

M/W
6/8/21

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

Ans)
$$v = 2\pi r / T = \frac{2(3.14)(4.5 \times 10^9 \text{ km})}{(165 \text{ d})(365 \text{ d/ly})(24 \text{ h/d})} = 2.0 \times 10^4 \text{ km/h}$$

2) A circular cycle track has circumference of 314m with AB as one of its diameters. A cyclist travels from A to B along the circular path with a velocity of const. magnitude 15.7 m/s. Find (a) the dis moved by the cyclist. (b) the displacement of the cyclist if AB represents 'N-S dir'. (c) the avg. velocity of the cyclist.

Ans) a) Dis moved equal to $\pi r = 3.14 \times 50 = 157 \text{ m}$.
b) Displacement = AB = $2R = 100 \text{ m}$ towards South.
c) Time taken by the cyclist to reach B from A
 $= 157 / 15.7 = 10 \text{ s}$.

$$\vec{v}_{\text{avg}} = \frac{\vec{\text{Dis}}}{\text{time}} = \frac{100}{10} = 10 \text{ m/s}$$

3) Define circular motion.

i) An artificial satellite is moving in a circular orbit of radius 42,250 km. Calculate speed, if it takes 24 hrs to revolve once around the Earth.

Ans) i) Circular motion is the motion of a body along the sides of a polygon of infinite no. of sides with uniform speed, the dirⁿ changing continuously.

ii) Radius = 42250 km, time = 24 hrs.
Dis travelled $\hat{=}$ circumference of circle = $2\pi r$.

$$= 2 \times \frac{22}{7} \times 42250.$$

$$\text{Avg. speed} = \frac{\text{Total dis}}{\text{Total time}}.$$

$$= \frac{2 \times \frac{22}{7} \times 42250}{24} = \frac{232375}{21}$$

$$= 11065.47 \text{ km/h.}$$

Conversion = $\frac{232375}{21} \times \frac{\text{km}}{3600 \text{ sec}}$

$$= \frac{232375}{21 \times 3600} \text{ km/s} = \frac{9295}{21 \times 144} \text{ km/s}$$

$$= \frac{9295}{3024} \text{ km/s} = 3.07 \text{ km/s.}$$

(km).

————— >>> —————