SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

MOTION IN A PLANE (UT-04) QB

PHYSICS

1. The position of a particle is given by $r = 9\cdot 0t\hat{i} + 4\cdot 0t^2\hat{j} + 25\cdot 0\hat{k}$ where t is in seconds and the coefficients have the proper units for r to in metres. Find a(t) of the particle is …. (m/s^2)

2. Rain is falling vertically with a speedof 70 ms^{-1}. A woman rides a bicycle witha speed of 24 m / s. In East to westdirection.what is the direction in which she should hold her umbrella?

3. A cricketer can throw a ball to a maximumhorizontal distance of 200 m. How much high above the ground can the cricketer throw thesame ball?

4. A stone tied to the end of a sling 50 cmlong is whirled in a horizontal circle witha constant speed. If the stone makes10revolutions in 20s, what is the magnitudeand direction of acceleration of the stone ….

5. An aircraft executes a horizontal loop of radius 2 km with a steady speed of 1800 km/h. Compare its centripetal acceleration with the acceleration due to gravity then ac/ g is ……

6. A body is projected at an angle $30^0$with thehorizontal with velocity V from the points. At the same time, another body is projected vertically upwards from B with velocity V_2. The point B lies vertically below the highest point of the trajectory of body projected from point A. For both the bodies to collide, the value of v_1/v_2 shouldbe …….

7. An insect trapped in a circular grooveof radius 10 cm moves along the groovesteadily and completes 8 revolution in loos. What is the angular speed? …………(rad/s)

8. A cricket ball is thrown ataspeedof 9.8 m/s in a direction 30^0 above thehorizontal. find themaximum height is …….(m).

9. The horizontal range of a projectilefired at an angle of 15^0 is 50 m. If itis fired with the same speed at anangle of 45^0, its range will be ……….(m)

10 The angle b/w $\overline{A} = \hat{i} + \hat{j}$ and $\overline{B} = \hat{i} - \hat{j}$ is

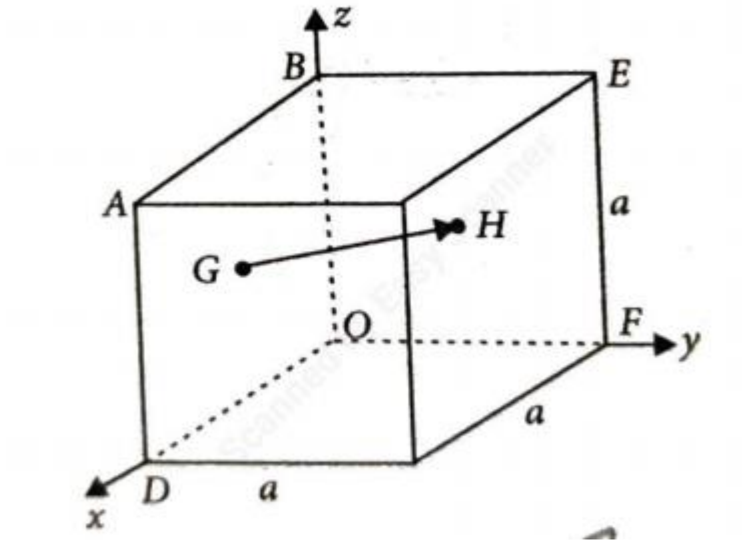
11. A person standing on an open ground hears the sound of a jet aeroplane, coming from north at an angle 6^0 with ground level. But he finds the aeroplane right vertically above his position. If v the speed of sound, speed of the plane is

1)v 2)$\frac{\sqrt{3}}{2}v$ 3) $\frac{2v}{\sqrt{3}}$ 4)$\frac{v}{2}$

12. Two boys are standing at the ends A and B of a ground where AB=a. The boy at B starts running in a direction perpendicular to AB with velocity v_1The bov at A starts running simultaneously with velocity v and catches the other in a time t, where t is

1)$\frac{a}{\sqrt{v^2+v_1^2}}$ 2)$\frac{a}{v+v_1}$ 3) $\frac{a}{v-v_1}$ 4)$\sqrt{\frac{a^2}{v^2-v_1^2}}$

