HW
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Date
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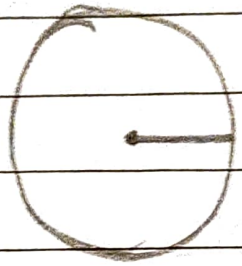
Exercises (ch-1)

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

⇒



Diameter = 200m; Radius = 200m/2
= 100m

In 140 seconds; $\frac{2\pi r \times 140}{40}$

$= \frac{2 \times 22 \times 100 \times 140}{7 \times 40} = 2200m$

3 full round = 40 × 3 = 120sec

Total time taken = 2min 20sec
= 140s

After 3 rounds he has taken 20sec, he has covered half of the circular track. So, the displacement is equal to 200m.

Q. Joseph jogs from one end A to other end B of a straight 300m road in 2 minutes 30 seconds and then turns around and jogs 100m back to point C in another 1 minute. What are Joseph's average speeds and velocities in jogging (a) from A to B and (b) from A to C?

⇒ (a) $150\text{sec} = \frac{300}{150} = 2\text{m/s}$

average speed = average velocity
= 2 m/s

(b) Total taken = 300 + 100 = 400m

Total time = 150s + 60 = 210 sec

$\text{avg. speed} = \frac{400}{210} = 1.9$

(a) avg. velocity = $\frac{\text{displacement}}{\text{total time}}$

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

3. Abdul, while driving to school, computers the average speed for his trip to be 20 km h^{-1}. On his return the same route, there is less traffic and the average speed is 30 km h^{-1}. What is the average speed for Abdul's trip?

⇒ The average speed = 20 km/h.

While returning = 30 km/h.

let the distance = x

The average speed for

$$\text{abdul trip} = \frac{2x}{\frac{x}{30} + \frac{x}{20}}$$

$$= \frac{2}{\frac{1}{30} + \frac{1}{20}} = \frac{2 \times 60}{2+3} = \frac{120}{5}$$

$$= 24 \text{ km/h}.$$

4. A motorboat starting from rest on a lake accelerates in a straight line at a constant rate of 3.0 m s^{-2} for 8.0 s. How far does the boat move during this time?

$\Rightarrow u = 9;\ a = 3.0 m/s^2,\ t = 8 sec$

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

$$s = \frac{1}{2} \times 3 \times \overset{32}{64}^2 = 96m$$

5. A driver of a car travelling at 52km h^{-1} applies the brakes and accelerates uniformly in the opposite direction. The car stops in 5s. Another driver going at 3km h^{-1} in another car applies his brakes slowly and stops in 10s. On the same graph paper, plot the speed versus time graphs for the two cars. Which of the two cars travelled farther after the brakes were applied?

$\Rightarrow$ $u = 52 km/h$; $t = 5s$; $v = 0$

$u' = 3 km/h$; $t = 10s$; $v' = 0$

In the first case : $a = \frac{v-u}{t}$

$a = 52 km/h = 52 \times \frac{5}{18} m/s$

$$\Rightarrow a = \frac{0 - 52 \times \frac{5}{18}}{5} = \frac{-52 \times 5}{18 \times 5} \text{ m/s}^2$$

$$= -2.8 \text{ m/s}^2$$

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

$$0 = \frac{9 \times 25}{18} - 2 \times \frac{1}{12} \times s'$$

$$\frac{s'}{6} = \frac{9 \times 25}{18} \Rightarrow s' = \frac{3 \times 25}{3}$$

$$= 75 \text{ m}$$

$$\Rightarrow s = \frac{52 \times 5 \times 25 \times 18}{18 \times 18 \times 2 \times 5} = 2.8 \times 25 = 70 \text{m}$$

In second case:

$$a' = \frac{v' - u'}{t'}$$

$$\Rightarrow a' = \frac{0 - 3 \times \frac{5}{18}}{10} = \frac{-8}{6 \times 10^2} = \frac{1}{12} \text{ m/s}^2$$

6. Shows the distance - time graph of the object A, B and C. Study the graph and answer the following question:

(a) Which of the three is travelling the faster?

⇒ B is travelling fastest. As slope of B is greatest.

(b) Are all three ever at the same point on the road?

⇒ No

(c) How far has C travelled when B passes A?

⇒ 7.5 km − 2.2 km = 5.3 km

(d) How far has B travelled by the time it B passes A?

⇒ Distance travelled by B
= 4 + 1.1 km = 5.1 km.

7. A ball is gently dropped from a height of 20m. If its velocity increases uniformly at the rate of $10ms^{-2}$, with what velocity will it strike the ground? After what time will it strike the ground?

$\Rightarrow$ $u = 0$

$h = 20m$

$g = -10m/s^2$

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

$\Rightarrow -20 = -\frac{1}{2} \times 10 \times t^2$

$\Rightarrow t = \sqrt{400} = 20s$

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

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

$\Rightarrow v = 20m/s$

(a) Find how far does the car travel in the first 4 seconds. Shade the area on the graph that represents the distance travelled by the car during the period

$$= \frac{0+6}{2} = 3 m/s$$

$$t = 4 sec$$

$$v = \frac{d}{t}$$

$$\Rightarrow d = vt$$

$$\text{distance} = 3 \times 4 m/s = 12 km$$

(b) which part of the graph represents uniform motion of the car?

$\Rightarrow$ 6 sec − 10 sec

10> An artifical satellite is moving in a circular orbit of radius 42250 Km. ~~Calculat~~ calculate its speed if it takes 24 hours to revolve around the the earth.

⇒ $r = 42250\,km$

$t = 24\,hrs$

Distance = $S = 2\pi r = 2 \times \frac{22}{7} \times 42250$

$= 365,464.5\,km$

Velocity = $\frac{S}{t} = 11,061\,km/h.$

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