Physicsaholics

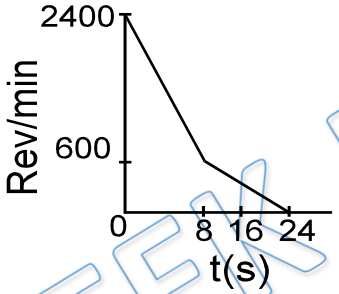
DPP – 1 Circular Motion)

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/78

Video Solution on YouTube:- https://youtu.be/_mpIm_c0ShM

Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/80

Q 1. A table fan rotating at a speed of 2400 rpm is switched off and the resulting variation of the rpm with time is shown in the figure. The total number of revolutions of the fan before it come to rest is:



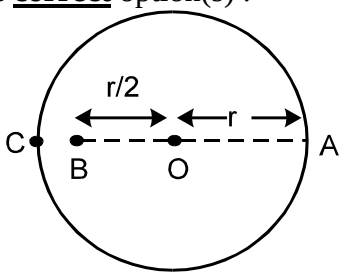
(a) 420 (b) 280 (c) 190 (d) 16800

Q 2. The constant quantity in uniform circular motion is.
(a) speed (b) centripetal force
(c) acceleration (d) momentum

Q 3. A wheel is of diameter 1m. If it makes 30 revolutions/sec., then the linear speed of a point on its circumference will be.
(a) 30π m/s (b) π m/s (c) 60 π m/s (d) π /2 m/s

Q 4. The angular velocity of the second's needle in watch is.
(a) π/30 (b) 2π (c) π (d) 60/π

Q 5. A particle is revolving in a circle of radius r and centre at 'O' with uniform angular velocity w. Choose the **correct** option(s) :



(a) the ratio of angular velocity at A about O and about B is 3 : 2.
(b) the angular velocity at A about all points O, B and C is same.
(c) the angular velocity at A about C is w/2.

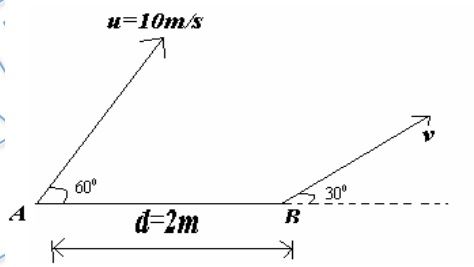
(d) the velocity at A and C are same.

Q 6. A particle moves along a circle of radius R = 1 m so that its radius vector $\vec{r}$ relative to a point on its circumference rotates with the constant angular velocity w =2 rad/s. The linear speed of the particle is:
(a) 4 m/s (b) 2 m/s (c) 1 m/s (d) 0.5 m/s

Q 7. A particle is moving in a circle of radius 1 m with speed varying with time as v = (2t) m/s. In first 2 s:
(a) distance travelled by the particle is 4 m
(b) displacement of the particle is 2 sin 2
(c) avenge speed of the particle is 2 m/s
(d) average velocity of the particle is zero

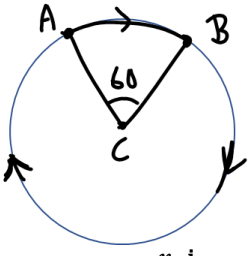
Q 8. A rigid body rotates with constant angular velocity ω about the line $x = \frac{y}{2} = \frac{z}{2}$, The speed of particle at the instant, it passes through the point (2,3,5) is:
a) ω b) 2ω c) 3ω d) $\sqrt{2}\omega$

Q 9. Two particles A and B are situated at a distance d = 2m apart. Particle A has a velocity of u = 10m/s at an angle of π/3 and particle B has a velocity v at an angle π/6 as shown in the figure. The distance d between A and B is 2m and it is not changing with time. The angular velocity of B with respect to A is



(a) $5\sqrt{3}rad/s$ (b) $5/\sqrt{3}rad/s$
(c) $10\sqrt{3}rad/s$ (d) $10/\sqrt{3}rad/s$

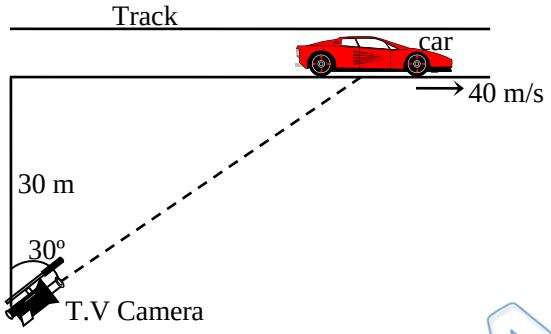
Q 10. A particle is describing circular path with centre C, in the sense as shown in figure with constant speed. If the average velocity in the time interval in which particle moves from A to B is v_0 **i** then the average velocity in the time interval in which particle moves from B to A will be