13. In the cube of side a shown in the figure, the vector from the central point of the face ABOD to the central point of the face BEFO will be



1)$\frac{1}{2}a(\hat{j}-\hat{k})$ 2)$\frac{1}{2}a(\hat{j}-\hat{\imath})$ 3)$\frac{1}{2}a(\hat{k}-\hat{\imath})$ 4)$\frac{1}{2}a(\hat{\imath}-\hat{k})$

14. The trajectory of a projectile near the surface of the earth is given as y=2x-9x^2. If it were launched at an angle$\theta_0$with speedv_0 then (g=10ms^{-2})

1)$\theta_0=\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$ and $v_0=\frac{5}{3}ms^{-1}$ 2)$\theta_0=\sin^{-1}\left(\frac{1}{\sqrt{5}}\right)$ and $v_0=\frac{5}{3}ms^{-1}$

3)$\theta_0=\cos^{-1}\left(\frac{2}{\sqrt{5}}\right)$ and $v_0=\frac{3}{5}ms^{-1}$ 4)$\theta_0=\sin^{-1}\left(\frac{2}{\sqrt{5}}\right)$ and $v_0=\frac{3}{5}ms^{-1}$

15. Two guns A and B can fire bullets at speeds 1 k/mand 2k/m respectively. From a point on a horizontal ground, they are fired in all possible directions. The ratio of maximum areas covered by the bullets by the two guns, on the ground is

1)1:2 2) 1:16 3) 1:4 4) 1:8

16. A particle is moving with a velocity $\vec{v}=K(y\hat{\imath}+x\hat{j})$were K is a constant. The general equation for its path is

1)$y^2=x^2+$ constant 2)$y=x^2+$ constant 3)$v^2=x+$ constant 4)$xy=$ constant

17. A particle moves from the point $(2.0\hat{\imath}+4.0\hat{j})$ at t=0,with an initial velocity$(5.0\hat{\imath}+4.0\hat{j})ms^{-1}$. itis acted upon by a constant force which produces a constant acceleration $(4.0\hat{\imath}+4.0\hat{j})ms^{-2}$. What is the distance of the particle from the origin at times 2s

1)$20\sqrt{2}$m 2) 5m 3) 15m 4)$10\sqrt{2}$m

18. The position co-ordinates of a particle m a 3-D coordinate system is given by x=a cosωt, y=a sinωt and z=aωt . The speed of the particle is

1) 2aω 2)$\sqrt{3}$ aω 3) $\sqrt{2}$ aω 4) aω

19. Six particles situated at the corners of a regular hexagon of side α move at a constant speed υ. Each particle maintain a direction such that it is always directed towards the particle at the next consecutive corner. Calculate the time after which the particles will meet each other

1) $\frac{a}{2V}$ 2) $\frac{2a}{V}$ 3) $\frac{V}{2a}$ 4) $\frac{2V}{a}$

20. If magnitude $\vec{A}+\vec{B}$ is equal to n times the magnitude of $\vec{A}-\vec{B}$, then the angle between $\vec{A}$ and $\vec{B}$ is

1) $\cos^{-1}\left(\frac{n-1}{n+1}\right)$ 2) $\cos^{-1}\left(\frac{n^2-1}{n^2+1}\right)$ 3) $\sin^{-1}\left(\frac{n-1}{n+1}\right)$ 4) $\sin^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

21. Let $|\vec{A_1}|=3, |\vec{A_2}|=5$ and $|\vec{A_1}+\vec{A_2}|=5$. The value of $(2\vec{A_1}+3\vec{A_2})\cdot(3\vec{A_1}-2\vec{A_2})$is

1) -106.5 2) -99.5 3) -118.5 4) -112.5

22. The direction cosines of $\hat{\imath}+\hat{j}+\hat{k}$are

1) 1,1,1 2) 2,2,2 3) $\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}$ 4) $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$

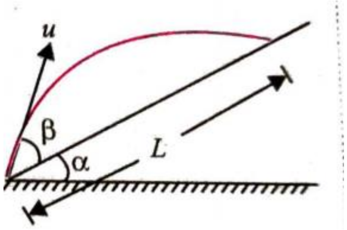
23. The ceiling of a hall is 40m high. For maximum horizontal distance, the angle at which the ball may be thrown with a speed of 56 m s^{-1} without hitting the ceiling of the hall is

