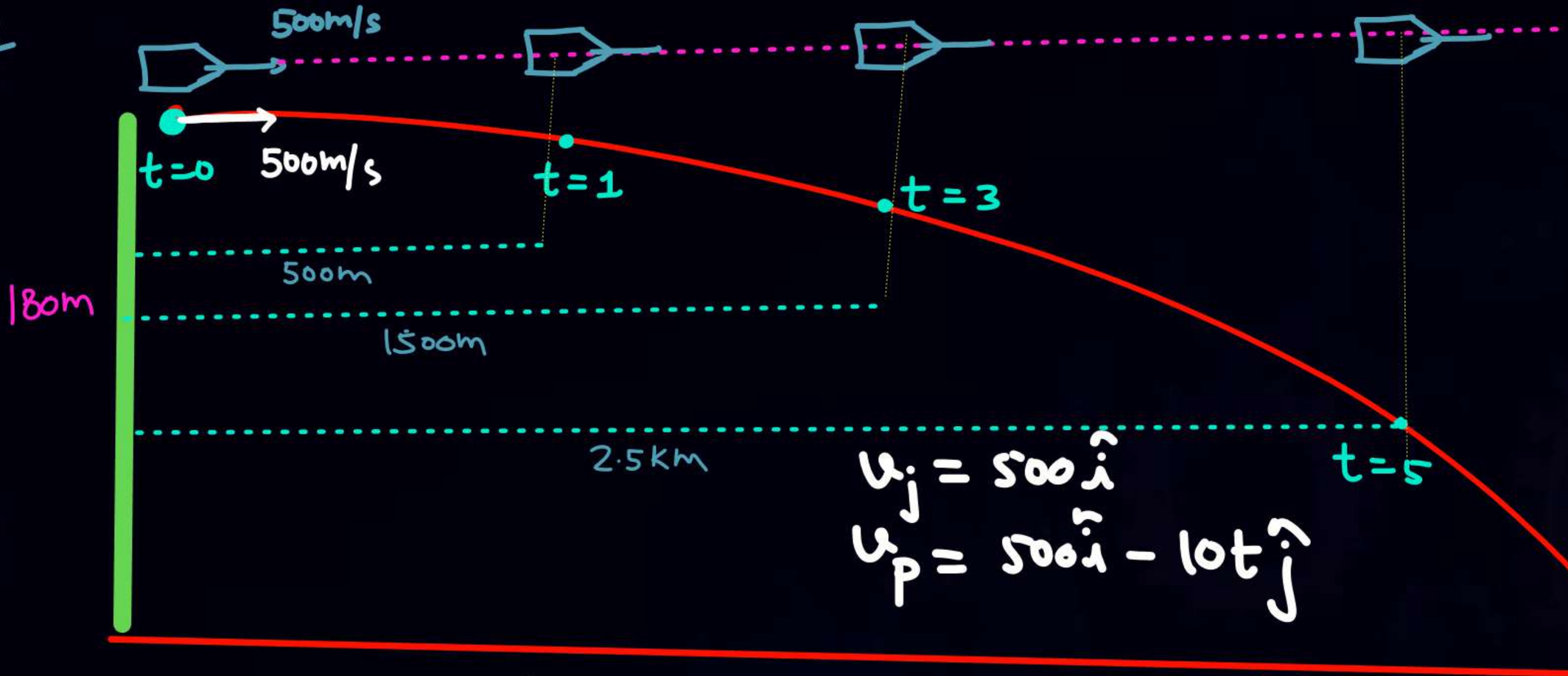
$$\vec{v}_P = \vec{v}_{\text{गुब्बारा}} = 20\hat{j}$$

(यही तो SKC point था)

Q


jet plane
500m/s
drop
500m/s
180m
$t = \sqrt{\frac{2 \times 180}{10}} = 6$
$R = 500 \times 6 = 3000m$

Q



x में $\Rightarrow \vec{v}_{p/jet} = 0$

x में relative velocity = 0

$\vec{v}_{p/jet} = -10t\hat{j}$

Q

path of particle wrt jet ≡ St. line (Downward)

" " " ground = parabola.

