CLASS IX
CHAPTER VIII
EXERCISE SOLUTION

Question 1:

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

Answer 1:

Time taken = 2 min 20 sec = 140 sec.
Radius, r = 100 m.
In 40 sec the athlete complete one round.
So, in 140 sec the athlete will complete = 140 ÷ 40 = 3.5 round.
⇒ Distance covered in 140 sec = $2\pi r \times 3.5 = 2 \times 22/7 \times 100 \times 3.5 = 2200$ m.
At the end of his motion, the athlete will be in the diametrically opposite position.
⇒ Displacement = diameter = 200 m.

Question 2:

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

Answer 2:

(a) For motion from A to B:
Distance covered = 300 m
Displacement = 300 m.
Time taken = 150 sec.
We know that, Average speed = Total distance covered ÷ Total time taken
= 300 m ÷ 150 sec = 2 ms-1
Average velocity = Net displacement ÷ time taken
= 300 m ÷ 150 sec = 2 ms-1
(b) For motion from A to C:
Distance covered = 300 + 100 = 400 m.
Displacement = AB - CB = 300 - 100 = 200 m.
Time taken = 2.5 min + 1 min = 3.5 min = 210 sec.
Therefore, Average speed = Total distance covered ÷ Total time taken
= 400 ÷ 210 = 1.90 ms-1
.Average velocity = Net displacement ÷ time taken
= 200 m ÷ 210 sec = 0.952ms-1

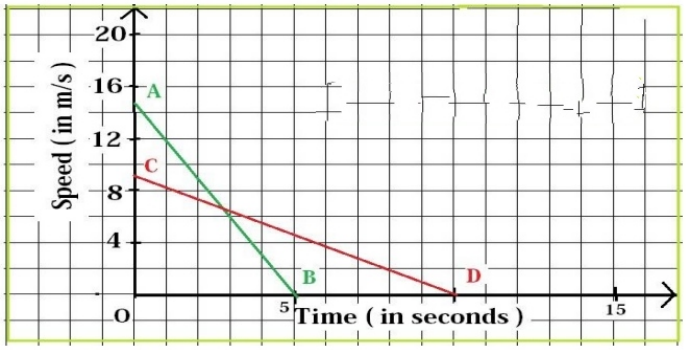
Question 3:

Abdul, while driving to school, computes the average speed for his trip to be 20 kmh-1. On his return trip along the same route, there is less traffic and the average speed is 30 kmh-1. What is the average speed of Abdul's trip?

Answer 3:
Let one side distance = x km.
Time taken for forward trip at a speed of 20 km/h = Distance / Speed = x/20 h.
Time taken in return trip at a speed of 30 km/h = x/30 h.
Total time for the whole trip =
x/20 + x/30
= (3x+2x)/60
= 5x/60h.
Total distance covered = 2x km.
We know, Average speed = Total distance ÷ Total time
= 2x ÷ (5x/60) = 24 kmh-1

Question 4:
A motor boat starting from rest on a lake accelerates in a straight line at a constant rate of 3.0 ms-2 for 8.0 s. How far does the boat travel during this time?
Answer 4:
Here, u = 0 m/s
a = 3 ms-2
t = 8 s
Using, $s = ut + 1/2\ at^2$
$s = (0\times8) + (1/2 \times 3 \times 8^2) = 96$ m.

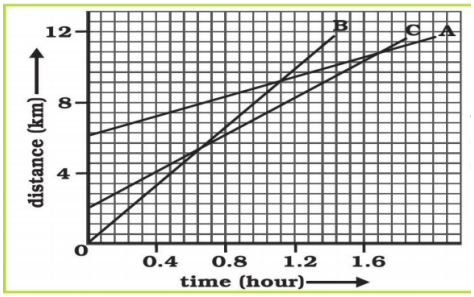
Question 5:
A driver of a car travelling at 52 kmh-1 applies the brakes and accelerates uniformly in the opposite direction. The car stops after 5 s. Another driver going at 34 kmh-1 in another car applies his brakes slowly and stops in 10 s. On the same graph paper, plot the speed versus time graphs for two cars. Which of the two cars travelled farther after the brakes were applied?
Answer 5:
In in the following graph, AB and CD are the time graphs for the two cars whose initial speeds are 52 km/h(14.4 m/s) and 34 km/h(8.9 m/s), respectively.