(a) v_0 **i** (b) -5 v_0 **i** (c) $\frac{-v_0\,\mathbf{i}}{5}$ (d) 5 v_0 **i**

Q 11. A particle moves in a circle with constant angular velocity ω about a point P on its circumference. The angular velocity of the particle about the center C of the circle is
(a) 2ω (b) ω / 2 (c) ω (d) not constant

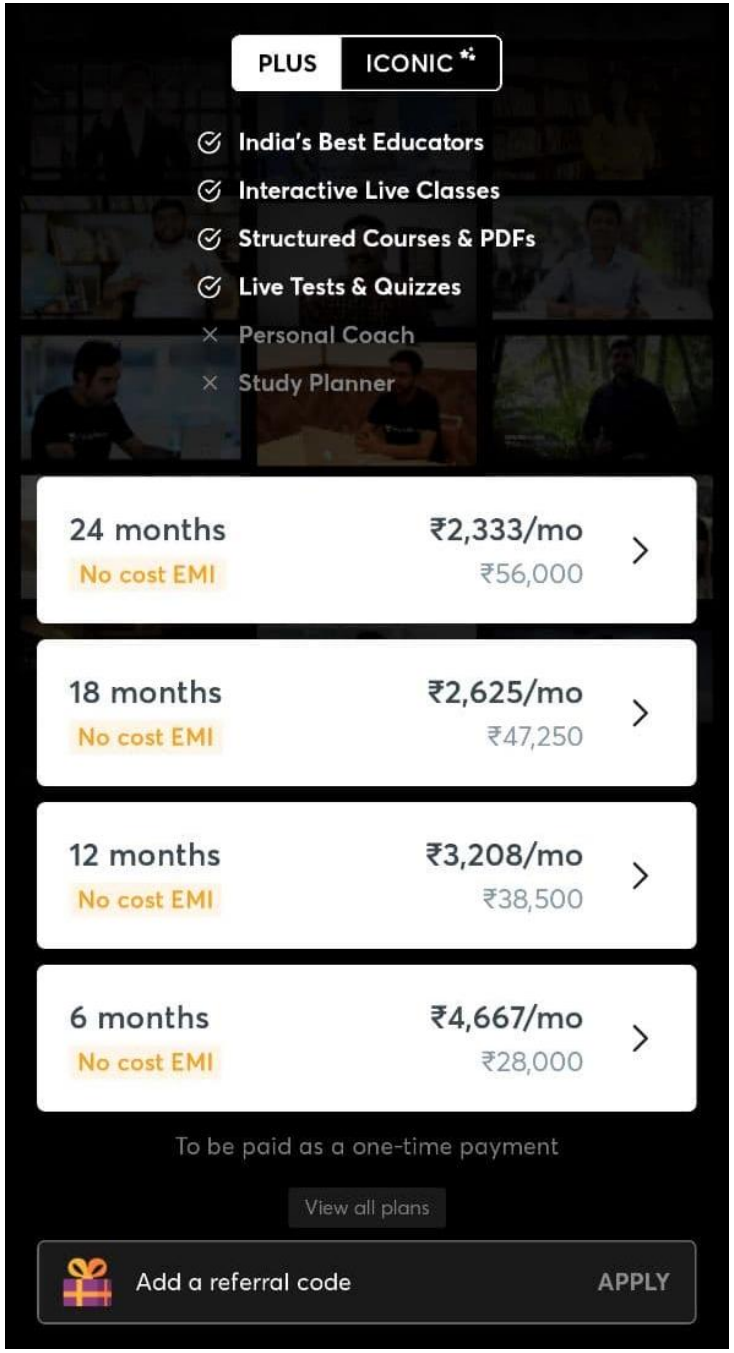
Q 12. A racing car is travelling along a track at a constant speed of 40 m/s. A T.V. camera men is recording the event from a distance of 30m directly away from the track as shown in figure. In order to keep the car under view in the position shown, the angular speed with which the camera should be rotated, is-