SKC bata

If $u=0$, $\vec{a}=$ dir^n const. $\Rightarrow$ St. line

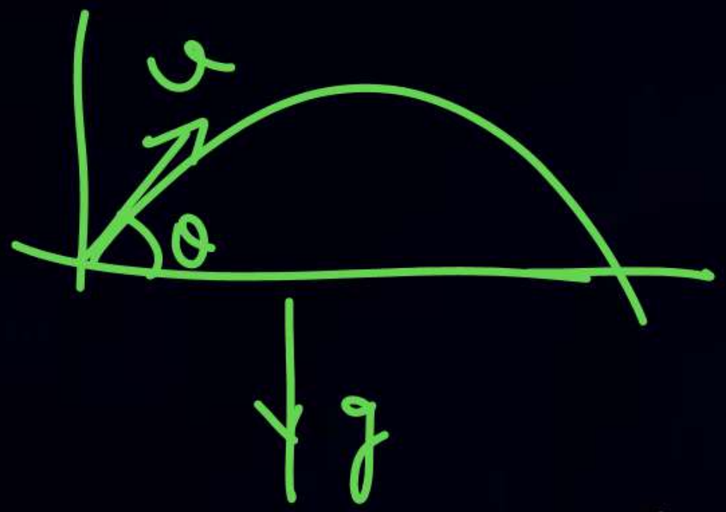
If $\vec{v}$ & $\vec{a}$ are in same dir $\equiv$ St. line

" " " opposite " $\supset$ St. line

} $a=$ Const, $a=$ Variable magnitude

If $\vec{u}$ & 'g' are making angle 'θ' $\Rightarrow$ parabola ($\vec{a} \to$ const)

