Title

HOME ASSIGNMENT

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 165y to make a complete trip around the sun. How fast (in Km/h) does not Neptune travel in its orbit?

Ans) Radius $= 45 \times 10^9$ Km

$= \frac{45}{1\cancel{0}} \times 1000000000\cancel{0} = 45000000000$ Km.

Time $= 165y = 165 \times 365 = 60225$ days

$= 60225 \times 24 = 1445400$ hrs

Angular velocity $= \omega = \frac{\theta}{t} = \frac{2\pi r}{1445400}$

$= 2 \times \frac{22}{7} \times 45000000000 \div 1445400$

$= 2 \times \frac{22}{7} \times 45000000\cancel{000} \times \frac{1}{\frac{1445400}{657}}$

$= 19569.47$ Km/h.

∴ So, it travels 19569.47 Km/h fast.

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

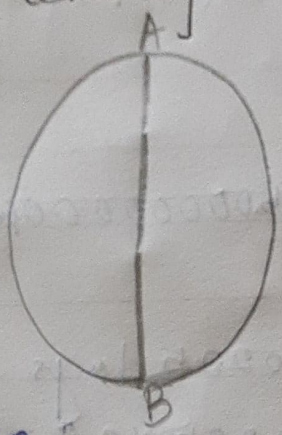
Find:

(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)



Given,

Circumference $= 2\pi r = 314\,m$

$\therefore$ Radius, $r = \frac{314}{2\pi} = \frac{314}{2 \times 3.14} = 50\,m.$

(a) Distance moved, $s = \frac{1}{2} \times$ circumference

$= \frac{1}{2} \times 314 = 157\,m.$

(b) Displacement $= \overrightarrow{AB} = 2r = 100\,m.$

Displacement is in north-south direction.

(c) Time taken in going from A to B $= \frac{157\,m}{15.7\,m/s} = 10\,s$

$\therefore$ Average velocity $= \frac{\text{Displacement}}{\text{Time}} = \frac{100}{10}$

$= 10\,m$, in north-south direction

3(a) Define circular Motion.

Ans) The motion of a body moving around a fixed point in a circular path is known as 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 the Earth.

Ans) Radius of the orbit = 42250km

Time taken = 24 hours

Distance travelled by the satellite

= circumference of circle

$= 2\pi r$

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

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

Now,

$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$

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

$= \frac{2 \times 22 \times 42250}{7 \times 24} = \frac{1 \times 11 \times 21125}{7 \times 3}$

$= \frac{232375}{21} = 11065.47 \text{ km/h}$

Also, converting speed into km/s

Average speed $= \frac{232375}{21}$ km/h

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

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

$= \frac{[redacted]9295}{21 \times 144}$ km/s

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