Homework

Exercise

Date / /

Page No.

Motion

1) Diametre of circular track = 200m

Radius = r = 100m.

Distance covered by an athlete if he completes one round of the circular track = $2 \times \pi \times r$

$= 2 \times 3.14 \times 100$

$= 628$ m.

Time taken to cover it = 40s

Speed of the athlete = $\frac{d}{t} = \frac{628}{40} = 15.7 ms^{-1}$

So, Distance covered in 1 sec = 15.7m

Then, distance covered in 2 min 20 sec / 140 sec

$= 140 \times 15.7 = 2198$ m

Time taken to complete 1 round = 90 sec

No. of rounds then completed in 2 min

$= 1 \times 3 = 3$ round

∴ Displacement after 2 min = 0m. = S_1

Now, Distance covered in 40 sec = 1 round = $2\pi r$

So, Distance covered in next 20 sec = $2\pi r / 2$

and, Displacement = $2r = 2(100) = 200$ m. = S_2

Hence, Total displacement = $S_1 + S_2 = 0 + 20$

$= 20$m.

2) Distance covered by Joseph between point A and B on a straight line = 300 m.

= Time taken by him to complete it
= 2 min 30 sec = 150 sec

∴ a) Josephs speed from A to B = $\frac{d}{t} = \frac{300m}{150s}$

= 2m/s

Distance covered from point B to C after turning around :-

= 100m.

∴ b) Distance covered from point A to C =
= 200m + 100 = 300m.

Time taken to cover path between B and C
= 1 min = 60s

Total time = 150sec + 60 sec = 210 sec.

∴ Josephs speed from A to C = $\frac{\Delta d}{\Delta t}$

= $\frac{200+100}{150+60} = \frac{300}{210} = 1.9 m/s$

Date / /
Page No.

a) Displacement from A to B point on straight line = +300m = s_1

Time taken = 150 sec

Average velocity from A to B = $\frac{s_1}{t} = \frac{300}{150}$ = 2m/s.

b) Displacement from B to C on straight line after turning back = −100m. = s_2

Total displacement from A to C = $s_1 + s_2$ = 300 + (−100) = 200m.

Total time taken from B to C = 60s

Total time taken from point A to C to travel = 150s + 60s = 210s

∴ Average velocity from A to C

$= \frac{\Delta s}{\Delta t} = \frac{200m}{210s} = 0.95 m/s$

So, avg. speed while travelling from A to B
= 2 m/s

Avg. speed while travelling from A to C
= 1.9 m/s

Avg. velocity while travelling from A to B
= + 2 m/s

Avg. velocity while travelling from A to C
= + 0.95 m/s.

3) Abdul's average speed while travelling to school = 20 Km/h.

Abdul's average speed while returning from school = 30 Km/h

Let distance from initial point to school = S

Time taken to cover S distance while going to school = $\frac{S}{V} = \frac{S}{20}$

Time taken to cover S distance while returning from school = $\frac{S}{V} = \frac{S}{30}$

Date / /
Page No.