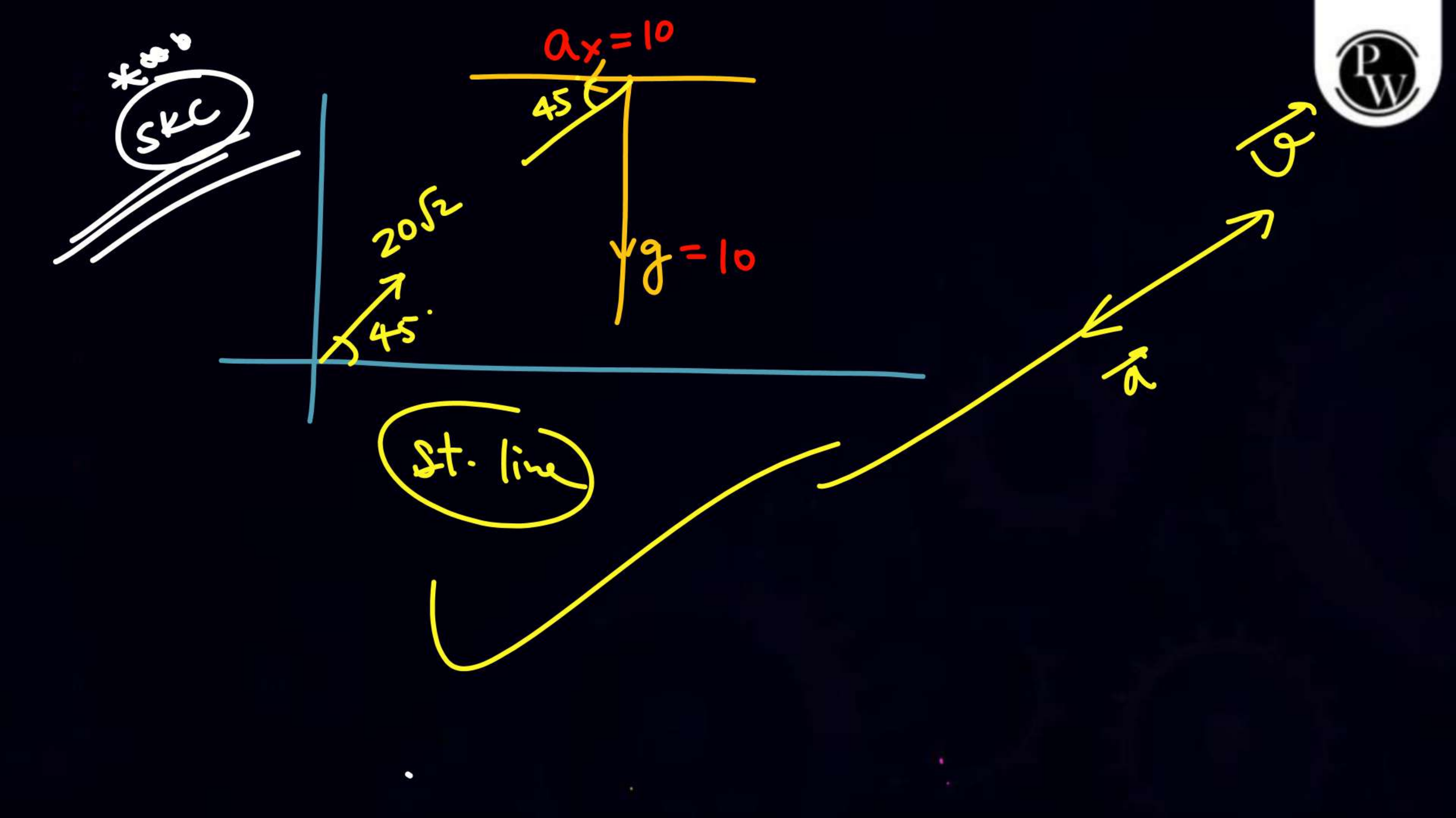
$\theta \neq 0, \theta \neq 180$



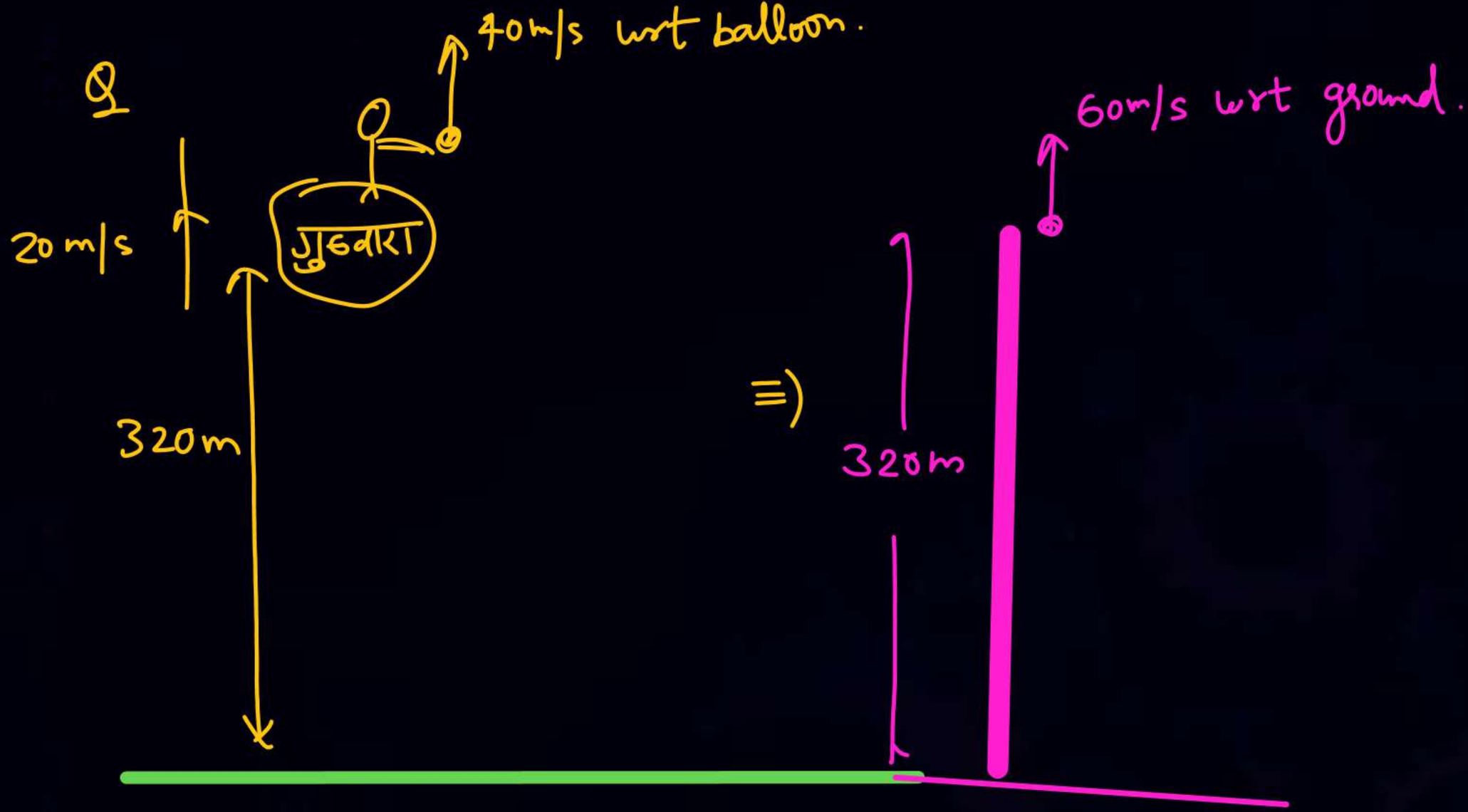
$\vec{a}, \vec{v}, \theta \equiv$ St. line motion