(a) 4/3 rad/sec (b) 3/4 rad/sec
(c) $8/3\sqrt{3}$ rad/sec (d) 1 rad/sec

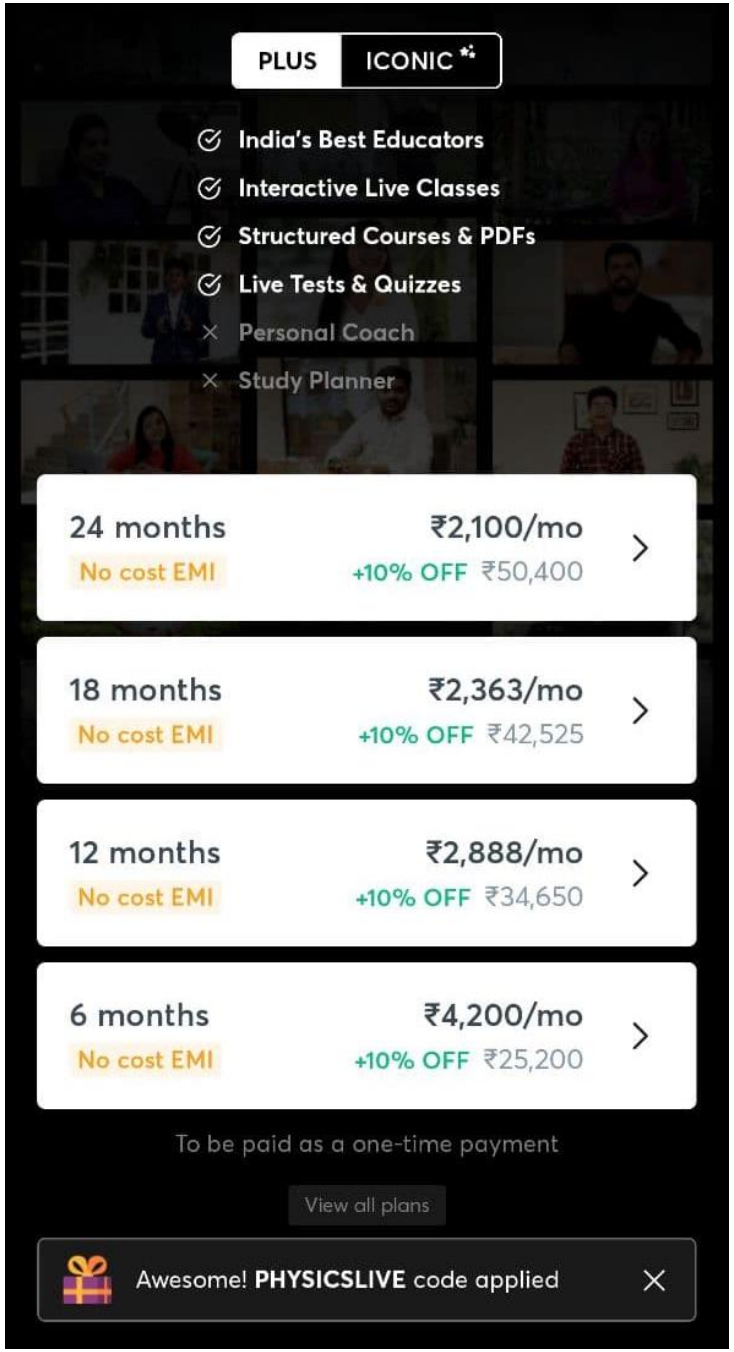
Answer Key

Q.1 b	**Q.2 a**	**Q.3 a**	**Q.4 a**	**Q.5 a, c**
Q.6 a	**Q.7 a, b, c**	**Q.8 d**	**Q.9 b**	**Q.10 c**
Q.11 a	**Q.12 d**			



PHYSICSLIVE

Use code PHYSICSLIVE to get 10% OFF on Unacademy PLUS.

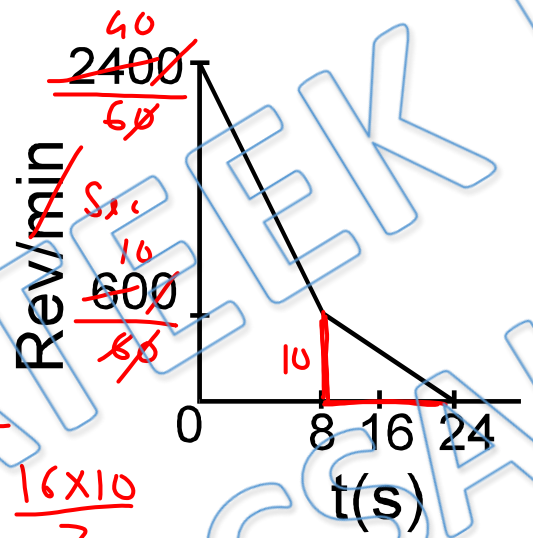


Written Solution

DPP- 1 : Angular displacement, Angular velocity angular acceleration and kinematics of circular motion

