HW
12/05/2021

Exercise ——

1) An athelete completes one round of a circular track of diameter 200 m in 40 s. What will be the distance covered and the displacement at the end of 2 minutes 20 s?

ans) Given,

diameter of the circle = 200 m

Time taken by the athelete to complete one round = 40 s

Radius = 200/2

= 100 m

Circumference = $2\pi r$

= $2 \times 100 \times \pi$

= 628 m

2 minute 20 s = 140 s

Number of rounds = 140/40

= 3.5

Total distance travelled = 628×3.5

= 2,198

= 2,200 (round)

∴ Total distance is 2,200 m

Displacement is 200 m because after 3 complete round $\frac{1}{2}$ round is left i.e., 200 m is left more to complete the round so, the displacement is 200 m.

2) Given,

Length of the road from A to B = 300m

Total time take to cover the distance = 2 min 30s

Length of the road from B to C = 150s

= 100m

Total time taken to cover the distance = 1 min

= 60 sec

Total distance from A to B and B to C = 300m + 100m

= 400m

Total time taken = 2 min 30 sec + 1 min 00 sec

= 3 min 30 sec

= 210 sec

a) From A to B

The average speed = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{300}{150}$

$= 2 \text{ m/s}$

Average velocity = $\frac{\text{Displacement}}{\text{Total time taken}}$

$= \frac{300}{150}$

$= 2 \text{ m/s}$

b) From A to C

Average speed = $\frac{300+100}{150+60}$

$= \frac{400}{210}$

$= 1.90476$ m/s

$= 1.9$ m/s (approx)

Average Velocity = $\frac{300-100}{150+60}$

$= \frac{200}{210}$

$= 0.95$ m/s (approx)

3) In Case (1): While driving to school.

Average speed of the Abdul's trip = 20 km/h

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

Total distance = Distance travelled to reach school = d

Total time taken = t_1

$\therefore 20 = \frac{d}{t_1}$

$t_1 = \frac{d}{20}$ - (1)

In Case (II) While returning from school

Total distance = d

Now, total time taken = t_2

Average speed = 30 ~~km/h~~ km/h

$\therefore 30 = \frac{d}{t_2}$

$t_2 = \frac{d}{30}$ - (II)

Average speed for Abdul's trip = $\frac{\text{Total distance covered in the trip}}{\text{Total time taken}}$

$= \frac{\text{Total distance covered in the trip}}{\text{Total time taken}}$

Where,

Total distance covered in the trip

$= d + d = 2d$

Total time taken = $t_1 + t_2$

$\therefore$ Average speed = $\frac{2d}{t_1 + t_2}$

For equation (I) and (II),

6) We known that distance is given by second equation of motion, $s = ut + \frac{1}{2}at^2$

Here,

s - distance

$u = 0$ = Initial velocity

$a = 3 m/s^2$ - acceleration

$t = 8 sec$ = ~~time~~ time

So,

using the equation ~~we~~ we get

$s = ut + \frac{1}{2}at^2$

$\Rightarrow s = 0 + \frac{1}{2} \times 3 \times 8^2$

$\Rightarrow s = 96 m$

7) a) Object B is travelling faster than other two objects.

b) No, all the three ~~objs~~ objects never at a same point on the road.

c) C has travelled 5.714 km when B passes A.

d) B has travelled 5.143 km by the time it passes C.

8) Distance covered by the ball, $s = 20 m$

Acceleration, $a = 10 m/s^2$

Initially, velocity, $u = 0$ (since the ball was initially at rest)

Final velocity of the ball which it stricks the ground, v

According to the third equation of motion:

$v^2 = u^2 + 2as$

$v^2 = 0 + 2(10)(20$

$v^2 = 20 m/s$

According to the first ~~two~~ equation of motion:

$v = u + at$

Where,

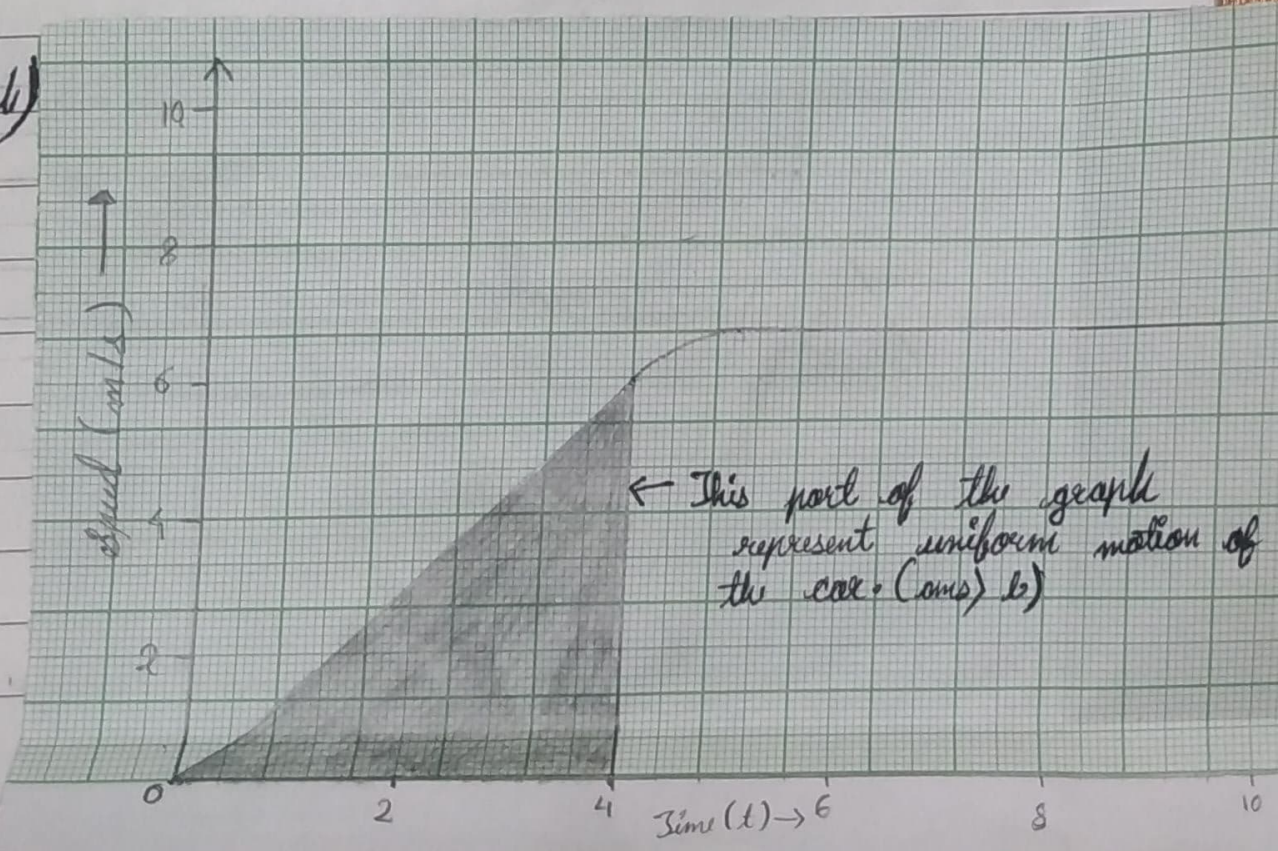
Time, t taken by the ball to stricke the ground is,

$20 = 0 + 10(t)$

$\Rightarrow t = 2 s$

Hence, the ball stricks the ground after 2 s with a velocity of 20 m/s.

9(a) and (b)



a) The shaded area which is equal to $\frac{1}{2} \times 4 \times 6 = 12\,m$ represents the distance travelled by the car in the first 4 sec.

18) Distance covered by the satellite in 24 hours

$s = 2\pi r$

$= 2 \times 3.14 \times 42250$

$= 265464.58\ km$

Therefore the speed of the ~~satellight~~ satellite =

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

$= \frac{265464.58}{24 \times 60 \times 60}$

$= 3.07\ km/s$