Projectile motion

(a) const


SKC
$a_x = 10$
45
$20\sqrt{2}$
45°
$g = 10$
$\vec{v}$
$\vec{a}$
St. line

Q



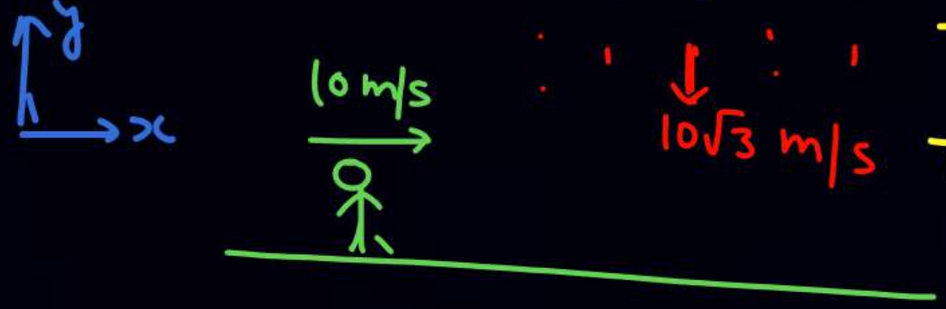
Q A man is moving along +x-Axis (east direction), with speed 10m/s and rain is falling vertically downward with speed $10\sqrt{3}$ m/s. In which direction man should hold umbrella to protect himself.

(Ans 60 South of west)

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

$$\theta = 60^\circ$$

Soln



$$\vec{v}_m = 10\hat{i}$$

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

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

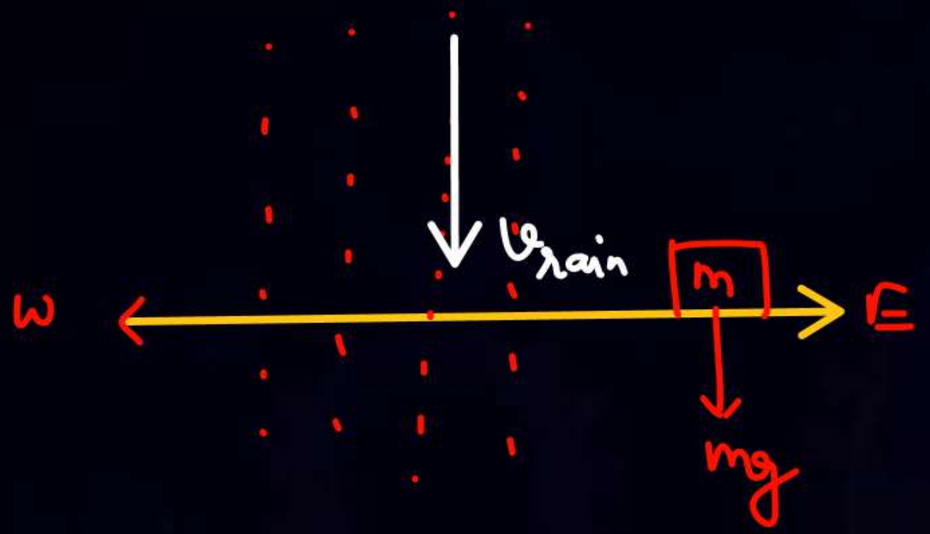
$$\vec{v}_{r/m} = -10\hat{i} - 10\sqrt{3}\hat{j}$$