By Physicsaholics Team

Q1) A table fan rotating at a speed of 2400 rpm is switched off and the resulting variation of the rpm with time is shown in the figure. The total number of revolutions of the fan before it come to rest is:



$$\text{Area} = \int \frac{d(\text{rev})}{dt}\, dt$$

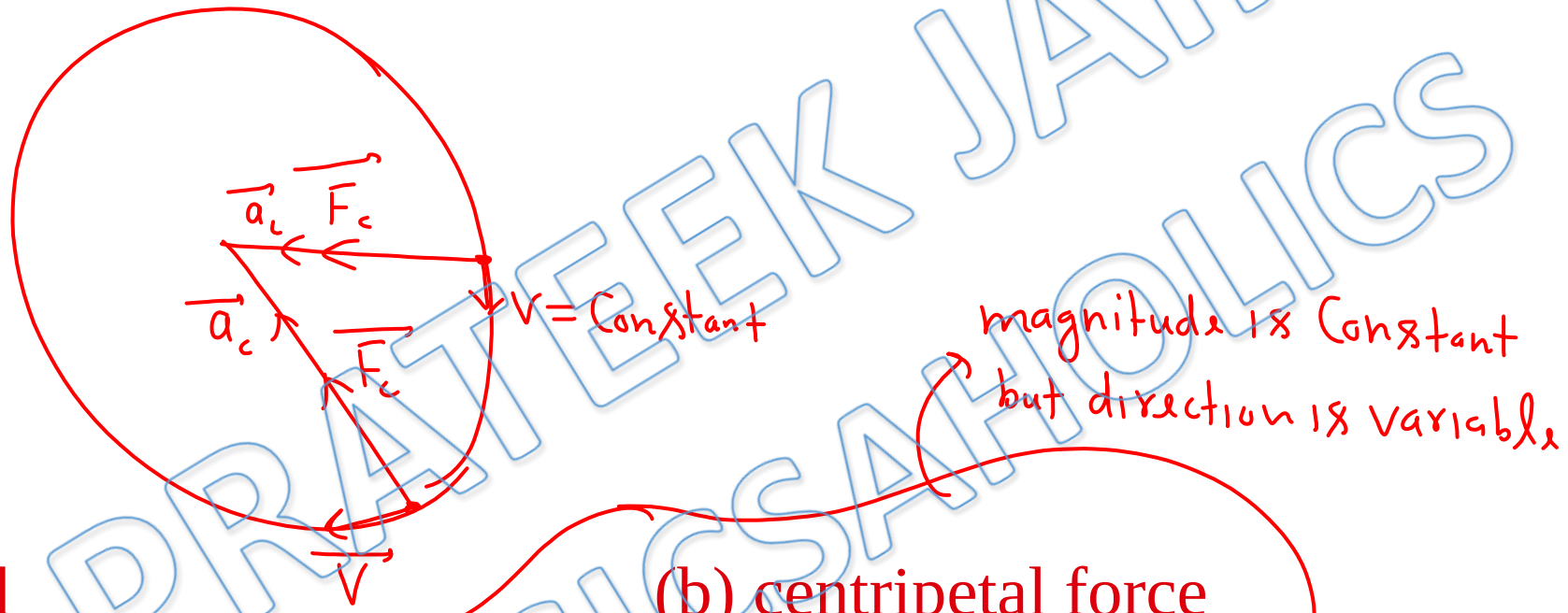
$$= \text{rev}$$

$$\text{no of revolution} = \frac{1}{2} \times 50 \times 8 + \frac{16 \times 10}{2}$$

$$= 280 \text{ rev}$$

(a) 420 (b) 280 (c) 190 (d) 16800

Q2) The constant quantity in uniform circular motion is.



(a) speed (b) centripetal force

(c) acceleration (d) momentum

Q3) A wheel is of diameter 1m. If it makes 30 revolutions/sec., then the linear speed of a point on its circumference will be.

$\omega = 30\ \text{rev/sec} = 30 \times 2\pi\ \text{rad/sec} = 60\pi\ \text{rad/sec}$

$r = \frac{D}{2} = \frac{1}{2}\ \text{m}$

$v = \omega r = \frac{1}{2} \times 60\pi = 30\pi\ \text{m/sec}$

(a) 30π m/s (b) π m/s (c) $60\ \pi$ m/s (d) π /2 m/s

Q4) The angular velocity of the second's needle in watch is.

