Exercises

1) • Diameter = 200 m

Radius = 100 m

Circumference = $2\pi r = 200\pi$ m

Distance covered in 40 sec = 200π

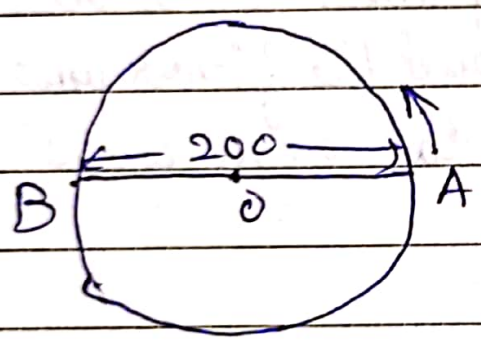
Distance covered in 1 sec = $\frac{200\pi}{40}$

Distance covered in 2 min 2 sec (140 sec) = $\frac{200\pi}{40} \times 140$

$= \frac{200\pi}{40} \times 140$

$= \frac{200}{40} \times \frac{22}{7} \times 140$

$= 2200$ m

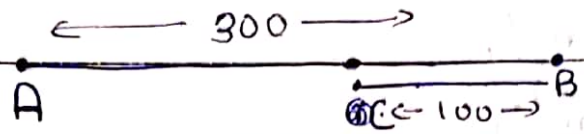


Revolution completed B in one sec = $\frac{140}{40} = 3.5$

So the final position of the athete is opposite of the track

So, the displacement is 200 m and distance covered is 2200 m

(2)



AB = 300 m

Time taken to cover AB = 2 min 30 sec = 150 sec

A to C = 300 + 100 = 400 m

Time taken to cover distance A to C = 150 + 60 = 210 sec

(a) A to B

Average speed = $\frac{300}{150}$ = 2 m/sec

Average velocitie = $\frac{300}{150}$ = 2 m/sec

(a) A to C

Average speed = $\frac{300+100}{150+60} = \frac{400}{210}$ = 1.9 m/sec

Average velocitie = $\frac{300-100}{150+60} = \frac{200}{210}$

= 0.95 m/sec

3) $V_1 = 20\ km/h$

$V_2 = 30\ km/h$

As distance is same

Average speed $= \frac{2 V_1 V_2}{V_1 + V_2}$

$= \frac{2 \times 20 \times 30}{20 + 30}$

$= \frac{1200}{50}$

$= 24\ km/h$

4) Initial velocities $= u = 0\ m/s$

Acceleration $= a = 3\ m/s^2$

Time $= 8.0\ sec$

As per 2nd motion equation -

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

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

$$= 0 + \frac{1}{2} \times 3 \times 64^{32}$$

$$= 96\ m$$

6(a) B is travelling the fastest because the slope of the line B is more

(b) No, the three are never at the same point of the road

(7) Initial velocity = $u = 0$ m/s

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

$S = 20$ m

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

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

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

$\Rightarrow v = \sqrt{400}$

$\Rightarrow v = 20$ m/s

We know $v = u + at$

$$t = \frac{v - u}{a}$$

$$\Rightarrow t = \frac{20 - 0}{10}$$

$\Rightarrow t = 2$ sec

$\therefore$ The ball reaches the ground after 2 secs