CW 29.09.21

Exercise [Motion]
[Only Answer]
Revision

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 min 20 s?

Ans → Diameter = 200 m
R = 100 m
In 40 sec, an athelete completes 1 round
In 140 sec, " " 1 = $\frac{140}{40} = 3\frac{1}{2}$ "

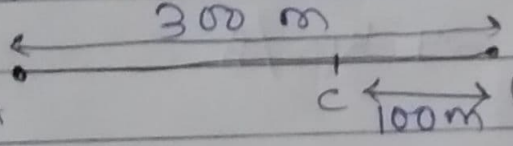
Distance covered = $3 \times 2\pi r + \frac{1}{2} \times 2\pi r$

= $3 \times 2 \times \frac{22}{7} \times 100 + \frac{1}{2} \times 2 \times \frac{22}{7} \times 100$

= 2200 m

→ Displacement = $2r$ = 2×100 = 200 m

② Joseph jogs from 1 end A to other end B of a straight 300 m road in 2 min 30 s & then turns around and jogs 100 m back to point C in another 1 min.



3) To 2 min 30 s = $2 \times 60 + 30$
= 150 sec.

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

$= \frac{300}{150} = 2 \text{ m/s}$

$V_{avg} = 2 \text{ m/s}$

ii) Distance = 400 m

T = 210 sec

Average speed = $\frac{400}{210} = 1.9 \text{ m/s}$

Displacement = 200 m

T = 210 s

$V_{avg} = \frac{200}{210} = 0.952 \text{ m/s}$

(3) let the distance covered be 'x' m

$v_1 = 20 = \frac{x}{t_1}$

$v_2 = 30 = \frac{x}{t_2}$

$t_1 = \frac{x}{20}$; $t_2 = \frac{x}{30}$

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

$= \frac{2x * 60}{5x} = 24 \text{ km/h}$

(4) $u = 0$, $T = 8 \text{ sec}$ } $a = 3 \text{ m/s}^2$

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

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

$s = \frac{1}{2} \times 3 \times 64 = 96\ m$

(5) Initial speed of car A = 52 km/h

$= 52 \times \frac{5}{18} = 14.44$ m/s

The car stops in 5 sec,

$V = 0$, $t = 5$ sec

Speed (s)	14.44 m/s	0
time (t)	0	5

Initial speed of car B = 3 km/hr = 0.83 m/s

The car stops in 10 sec.

$V = 0$, $t = 10$ sec.

Speed (s)	0.83 m/s	0
time (t)	0	10s

Distance travelled^{A} = Area of ΔOCD

$= \frac{1}{2} \times 14.44 \times 5 = 36.1\ m$

Distance travelled^{B} = $\frac{1}{2} \times 0.83 \times 10 = 4.15\ m$

→ Car A travelled father than car B

(6) i) Object B

Slope max^m = 0 max^m = speed max^m

ii) All the three will never intersect at any point

iii) When B passes A, then distance travelled

C = 9.6 − 2 = 7.6 km

iv) Distance travelled by B when it passes C

C = 6 km

(7) u = 0

Accn : a = 10 m/s^2

Distance = s : 20 m

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

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

$v^2 = 400.$

$\boxed{v = 20 \text{ m/s}}$

$v = u + at$

$20 = 0 + 10 \times t$

$20 = 0 + 10t$

$\frac{20}{10} = \boxed{2 \text{ sec} = t}$

(8) The area under the slope of the speed-time graph gives the distance travelled by an object.

i) 5 sq. on x-axis = 2 sec.
1 sq. on x-axis = 2/5 sec.
3 sq. on y axis = 2 m/s
1 sq. on y-axis = 2/3 m/s
So, area of 1 sq. on graph = $\frac{2}{5} \times \frac{2}{3} = \boxed{\frac{4}{15}}$
$= \frac{4}{15}$ m

Since, approx. 62 sq. come under the area of slope of time of 4 sec.
So, distance travelled in 4 sec. $= \frac{4}{15} \times 62$
$= 16.53$ m

ii) For uniform motion, the speed-time graph is a straight line parallel to the time axis. So, the straight part of the curve parallel to the time axis represents the uniform motion of the car.