Distance covered by the first car before coming to rest
= Area of triangle AOB
= 1⁄2 × AO × BO
= 1⁄2 × 52 kmh-1 × 5 s
= 1⁄2 x (52 × 1000 × 1/3600) ms-1 × 5 s = 36.1 m
Distance covered by the second car before coming to rest
= Area of triangle COD
= 1⁄2 × CO × DO
= 1⁄2 × 34 km h-1 × 10 s
= 1⁄2 × (34 × 1000 × 1/3600) ms-1 ×10 s = 47.2 m
Thus, the second car travels farther than the first car after they applied the brakes.

Question 6:

Fig 8.11 shows the distance-time graph of three objects A, B and C. Study the graph and answer the following questions:



(a) Which of the three is travelling the fastest?
(b) Are all three ever at the same point on the road?
(c) How far has C travelled when B passes A?
(d) How far has B travelled by the time it passes C?

Answer 6:

(a) B is travelling fastest as he is taking less time to cover more distance.
(b) All three are never at the same point on the road.
(c) Approximately 6 kms. [as 8 – 2 = 6]
(d) Approximately 7 kms. [as 7 – 0 = 7]

Question 7:

A ball is gently dropped from a height of 20 m. 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?

Answer 7:

Here, u = 0 m/s, s = 20 m, a = 10 ms-2, v =?, t = ?
Using $v^2 – u^2 = 2as$
We have, $v^2 – 0^2 = 2 \times 10 \times 20 = 400 \Rightarrow v = 20$ ms-1
and t = (v – u) ÷ a = 20 ÷ 10 = 2 s.

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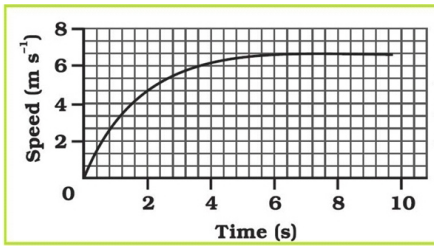
Question 8:

The speed – time graph for a car is shown in Figure:



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

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

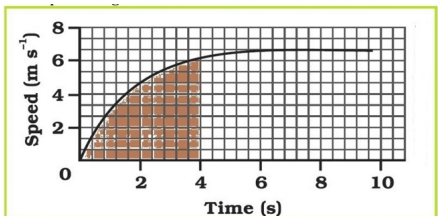
Answer 8:

(a) Distance covered = area under speed – time

⇒ Distnce =

(½)× 4 × 6 = 12 m

Shaded area representing the distance travelled is as follows:



(b) After 6 seconds the car moves in uniform motion (at a speed of 6 m/s).

Question 9:

State which of the following situations are possible and give an example of each of the following:

(a) an object with a constant acceleration but with zero velocity,

(b) an object moving in a certain direction with an acceleration in the perpendicular direction.

Answer 9:

(a) Yes, a body can have acceleration even when its velocity is zero. When a body is thrown up, at highest point its velocity is zero but it has acceleration equal to acceleration due to gravity.

(b) Yes, an acceleration moving horizontally is acted upon by acceleration due to gravity that acts vertically downwards.

Question 10:

An artificial is moving in a circular orbit of radius 42250 km. Calculate its speed if it takes 24 hrs to revolve around the earth.

Answer 10:

Here,

r = 42250 km = 42250000 m

T = 24 h = 24 × 60 × 60 s

Using Speed, $v = 2\pi r \div T$

$v = (2 \times 3.14 \times 42250000) \div (24 \times 60 \times 60)$ m/s

= 3070.9 m/s = 3.07 km/s