1) 25^0 2) 30^0 3) 45^0 4) 60^0

24. Galileo writes that for angles of projection of a projectile at angles $(45° + \theta)$and $(45° - \theta)$, the horizontal ranges described by the projectile are the ratio of (if $\theta \le 45°$)

1) 2:12)1:2 3)1:1 4)2:3

25. A particle is projected in air at an angle β to a surface which itself is inclined at an angle α to the horizontal. The distance L is equal to



1) $\frac{2u^2 \sin\alpha \cos(\alpha+\beta)}{g\cos^2\alpha}$ 2) $\frac{2u^2 \sin\beta \cos(\alpha+\beta)}{g\cos^2\beta}$ 3) $\frac{2u^2 \sin\beta \cos(\alpha+\beta)}{g\cos^2\alpha}$ 4) $\frac{2u^2 \sin\alpha \cos(\alpha+\beta)}{g\cos^2\beta}$

26. A cyclist is riding with a speed of 27 kmh^{-1}. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the constant rate of 0.50 m s^{-1} every second. The net acceleration of the cycliston the circular turn is

1) $0.68 ms^{-2}$ 2) $0.86 ms^{-2}$ 3) $0.56 ms^{-2}$ 4) $0.76 ms^{-2}$

27. The area of the triangle formed by the adjacent sides with $\vec{A} = -3\hat{\imath} + 2\hat{\jmath} - 4\hat{k}$ and $\vec{B} = -\hat{\imath} + 2\hat{\jmath} + \hat{k}$ is

1) $\frac{\sqrt{165}}{2}$ units 2) $\frac{\sqrt{137}}{2}$ units 3) $\sqrt{165}$ units 4) $\sqrt{137}$ units

28. An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation point by the aircraft positions 10 s apart is 30^0, then the speed of the aircraft is

1) $10.8 ms^{-1}$ 2) $1963 ms^{-1}$ 3) $108 ms^{-1}$ 4) $196.3 ms^{-1}$

29. A particle is moving on a circular path of radius r with uniform speed v. What is the displacement of the particle after it has described an angle of 60^0 ?

1) $r\sqrt{2}$ 2) $r\sqrt{3}$ 3) r 4) 2r

30. A river is flowing due east with a speed 3m s^{-1}. A swimmer can swim in still water at a speed of 4 ms^{-1}. If swimmer starts swimming due north, then the resultant velocity of the swimmer is

1) 3 ms^{-1} 2) 5 ms^{-1} 3) 7 ms^{-1} 4) 2 ms^{-1}

KEY

PHYSICS

1) **8.0**	2) **0.343**	3) **100**	4) **493**	5) **12.7**	6) **2**	7) **0.50**	8) **1.225**	9) **100**	10) **90^0**
11) **4**	12) **4**	13) **2**	14) **1**	15) **2**	16) **1**	17) **1**	18) **3**	19) **2**	20) **2**
21) **3**	22) **4**	23) **2**	24) **3**	25) **3**	26) **2**	27) **1**	28) **4**	29) **3**	30) **2**

SOLUTIONS

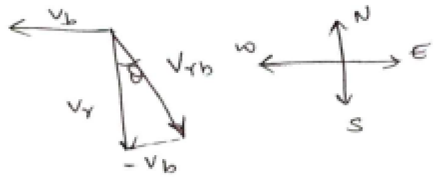
1. $v(t) = \frac{dr}{dt} = \frac{d}{dt}\left(9 \cdot 0t\hat{\imath} + 4 \cdot 0t^2\hat{\jmath} + 25 \cdot 0\hat{k}\right)$

$= 9.0\hat{\imath} + 8.0t\hat{\jmath}$

$a(t) = \frac{dv}{dt} = \frac{d}{dt}(9.0\hat{\imath} + 8 \cdot 0t\hat{\jmath})$

$a = 8.0\hat{\jmath}$

$a = 8.0 ms^2$ a long y–direction

2. 