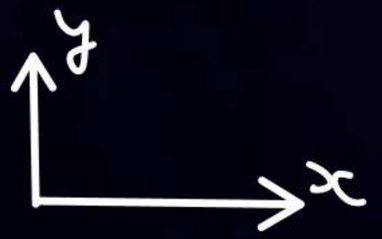
Do prakar ke ques

Top View

Aasman se Neeche dekh Rahe hai

Rain-man Problem





SKC

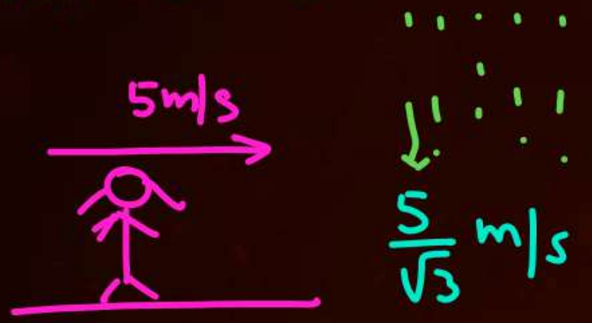
* $v_r, v_m \longrightarrow \hat{i}, \hat{j}$ me likh lo
* $v_{r/m}$ Nikalo or Draw karo (Naya Daigram banao vector wallah)
* Chhata laga do.

$v_{rain/man}, v_{bird/man}, v_{\text{इवा}/man}$

Q

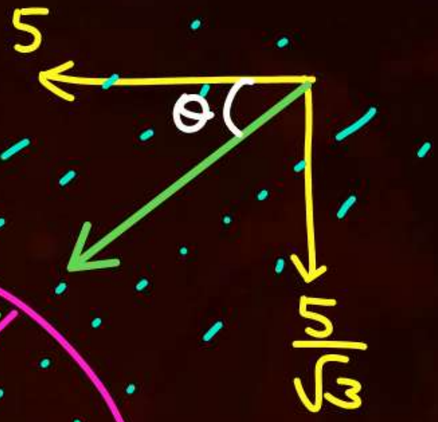
A girl is moving along +x-Axis (east direction), with speed 5 m/s and rain is falling vertically downward with speed $5/\sqrt{3}$ m/s. In which direction man should hold umbrella to protect herself.

Sol



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

ये rain की velocity है girl को दिखाई दे रही है



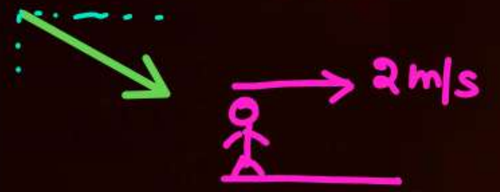
$\tan\theta = \frac{5/\sqrt{3}}{5} = \frac{1}{\sqrt{3}}$

$\theta = 30^\circ$

Q Note it

A rain is falling with speed 10m/s at angle 53° with verticle. A man is moving with speed 2m/s along east as shown in daigram.

(a) In which direction he should hold umbrella to protect himself.

