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Circular motion, Angular displacement & velocity :-

1) The planet Neptune travels in a nearly circular orbit of radius, $r = 4.5 \times 10^9 km$, about the Sun, It takes Neptune 165 y to make a complete trip around the Sun. How fast in (km/h) does not Neptune travel in its orbit.

2) A circular cycle track has a circumference of 31.4m with AB as one of its diameter. A cyclist moves from A to B along the circular path with a constant magnitude 15.7m/s. Find

a) distance moved by the cyclist

b) displacement of cyclist AB represent N-S direction

c) Average velocity of the cyclist.

2)

3) a) Define circular motion.

b) An artificial satellite is moving in a circular orbit of radius 42,250km. Calculate speed if it takes 24 hours to revolve once around earth.

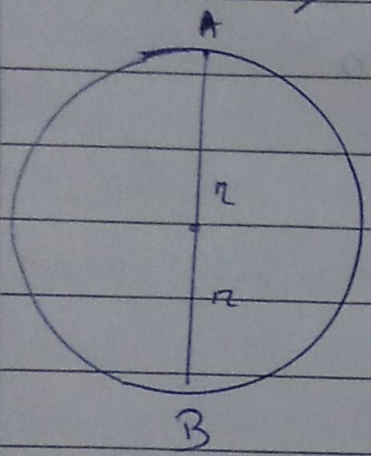
Answers:-

1)

$$V = \frac{2\pi r}{t} = \frac{2\,(3.14)\,(4.5\times10^{9}\,km)}{(165\,d)\,(365\,d/1\,y)\,(24\,h/1\,d)}$$

$$\Rightarrow 2.0\times10^{4}\ km/h$$

2)



a) Distence. $\frac{\text{Circumference}}{2} = \frac{3.14}{2} : 157\,m$

b) ~~Average velocity = $\frac{\text{displacement}}{\text{time}}$~~ $\frac{2\pi}{157}$ / 15.7

b) displacement = 2π

$\Rightarrow 2 \times \frac{3.14}{2\pi}$

$\Rightarrow$ 100 m towards South

$\Rightarrow 2 \times \frac{3.14}{2\pi} = 10\ m/sec$ / $\frac{157}{15.7}$

c) average velocity = $\frac{\text{displacement}}{\text{time}}$

$\frac{100}{\frac{100}{15.7}} = \frac{100 \times 15.7}{100} = 15.7 m/s$

3) a) motion of a body along circular path is called circular motion

b) Distance covered by Satellite in 24 hours

$S = 2\pi r$

$2 \times 3.14 \times 42250 = 265464.58 km$

Speed of Satellite

$V = \frac{\text{distance travelled}}{\text{time taken}}$

$\frac{265464.58}{24 \times 60 \times 60} = 3.07 km/s$