$\operatorname{Tan}\theta = \frac{v_b}{v_r} = \frac{24}{70} = 0.343$

3. $R = 200\text{m}$

$\theta = 45°$

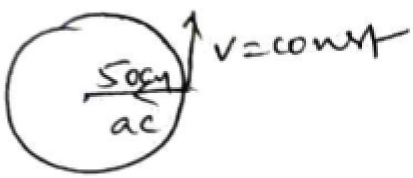
$\text{Rmax} = \frac{u^2}{g}$

$200 = \frac{u^2}{g} - (1)$

$v^2 - u^2 = -2gH$

$H = \frac{u^2}{2g} = \frac{200}{2} = 100\text{m}$

4.



$a_c = \omega^2 r$

angular velocity $= \frac{\text{angules displacement}}{\text{Tine taken}}$

$w = \frac{\theta}{t}$

$\omega = \frac{10\times 2\pi}{20} = \pi \text{ rad } /s$

$a_c = \omega^2 r = (\pi^2) \times 50\text{cm}$

$= 50\pi^2 \text{cm/s}^2$

$= 493\text{cm/s}$

5. $a_c = \frac{v^2}{\gamma}$

$= \frac{\left(1800\times\frac{5}{18}\right)^2}{2000} = \frac{500\times 500}{2000} = \frac{250}{2}$

$\frac{a_c}{g} = \frac{250}{2} \times \frac{1}{9\cdot 8}$

$\frac{ac}{g} = \frac{250}{19\cdot 6} = 12.7.$

$\frac{a_c}{g} = 12 \cdot 7$

6. $\frac{v_1^2 \sin^2 30^0}{2g} = \frac{v_2^2}{2g}$

$\frac{V_2}{v_1} = \sin 30° = \frac{1}{2}$

$\frac{v_1}{v_2} = 2$

7. $w = \frac{2\pi}{T} = 2\pi \times \frac{8}{100} = 0.50 rad/s$

8. $h_m = \frac{(V_0 \sin\theta_0)^2}{2g} = \frac{(9.8 \sin 30^0)^2}{2 \times 9.8}$

$= \frac{9.8 \times 9.8 \times 1}{4 \times 2 \times 9.8}$
$= 1.225\text{m}$

9. $R = \frac{u^2 \sin 2\theta}{g}$

$\frac{R_1}{R_2} = \frac{\sin 2\times 15}{\text{cin } 2\times 45} = \frac{\sin 30°}{\sin 90°} = 100\text{m}$

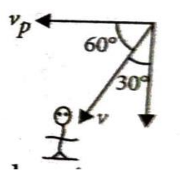
10. $|\bar{A}| = \sqrt{1^2 + 1^2} = \sqrt{2}$

$|\bar{B}| = \sqrt{1^2 + (-1)^2} = \sqrt{2}$

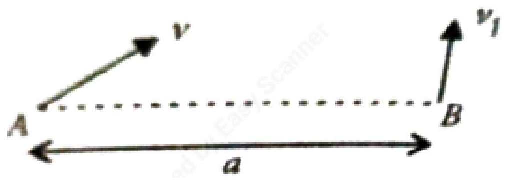
$\bar{A} \cdot \bar{B} = |\bar{A}||\bar{B}| \cos\theta$

$\cos\theta = 0$
$\theta = \cos^{-1}(0)$
$\theta = 90°$

11. $v_p = v\cos 60° = \frac{v}{2}$



12.



$t=\frac{a}{v'}=\frac{a}{\sqrt{v^2-v_1^2}}$

13. The position vectors for points G and H are $\left(\frac{a}{2}\hat{k}+\frac{a}{2}\hat{\imath}\right)$ and $\left(\frac{a}{2}\hat{\jmath}+\frac{a}{2}\hat{k}\right)$ respectively

So, the displacement vector from G to H is $\overrightarrow{OH}-\overrightarrow{OG}=\frac{a}{2}(\hat{k}+\hat{\jmath}-\hat{k}-\hat{\imath})=\frac{a}{2}(\hat{\jmath}-\hat{\imath})$