Time period of second needle = 60 Sec

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{60} = \frac{\pi}{30}$$

(a) $\pi/30$ (b) 2π (c) π (d) $60/\pi$

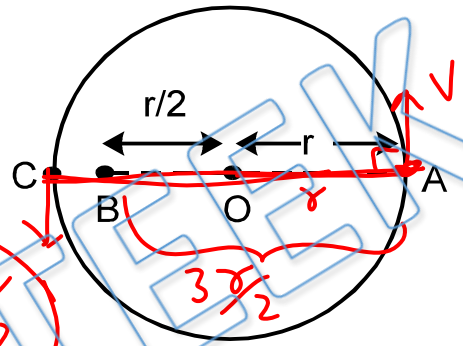
Q5) A particle is revolving in a circle of radius r and centre at 'O' with uniform angular velocity w. Choose the **correct** option(s) :

$\omega = \frac{V_1}{r}$

$\omega_0 = V/r$

$\omega_B = \frac{2V}{3r}$

$\frac{\omega_0}{\omega_B} = 3/2$



$\omega_C = \frac{V}{2r} = \frac{\omega_0}{2} = \omega$

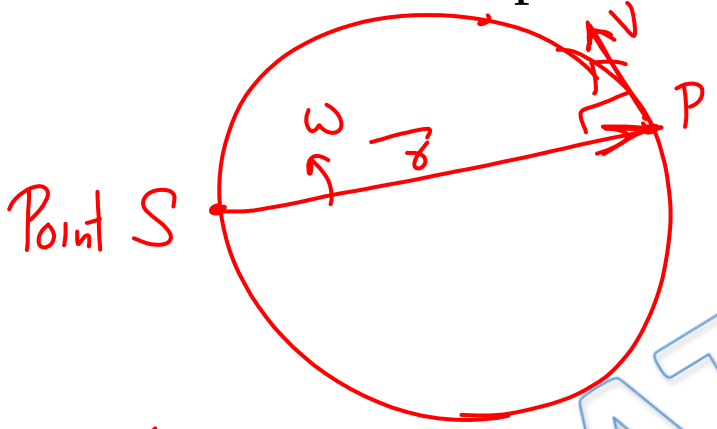
(a) the ratio of angular velocity at A about O and about B is 3 : 2.

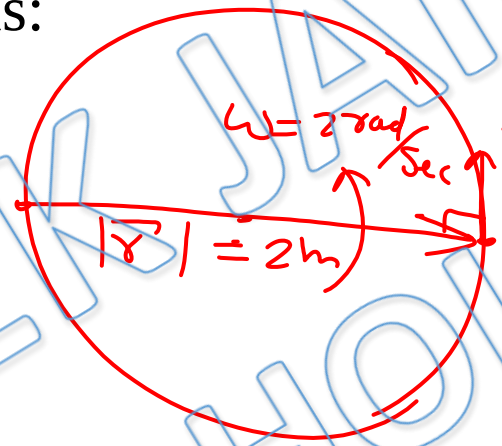
(b) the angular velocity at A about all points O,B and C is same.

(c) the angular velocity at A about C is w/2.

(d) the velocity at A and C are same.

Q6) A particle moves along a circle of radius R = 1 m so that its radius vector $\vec{r}$ relative to a point on its circumference rotates with the constant angular velocity w =2 rad/s. The linear speed of the particle is:





(a) 4 m/s (b) 2 m/s (c) 1 m/s (d) 0.5 m/s

$V = 2 \times 2 = 4\ m/sec$

Q7) A particle is moving in a circle of radius 1 m with speed varying with time as v = (2t)m/s. In first 2 s:

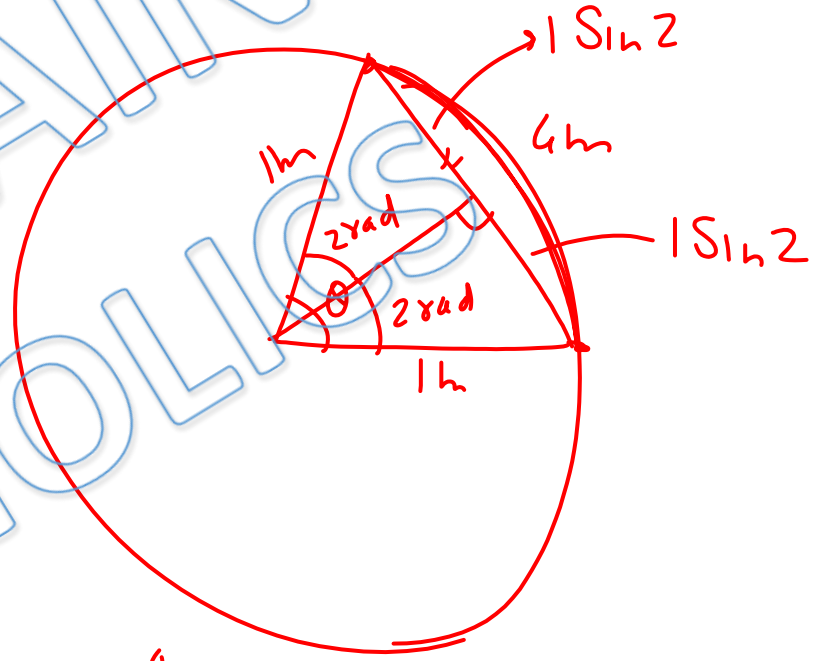
$v = 2t$

$\int ds = \int 2t\,dt$

$s = t^2$

at $t = 2$

$s = 4\ m$



(a) distance travelled by the particle is 4 m

(b) displacement of the particle is 2 sin 2

(c) avenge speed of the particle is 2 m/s

(d) average velocity of the particle is zero

$\theta = \frac{Arc}{R} = 4\ rad$

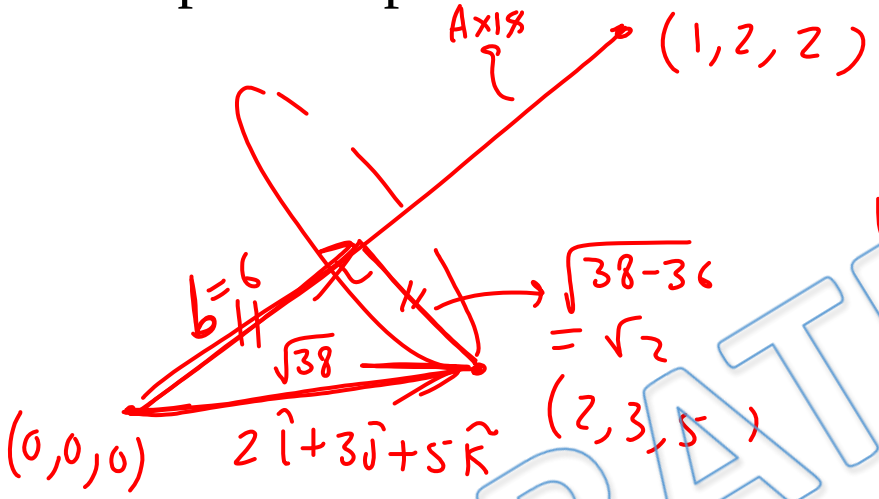
$Av\ speed = \frac{\Delta s}{\Delta t} = \frac{4}{2}$

$= 2\ m/Sec$

Displacement $= 2\ Sin 2$

$Av.\ velocity = \frac{2\ Sin 2}{2} = Sin 2$

Q8) A rigid body rotates with constant angular velocity ω about the line $x = \frac{y}{2} = \frac{z}{2}$, The speed of particle at the instant, it passes through the point (2,3,5) is :



$x=0 \Rightarrow y=0, z=0$

$x=1 \Rightarrow y=2, z=2$

Vector along axis $= \hat{i}+2\hat{j}+2\hat{k}$

Unit " " $= \frac{\hat{i}+2\hat{j}+2\hat{k}}{3}$

$|2\hat{i}+3\hat{j}+5\hat{k}| = \sqrt{4+9+25} = \sqrt{38}$

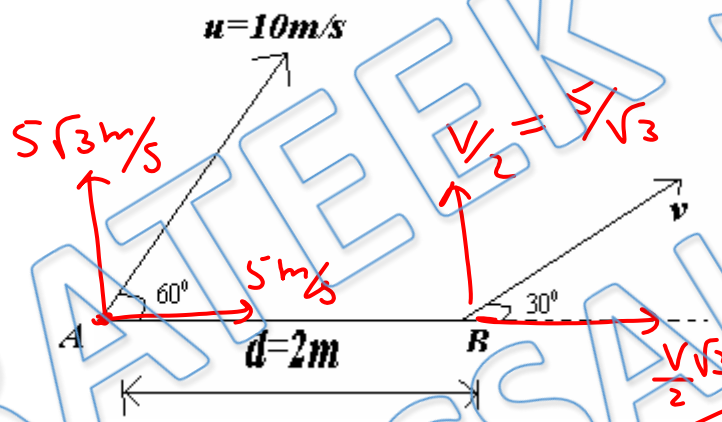
a) ω b) 2ω c) 3ω d) $\sqrt{2}\omega$ ✓

$b = (2\hat{i}+3\hat{j}+5\hat{k}) \cdot \frac{(\hat{i}+2\hat{j}+2\hat{k})}{3}$

$= \frac{2+6+10}{3} = 6$

$V = \omega r = \sqrt{2}\omega$

Q9) Two particles A and B are situated at a distance d = 2m apart. Particle A has a velocity of u = 10m/s at an angle of $\pi/3$ and particle B has a velocity v at an angle $\pi/6$ as shown in the figure. The distance d between A and B is 2m and it is not changing with time. The angular velocity of B with respect to A is



