→ Homework :- 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/hr) doesnot Neptune travel in its orbit?

Ans:-

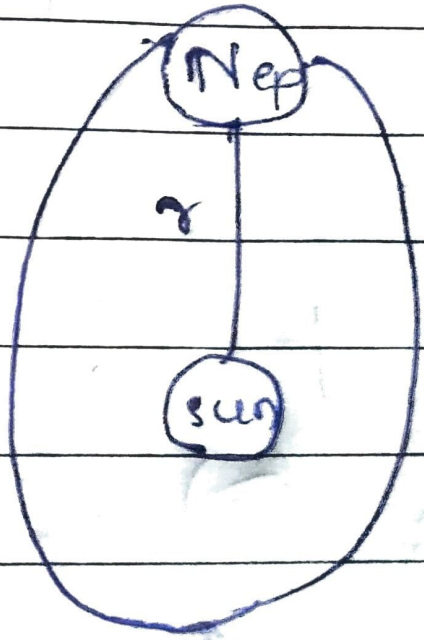
Radius of the orbit

$r = 4.5 \times 10^9$ km

Time = 165 y

$= (365 \times 24 \times 165)$ hrs.

Speed = ?



$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{\cancel{2} \times \cancel{3.14}^{1.57} \times \cancel{0.5}^{0.1} \times 10^9}{365 \times \cancel{24}^{12} \times \cancel{165} \; 11}$$

$$= \frac{1.57 \times 0.1 \times 10^9}{365 \times 2 \times 11}$$

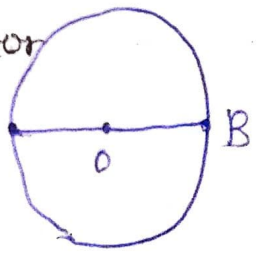
$$= 9,463,013.7 \text{ km/hr}.$$

(2) A circular cycle track has a circumference of 314 m with AB as one of its diameter. A cyclist travel from A to B along the circular path with a velocity of constant magnitude 15.7 m/s.

(a) the distance moved by the cyclist ?

(b) the displacement of the cyclist if AB represents north-south direction

(c) The average velocity of the cyclist ?



Ans :- (a) Circumference = $2\pi r = 314$ m

$= 2 \times \frac{22}{7} \times r = 314$ m

$= 2 \times 22r = \frac{314 \times 7}{}$

$44r = 314 \times 7$

$r = \frac{314 \times 7}{44} = 49.9545$

$r = 50$ m (Approx.)

Given, $V = 15.7$ m/s

(a) Distance moved $= \pi r$

$= \frac{22}{7} \times 50 = 157.1428$ m

(b) Displacement = diameter = $2R$

~~$\pi R = \frac{22}{7} \times 50$~~

$= 2 \times 50 = 100$ m towards north-south direction.

(c) Time taken by the cyclist to reach from one end of the diameter to other end $= \frac{157}{15.7} = 10$ sec.

$V_{avg} = \frac{\text{displacement}}{\text{Time}} = \frac{100}{10} = 10$ m/s.

(3) Define circular motion. An artificial satellite is moving in a circular orbit of radius 42,250 Km. Calculate speed, if it takes 24 hours to revolve once around the Earth.

Ans :- ~~Uniform~~ Motion of a particle along a circle (circular path) is called as circular motion. If the body covers equal distance along the circumference of the circle, in equal interrals of time, this is known as uniform motion.

Speed = constant.
velocity = variable.

(b) Given,
the radius of the orbit = 42250 km
time = 24 hrs

- distance covered by the satelite in 24 hrs =

$$S = 2\pi r$$
$$S = 2 \times \frac{22}{7} \times 42250 = 265464.58 \text{ km}$$

Therefore speed of statelite,

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

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