# Motion

## Exercises

1.) Ans: Time take = 2min 20 sec = 140 sec
Radius $r$ = 100 m
In 40 sec the athlete compalete one round
So, in 140 sec the athlete will complete = 140 ÷ 40 = 3.5 round.
⇒ Distance covered in 140 sec = $2\pi r \times 3.5 = 2 \times 22/7 \times 100 \times 3.5 = 2200$ m
At the end of his motion, the athlete will be in the diametically opposite position
⇒ Displacement = diameter = 200m

2.) Ans: From motion from A to B:
Distance covered = 300 m
Displacement = 300 m
Time taken = 150 sec.
We know that Average speed = Total distance covered ÷ Total time taken

$= 300\,m \div 150\,sec = 2\,m\,s^{-1}$

Average velocity = Net Displacement ÷ time taken.

$= 300\,m \div 150\,sec = 2\,ms^{-1}$

(b.) For motion from A to C

Distance covered = 300 + 100 = 400m

Displacement = AB - CB = 300 - 100 = 210sec.

time = 2·5min + 1min = 3·5min = 210sec

Therefore, Average Speed =

= Total distance ÷ Total time

$= 400 \div 210 = 1{\cdot}90\,ms^{-1}$

Average velocity =

= Net displacement ÷ time

$= 200m \div 210\,sec$

$= 0{\cdot}952\,ms^{-1}$

3.) Ans: Let one side distance = x km

Time taken for forward trip at a speed of 20 km/h = $\frac{\text{Distance}}{\text{Speed}}$

$= x/20\ h$

Total time for the whole trip

$= \frac{x}{20} + \frac{x}{30} = \frac{3x + 2x}{60} = \frac{5x}{60}\ h$

Total distance covered = 2x km

Average speed = Total distance ÷ Total time

$= 2x \div (5x/60)$

$= 24\ km\ h^{-1}$

4.) Ans: $u = 0\ m/s$

$a = 3\ ms^{-2}$

$t = 8\ s$

Using: $S = ut + 1/2\ at^2$

$\Rightarrow S = 0 \times 8 + 1/2 \times 3 \times 8^2$

$= 96 m.$

6.) a) B is travelling fastes as he is taking less time to comes more distame.

b.) All three are neres at the same point on the road.

c.) Approximately 6km.

d.) Approximately 7km.

7.) Fly. Here $\Rightarrow u = 0 m/s$

$s = 20 m$

$a = 10 ms^{-2}$

$v = ?$

$t = ?$

Using $v^2 - u^2 = 2as$

we have, $v^2 - 0^2 = 2 \times 10 \times 20 = 400$

$\Rightarrow v = 20 ms^{-1}$

and $t = (v-u) \div a = 20 \div 10 = 2s$

8.) a.) Distance covered = Area under Speed - time

=> Distance = $\frac{1}{2} \times 4 \times 6 = 12m$.

(b.) After 6 seconds the car moves in uniform motion.

9.) (a.) Yes, a body can have acceleration but with zero velocity. When a body is thrown up at highest point its velocity is zero but it has acceleration due to acceleration due to gravity.

(b.) Yes an acceleration moving horizontally is acted upon by acceleration due to gravity that acts vertically downwards.

10.) any, Here,

$R = 4225 km$

$= 4225000 m$

$T = 24 h$

$= 24 \times 60 \times 60 s$

Using, Speed, $V = 2\pi R \div t$

$V = (2 \times 3.14 \times 4225000) \div (24 \times 60 \times 60)\ m/s$

$= 3070.9 m/s$

$= 3.07 km/s$