a) $5\sqrt{3}rad/s$
b) $5/\sqrt{3}rad/s$
c) $10\sqrt{3}rad/s$
d) $10/\sqrt{3}rad/s$

Since d is constant

$\frac{V\sqrt{3}}{2} = 5$

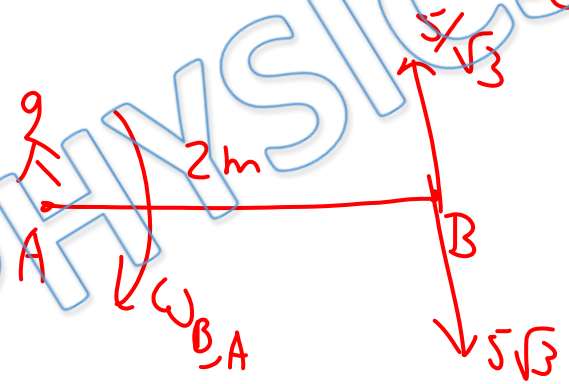
$V = 10/\sqrt{3}$ m/sec

$5\sqrt{3}$ m/s

$V_2 = 5/\sqrt{3}$

5 m/s

$\frac{V\sqrt{3}}{2}$



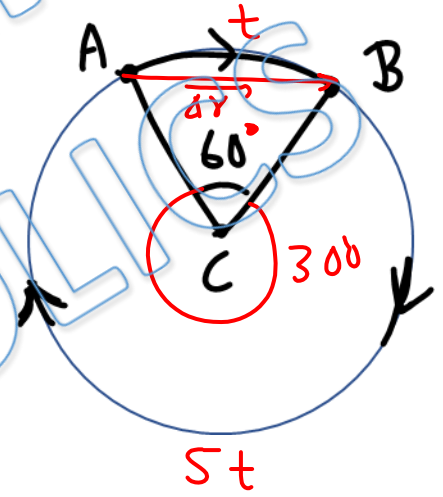
$\omega_{BA} = \frac{5\sqrt{3} - 5/\sqrt{3}}{2} = \frac{15-5}{2\sqrt{3}}$

$= 5/\sqrt{3}$

Q10) A particle is describing circular path with centre C, in the sense as shown in figure with constant speed. If the average velocity in the time interval in which particle moves from A to B is v_0 **i** then the average velocity in the time interval in which particle moves from B to A will be

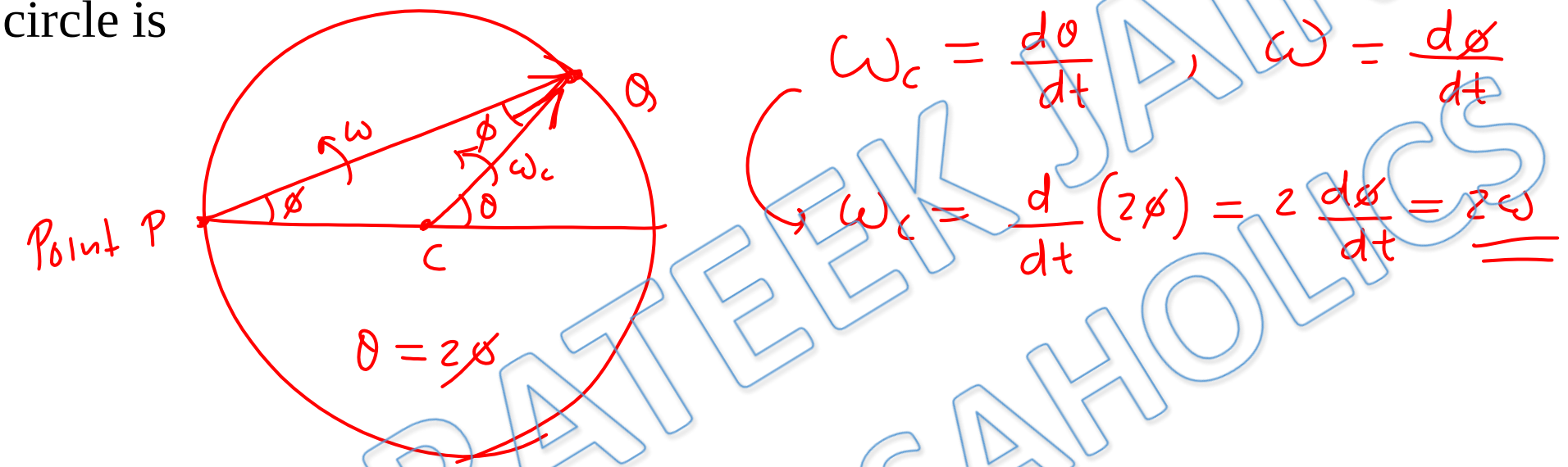
$$\vec{V}_{AB} = v_0 \hat{i} = \frac{\vec{\Delta Y}}{t}$$