14. Given trajectory of particle, y=2 x-9x^2Comparing it with equation of projectile

$y=x\tan\theta_0-\frac{g}{2u^2\cos^2\theta_0}x^2$

$\tan\theta_0=2\Rightarrow\cos\theta_0=\frac{1}{\sqrt{5}}\Rightarrow\theta_0=\cos^{-1}\left(\frac{1}{\sqrt{5}}\right)$

and $\frac{g}{2u^2\cos^2\theta_0}=9\Rightarrow u=v_0=\frac{5}{3}\text{ms}^{-1}$

15. Range, $R=\frac{v_0^2\sin 2\theta}{g};\frac{A_1}{A_2}=\frac{\pi R_{1max}^2}{\pi R_{2max}^2}=\frac{v_1^4}{v_2^4}=\frac{1}{16}$

16. Here, $\vec{v}=K(y\hat{\imath}+x\hat{\jmath})$

$\frac{dx}{dt}i+\frac{dy}{dt}\hat{\jmath}=K(y\hat{\imath}+x\hat{\jmath})\frac{dx}{dt}=Ky$ and $\frac{dy}{dt}=Kx$

$\frac{dy}{dx}=\frac{dy|dt}{dx|dt}=\frac{Kx}{Ky};ydy=xdx$

Integrating both sides
$\int ydy=\int xdx$ or $y^2=x^2+$ constant

17. $\vec{r}_0=(2.0\hat{\imath}+4.0\hat{\jmath})\text{m}$

$\vec{v}_0=(5.0\hat{\imath}+4.0\hat{\jmath})\text{ms}^{-1},\vec{a}=(4.0\hat{\imath}+4.0\hat{\jmath})\text{ms}^{-2}$

Along x -axis, $S_{ox}=2\text{m},v_{ox}=5\text{ms}^{-1},a_x=4\text{ms}^{-2}$

$S_x=S_{0x}+v_{0x}t+(1/2)a_xt^2=2+5\times2+(1/2)\times4\times(2)^2=20\text{m}$

Along y -axis, $S_{0y}=4\text{m}\ v_{0y}=4\text{ms}^{-1},a_y=4\text{ms}^{-2}$

$S_y=S_{0y}+v_{0y}t+(1/2)a_yt^2=4+4\times2+(1/2)\times4\times2^2=20\text{m}$

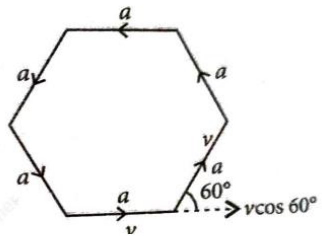
$S=\sqrt{S_x^2+S_y^2}=\sqrt{(20)^2+(20)^2}=20\sqrt{2}\text{m}$

18.: $x = a\cos\omega t \Rightarrow v_x = -a\omega\sin\omega t$

$y = a\sin\omega t \Rightarrow v_y = a\omega\cos\omega t; z = a\omega t \Rightarrow v_z = a\omega$

Speed of particle, $v = \sqrt{v_x^2 + v_y^2 + v_z^2} = \sqrt{a^2\omega^2 + a^2\omega^2} = a\omega\sqrt{2}$

19. Due to symmetry of the problems, we can say that the six particles will meet at the centre of the hexagon.



The separation between any two consecutive particles decreases at the rate of approach velocity. Velocity of approach

$v_{\square pp} = v - v\cos 60^\circ = v - v/2 = v/2$

The initial separation between two consecutive particles is a and it decreases to zero with a velocity of approach equal to v/2

$t = \frac{a}{v_{\text{app}}} = \frac{a}{v/2} = \frac{2a}{v}$

20. Let θ be an angle between vectors $\vec{A}$and $\vec{B}$.

$|\vec{A} + \vec{B}| = n|\vec{A} - \vec{B}|$ (Given)

$|\vec{A} + \vec{B}|^2 = n^2|\vec{A} - \vec{B}|^2$

$A^2 + B^2 + 2AB\cos\theta = n^2[A^2 + B^2 - 2AB\cos\theta]$

$A^2 + A^2 + 2A^2\cos\theta = n^2[A^2 + A^2 - 2A^2\cos\theta]$

$\because \because |\vec{A}| = |\vec{B}|]$

$(n^2 + 1)\cos\theta = (n^2 - 1)$

$\cos\theta = \left(\frac{n^2-1}{n^2+1}\right)$ or $\theta = \cos^{-1}\left(\frac{n^2-1}{n^2+1}\right)$