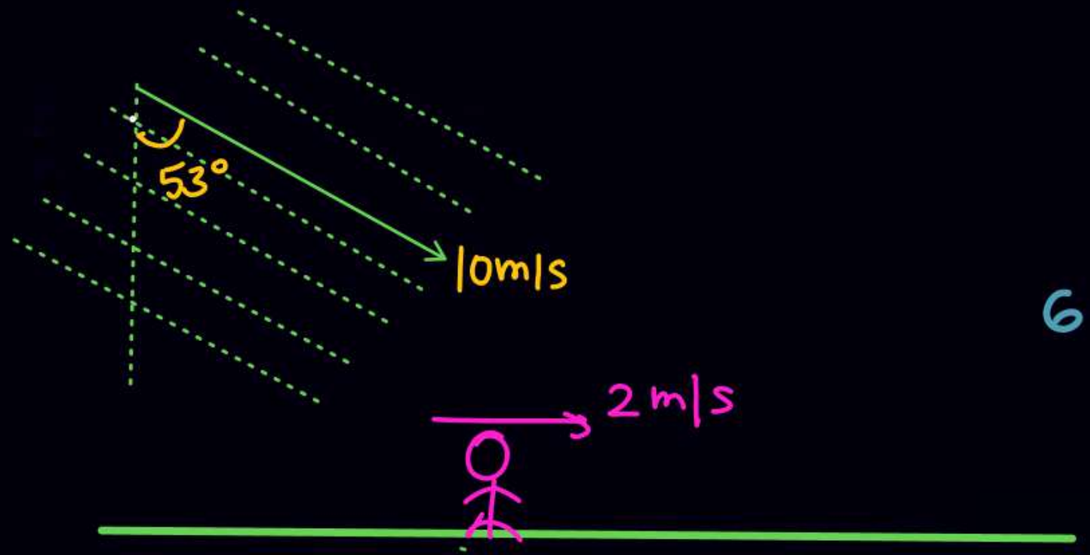


(b) what should be velocity of man so that rain appear to falling vertically

(c) with what additional speed man should run so that rain appear to fall vertically to him.

to him.

Ans (6)

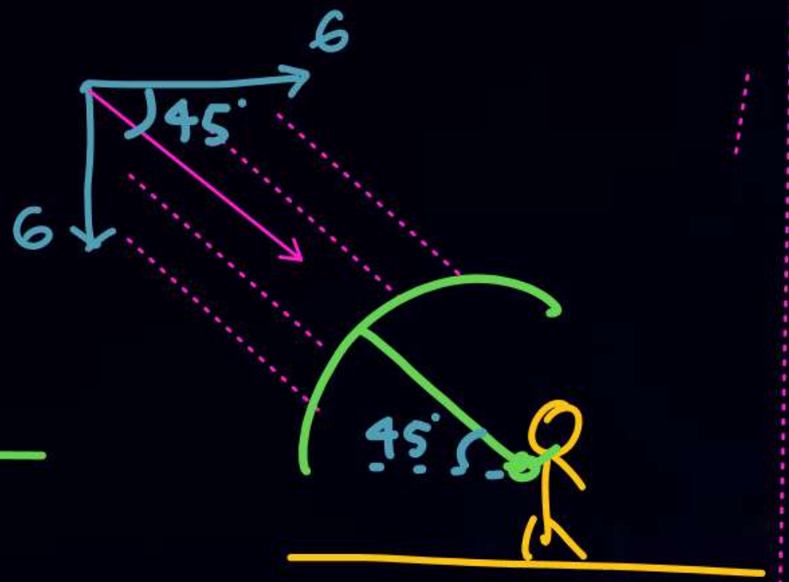


$\vec{v}_r = 8\hat{i} - 6\hat{j}$

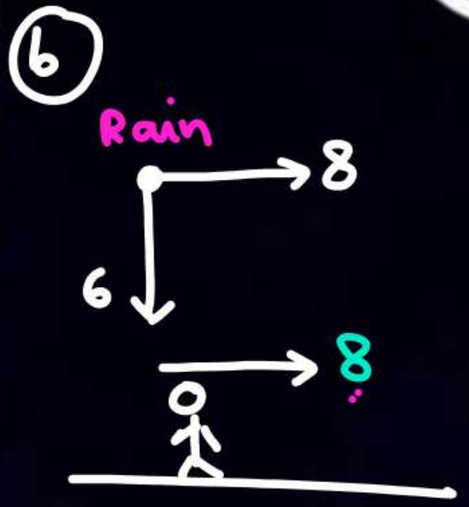
$\vec{v}_m = 2\hat{i}$

$\vec{v}_{r/m} = \vec{v}_r - \vec{v}_m = 8\hat{i} - 6\hat{j} - 2\hat{i}$

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



(b)



If $v_{man} = 8\hat{i}$

Rain will appear to fall Vertically.

$v_{r/m} = (8\hat{i} - 6\hat{j}) - 8\hat{i}$

$= -6\hat{j}$

Home Work

- Complete your notes
- KPP 17-18 solve if you haven't
- KPP-19 (one liner ques + 1 mint based ques to cover All NEET PYQ will be uploaded today)

join it for SKC pdf

Thankyou