$$\vec{V}_{BA} = \frac{-\vec{\Delta Y}}{5t} = -\frac{v_0 \hat{i}}{5}$$



(a) v_0 **i** (b) -5 v_0 **i** (c) $\frac{-v_0 \mathbf{i}}{5}$ (d) 5 v_0 **i**

Q11) A particle moves in a circle with constant angular velocity ω about a point P on its circumference. The angular velocity of the particle about the center C of the circle is



$\omega_c = \frac{d\theta}{dt}$, $\omega = \frac{d\phi}{dt}$

$\omega_c = \frac{d}{dt}(2\phi) = 2\frac{d\phi}{dt} = 2\omega$

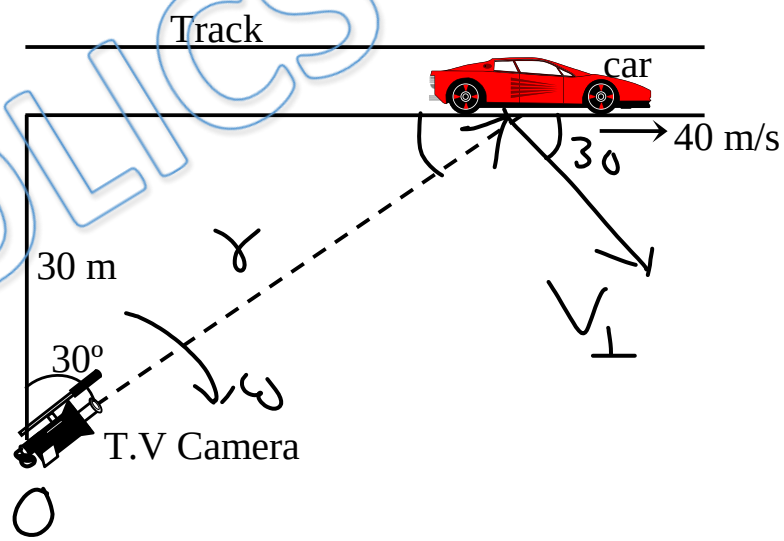
(a) 2ω (b) ω / 2 (c) ω (d) not constant

Q12) A racing car is travelling along a track at a constant speed of 40 m/s. A T.V. camera men is recording the event from a distance of 30m directly away from the track as shown in figure. In order to keep the car under view in the position shown, the angular speed with which the camera should be rotated, is-

$$\cos 30 = \frac{30}{r} = \frac{\sqrt{3}}{2}$$

$$r = \frac{60}{\sqrt{3}}\ m$$

$$V_\perp = 40\cos 30 = \frac{40\sqrt{3}}{2} = 20\sqrt{3}$$



(a) 4/3 rad/sec

(b) 3/4 rad/sec

(c) $8/3\sqrt{3}$ rad/sec

(d) 1 rad/sec

$$\omega = \frac{V_\perp}{r} = \frac{20\sqrt{3}}{60/\sqrt{3}} = 1\ \text{rad/sec.}$$

For Video Solution of this DPP, Click on below link

Video Solution on Website:- https://physicsaholics.com/home/courseDetails/78

Video Solution on YouTube:- https://youtu.be/_mpIm_c0ShM

Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/80

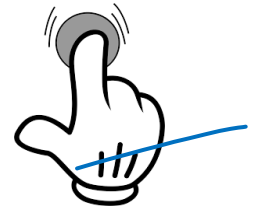
@Physicsaholics

@Physicsaholics_prateek

@NEET_Physics
@IITJEE_Physics

physicsaholics.com

Unacademy



CLICK

Chalo Niklo