21. $\left(|\vec{A}_1 + \vec{A}_2|\right)^2 = A_1^2 + A_2^2 + 2\overrightarrow{A_1}\cdot\overrightarrow{A_2} = 25$ or $\vec{A}_1 \cdot \vec{A}_2 = \frac{1}{2}(25 - 9 - 25) = -\frac{9}{2}$

So, $\left(2\overrightarrow{A_1} + 3\overrightarrow{A_2}\right)\cdot\left(3\overrightarrow{A_1} - 2\vec{A}_2\right) = 6A_1^2 - 4\overrightarrow{A_1}\cdot\overrightarrow{A_2} + 9\overrightarrow{A_2}\cdot\overrightarrow{A_1} - 6A_2^2$

$= 6(9) + 5\left(\frac{-9}{2}\right) - 6(25) = -118.5$

22. Let $\vec{A} = \hat{\imath} + \hat{\jmath} + \hat{k} \therefore A_x = 1, A_y = 1, A_z = 1$

and $A = \sqrt{A_x^2 + A_y^2 + A_z^2} = \sqrt{(1)^2 + (1)^2 + (1)^2} = \sqrt{3}$

$\cos\alpha, \cos\beta$ and $\cos\gamma$ are the direction cosines of $\vec{A}$

$\cos\alpha = \frac{A_x}{A} = \frac{1}{\sqrt{3}}, \cos\beta = \frac{A_y}{A} = \frac{1}{\sqrt{3}}, \cos\gamma = \frac{A_z}{A} = \frac{1}{\sqrt{3}}$

23. Here, $u = 56\text{ms}^{-1}$

Let θbe the angle of projection with the horizontal to have maximum range, with

maximum height =40 m

Maximum height, $H = \frac{u^2 \sin^2 \theta}{2g}$

$$40 = \frac{(56)^2 \sin^2 \theta}{2 \times 9.8}$$

$$\sin^2 \theta = \frac{2 \times 9.8 \times 40}{(56)^2} = \frac{1}{4} \text{ or } \sin \theta = \frac{1}{2} \text{ or } \theta = \sin^{-1}\left(\frac{1}{2}\right) = 30^\circ$$

24.: For a projectile launched with velocity u at an angle θ, the horizontal range is given by

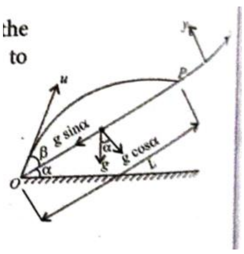
$$R = \frac{u^2 \sin 2\theta}{g}$$

(i) For $\theta_1 = 45^\circ - \theta$.$R_1 = \frac{u^2 \sin(90^\circ - 2\theta)}{g} = \frac{u^2 \cos 2\theta}{g}$

(ii) For $\theta_2 = 45^\circ + \theta_1$

$$R_2 = \frac{u^2 \sin(90^\circ + 2\theta)}{8} = \frac{u^2 \cos 2\theta}{g} = R_1 \therefore \frac{R_2}{R_1} = 1$$

25. Take the x –axis along the incline and y -axis perpendicular to the plane.



$\therefore u_x = u \cos \beta$

$u_y = u \sin \beta$

$$a_x = -g \sin \alpha$$
$$a_y = -g \cos \alpha$$

When the particle lands at P its y coordinate becomes zero.

$$\therefore 0 = u_y t + \frac{1}{2} a_y t^2$$

$$0 = u \sin \beta t - \frac{1}{2} g \cos \alpha t^2 \text{ or } t = \frac{2u \sin \beta}{g \cos \alpha}$$