Total distance travelled = $s + s = 2s$

Total time taken = $\frac{s}{20} + \frac{s}{30} = \frac{30s + 20s}{600}$

$= 50s/600 = s/12$

∴ Average speed during whole trip = $\frac{d}{t}$

$= \frac{2s}{\frac{s}{12}} = 2 \times 12 = 24 s^{-1} m$

Hence, average speed during whole trip is $24 m s^{-1}$

9) Initial velocity = 0

Acceleration of boat = $3 m/s^2$

Time taken = 8 s

Distance covered during this time =

= By (1) equation of motion

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

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

$= \frac{1}{2} \times 3 \times 64 = 32 \times 3$

$= 96 m.$

5) Speed of car = $52\ kmh^{-1}$

Time after which the car stops after applying the brakes = 5s

Speed of second car = 3 km/h

Time after which the car stops after applying brakes = 10s

⋮

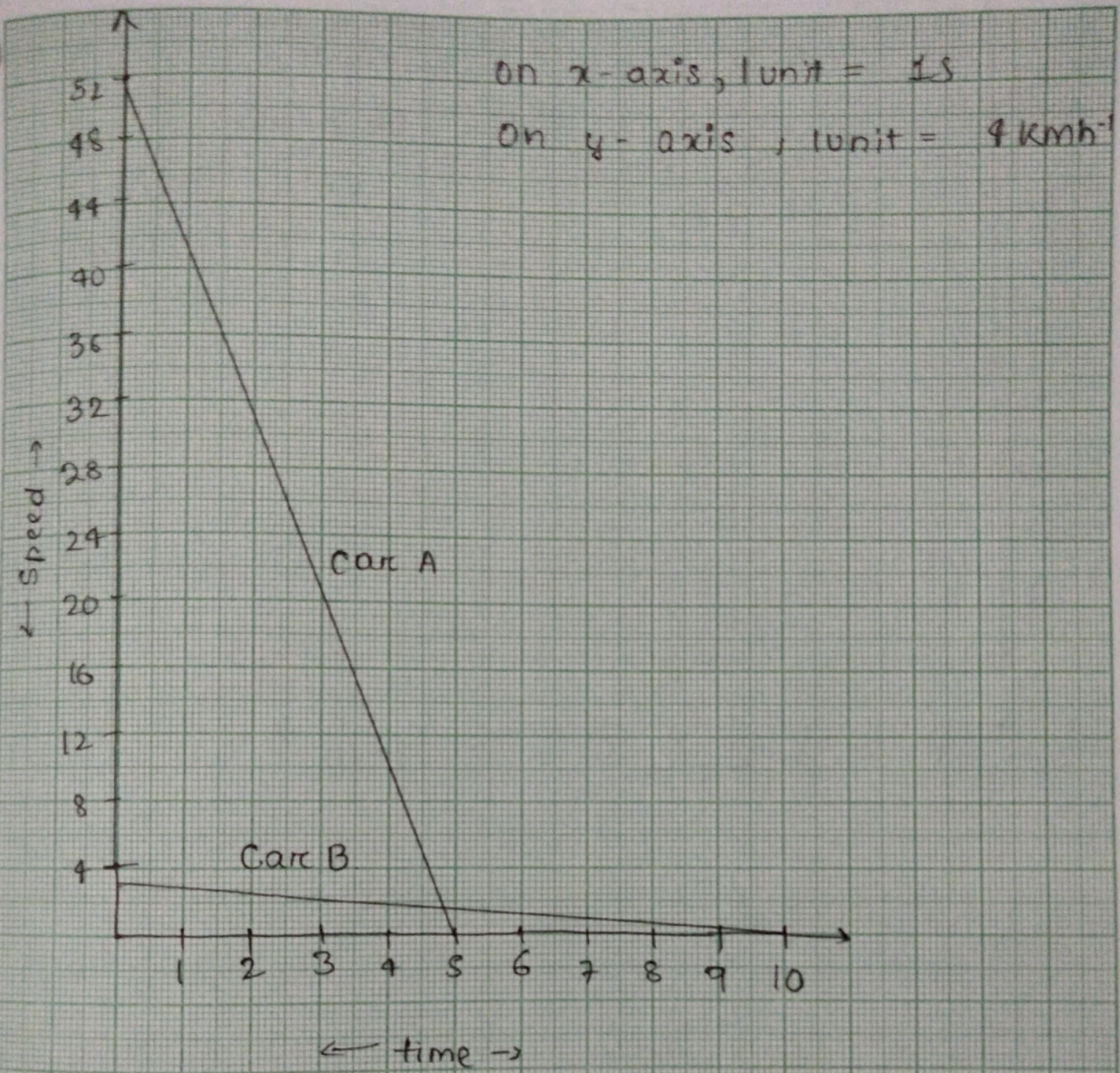
According to the graph, as area under the slope of graph A is more than the area under the graph B's slope.

Therefore distance travelled by car A is greater than the distance travelled by car B.

6) a) As slope of B is steepest, therefore B is travelling the fastest.

b) NO, all the three are never at the same point on the road.

5)


on x-axis, 1 unit = 1 s
on y-axis, 1 unit = 4 kmh⁻¹
52
48
44
40
36
32
28
24
20
16
12
8
4
↑ speed ↓
Car A
Car B
1
2
3
4
5
6
7
8
9
10
← time →

Date / /
Page No.

c) Distance represented by each small box = $\frac{4}{7}$ m

Initial position of C = $5 \times \frac{4}{7} = \frac{20}{7}$ m

Final position of C when B passes A

= $8 + 2 \times \frac{4}{7} = \frac{8+8}{7} = \frac{64}{7}$ m

Distance travelled by C when B passes A

= $\frac{64}{7} - \frac{20}{7} = \frac{44}{7}$ m

d) Initial position of B = 0m

Position of B when it passes A

= $8 + \frac{2(4)}{7} = \frac{8+8}{7} = \frac{64}{7}$

∴ Distance travelled by B when it passes A

= $\frac{64}{7} - 0 = \frac{64}{7}$

7) Height from which ball is dropped = 20m,

then initial velocity = 0

Acceleration = $10 m/s^2$

By applying the third equation of motion,

Velocity with which it will strike the ground

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

$= v^2 - 0^2 = 2 \times 10 \times 20$

$= v^2 = 400$

$= v = \sqrt{400} = 20 \text{ m/s}$

By applying the first equation of motion,

Time at which it will strike the ground

$= v = u + at$

$= 20 = 0 + 10t$

$= 20 = 10t$

$t = 2s$

8) a) Distance travelled by car in first 4 s

$=$ Area under the graph

$= \frac{\pi r^2}{4}$

$= \frac{\pi (4)^2}{4} = \frac{\pi \times 4 \times 4}{4}$

$= \pi \times 4 = (4\pi) m.$

b) The part of the graph from 6 - 10 s is representing the uniform motion of car.