For motion along inclined plane, $x = u_x t + \frac{1}{2} a_x t^2$

$\therefore L = u\cos\beta t - \frac{1}{2} g\sin\alpha t^2$

Substituting the value of t from eq. (i), we get

$$L \approx u\cos\beta\left(\frac{2u\sin\beta}{g\cos\alpha}\right) - \frac{1}{2} g\sin\alpha\left(\frac{2u\sin\beta}{g\cos\alpha}\right)^2$$
$$= \frac{2u^2\sin\beta\cos\beta}{g\cos\alpha} - \frac{2u^2\sin\alpha\sin^2\beta}{g\cos^2\alpha}$$
$$= \frac{2u^2\sin\beta}{8\cos^2\alpha}\left\{\cos\beta\cos\alpha - \sin\alpha\sin\beta\right| = \frac{2u^2\sin\beta\cos(\alpha+\beta)}{g\cos^2\alpha}$$

26. Here, $v = 27\text{kmh}^{-1} = 27 \times \frac{5}{18}\text{ms}^{-1}$

$v = \frac{15}{2}\text{ms}^{-1} = 7.5\text{ms}^{-1}, r = 80\text{m}$

Centripetal acceleration, $a_c = \frac{v^2}{r}$

$a_c = \frac{(7.5\text{ms}^{-1})^2}{80\text{m}} \approx 0.7\text{ms}^{-2}$

Tangential acceleration, $a_t = -0.5\text{ms}^{-2}$

Magnitude of the net acceleration is

$a = \sqrt{(a_c)^2 + (a_t)^2} = \sqrt{(0.7)^2 + (-0.5)^2} \approx 0.86\text{ms}^{-2}$

27. $\vec{A} \times \vec{B} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ -3 & 2 & -4 \\ -1 & 2 & 1 \end{vmatrix}$

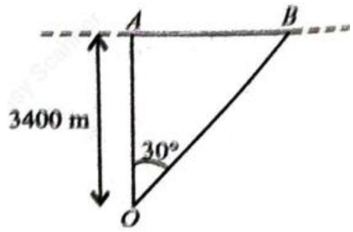
$= \hat{\imath}[2+8] + \hat{\jmath}[4+3] + \hat{k}[-6+2] = 10\hat{\imath} + 7\hat{\jmath} - 4\hat{k}$

$\therefore |\vec{A} \times \vec{B}| = \sqrt{10^2 + 7^2 + 4^2} = \sqrt{100 + 49 + 16} = \sqrt{165}$

Area of triangle $= \frac{1}{2}|\vec{A} \times \vec{B}| = \frac{\sqrt{165}}{2}$ units

28. O is the observation point at the ground, A and B are the positions of aircraft for which

$\angle AOB = 30^9$, Time taken by aircraft from A to B is 10 s



In $\Delta\ AOB$

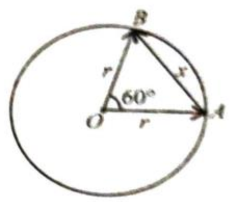
$\tan 30^\circ = \frac{AB}{3400}$

$AB = 3400 \tan 30^\circ = \frac{3400}{\sqrt{3}}$ m

Speed of aircraft.

$$v = \frac{AB}{10} = \frac{3400}{10\sqrt{3}} = 196.3 \text{ms}^{-1}$$

29.

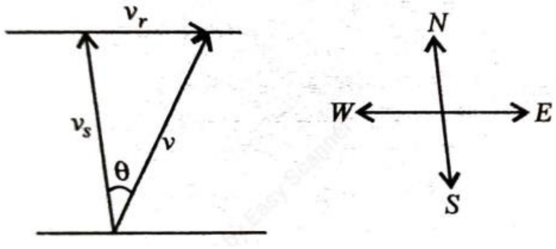


According to cosine formula

$$\cos 60^\circ = \frac{r^2 + r^2 - x^2}{2r^2}$$
$$2r^2 \cos 60^\circ = 2r^2 - x^2$$
$$x^2 = 2r^2 - 2r^2 \cos 60^\circ = 2r^2(2\sin^2 30^\circ] = r^2$$
$$\therefore x = r$$

Displacement $AB = x = r$

30.



Here, Velocity of water flowing in river, $v_r = 3\text{ms}^{-1}$

Velocity of swimmer in still water, $v_s = 4\text{ms}^{-1}$

From figure, The resultant velocity of the swimmer is

$v = \sqrt{v_s^2 + v_r^2} = \sqrt{(4)^2 + (3)^2} = \sqrt{25} = 5\text{ms}^{-1}$